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A Journal of Policy Development and Research

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

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Housing, Contexts, and the Well-Being of Children and Youth: Guest Editors' Introduction

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The opinions expressed in this guest editors' introduction and in the following articles and commentaries are those of the authors and do not necessarily reflect the official positions or policies of the U.S. Department of Housing and Urban Development, the U.S. Department of Health and Human Services, or the U.S. government.

From time to time, most families with children carefully consider the consequences of their housing and neighborhood choices for their children. Policymakers allocate many billions of dollars to a wide variety of housing and neighborhood-based activities in the hope that these activities will foster the healthy development of the next generation. When parents and policymakers look to the social sciences for hard evidence in support of their decisions, however, they will find much of the literature disappointingly inconclusive. This symposium is intended to help build a better evidence base.

This symposium examines the relationship between housing and neighborhood contexts and the well-being of children and youth. The articles are based on the premise that time-invariant, family- and individual-level factors are not alone in affecting child and youth development, but that the contexts in which children grow up also independently influence outcomes. Thus, the articles reflect both an ecological framework that considers multiple levels (the individual child or youth, the family, the context in which they live or spend time) and a developmental perspective that asks how risk and protective factors vary by age and development stage. The articles highlight important issues and provide lessons for policymakers, practitioners, and researchers about how best to serve children and families, strengthen the communities in which they live, and advance research in this area.

This symposium demonstrates several types of cross-fertilization. The guest editors are affiliated with the U.S. Department of Housing and Urban Development and with the Administration for Children and Families in the U.S. Department of Health and Human Services. The articles reflect multiple disciplines and bring together distinct literatures in new ways. For example—

- A large literature links moving, or residential mobility, with adverse outcomes for children and youth. The articles in this symposium take this literature further by exploring how the effects of mobility may vary by age and across outcomes.

- A large and growing research base examines neighborhood effects on children and families. These articles advance understanding of what neighborhood means and of what really matters in neighborhoods by critically assessing the concepts of housing and neighborhood and the tools we use to study them.

- A large literature discusses family homelessness. This symposium explores how homelessness is associated with child development and how service providers might ameliorate its negative effects.

Articles in the Symposium

In "Residential Mobility Among Children: A Framework for Child and Family Policy," Sara Anderson, Tama Leventhal, Sandra Newman, and Veronique Dupéré encourage the field to adopt a developmental perspective that takes into account the interaction between developmental period and exposure. Applying this approach to residential mobility, they argue that "moving may not be an equivalent experience for all children during all developmental periods." They review existing research and report on an exploratory analysis of their own to show how qualities of families, neighborhoods, peers, and schools vary in salience for children of different ages; they also describe how moving might affect these contexts in ways that influence development.

In "Profiles of Housing and Neighborhood Contexts Among Low-Income Families: Links With Children's Well-Being," Rebekah Levine Coley, Melissa Kull, Tama Leventhal, and Alicia Doyle Lynch propose that the variables defining housing contexts do not exist as independent factors in the real world. Instead, they argue, "we must identify how housing and neighborhood factors are linked together in particular patterns." Their analysis reveals four particular housing profiles that are associated with children's academic skills and emotional and behavioral problems. Counterintuitive results, they argue, suggest that modeling the effects of housing and neighborhood characteristics as if they function in an independent and unrelated way might obscure the true effects of housing and neighborhood on children's development.

Place-based initiatives to improve the quality of neighborhoods, including schools, are a policy outgrowth of the theory that neighborhood contexts matter. In "Getting to Better Performing Schools: The Role of Residential Mobility in School Attainment in Low-Income Neighborhoods," Brett Theodos, Claudia Coulton, and Amos Budde examine the interactions of residential and school mobility—both known to be related to children's school performance—within the context of a place-based initiative. Their analysis finds that only 49 percent of the children studied were in schools inside the target area, that residential and school mobility were often independent, and that on average switching schools did not get children to better ranked schools. Focusing investments in small geographic areas, the authors conclude, may not achieve desired results, partly because so many children move in and out of any target area. In fact, they argue, "[r]educing unproductive school and residential churning may be a key to the success of both in-place investment approaches and mobility strategies."

In "Coercive Sexual Environments: What MTO Tells Us About Neighborhoods and Sexual Safety," Robin Smith, Megan Gallagher, Susan Popkin, Amanda Mireles, and Taz George highlight the importance of what they term the "sexual environment" as a dimension of neighborhood quality. Although ample, diverse, and wide-ranging bodies of research have established the critical role of gender in structuring the life chances of both boys and girls, neighborhood effects research has left largely unexamined the influence of gender relations on aspects of neighborhood quality that are important for the development of children and youth. Smith et al. argue that experiences of sexual harassment can produce a culture greater than the sum of its parts: a *coercive sexual environment* that inhibits girls and women from inhabiting public spaces with confidence and undermines the chances of developing mutually supportive relationships with men in their neighborhoods.

One of the most important housing contexts is the lack of housing. Two articles in the symposium review the developmental consequences of homelessness and the implications of a developmental framework for relevant policies and programs. In "Promoting Resilience for Children Who Experience Family Homelessness: Opportunities To Encourage Developmental Competence," J.J. Cutuli and Janette E. Herbers review the literature on homelessness as a risk factor in child development and "identify two ordinary but powerful adaptive systems that help children avoid or bounce back from the negative effects of homelessness on development—positive parenting and child self-regulation." Furthermore, they offer suggestions for how "policymakers and homeless services providers can enhance, support, and facilitate these systems."

In the second article on family homelessness, "Healthy Start in Housing: A Case Study of a Public Health and Housing Partnership To Improve Birth Outcomes," Emily Feinberg, Bricia Trejo, Brianna Sullivan, and Zhandra Ferreira-Cesar Suarez adopt a medical and public health perspective to explain the significance of housing as a social determinant of healthy pregnancy and childbearing. The article describes how life-course theory helped the Boston Public Health Commission convince the Boston Housing Authority to design and implement an intervention for women with high-risk pregnancies who are homeless or at risk of becoming homeless, despite initial opposition from advocates for the homeless. This article provides a case study of how this work might be implemented in the field.

We bookend this symposium with "Moving Beyond Neighborhood: Activity Spaces and Ecological Networks As Contexts for Youth Development," in which Christopher R. Browning and Brian Soller argue that neighborhood effects research needs the tools of network analysis. Browning and Soller propose that routine spatial exposures, or "activity spaces," can be viewed as parts of larger wholes, which they term "ecological networks" and "ecological communities." They detail how new data collection methods allow for empirical analysis of ecological networks and communities. Such analyses, they argue, will illuminate the processes linking neighborhood structural features to youth development in disadvantaged neighborhoods and will enhance the capacity for effective youth-oriented interventions.

Finally, to provide an international perspective, we include commentary from two scholars of housing, mobility, and child and youth well-being who have studied these processes extensively outside the United States: Sandra Garcia Jaramillo (Colombia) and Roger Andersson (Sweden).

Conclusion

The articles in this symposium contribute to understanding the relationship between the contexts in which children and youth live and spend time and their well-being. Although the articles vary in the aspects of context and child well-being that they address, common themes and lessons emerge. This set of articles pushes us to better define and measure the contexts that matter for children and to expand our methods and analytic tools for studying these contexts and their relationship to child well-being. They also point to the fact that the effects of context may vary by age, developmental stage, and outcome—and push us to consider this fact as we plan and study programs and policies. This symposium suggests the need to broaden our thinking and perhaps better coordinate policy and practice. This lesson is timely. Considerable effort and investments are being made at the federal, state, and local levels to improve the environments in which children and youth live and spend time and to ameliorate the negative effects of suboptimal environments. Research and theory development, like that highlighted in this symposium, can help to better direct those efforts and ultimately improve outcomes.

Acknowledgments

All the articles in this symposium were peer reviewed. The guest editors are proud to have made this venue available to the authors of valuable research, which they believe significantly contributes to knowledge in this area. The guest editors thank the many anonymous referees who provided timely and thoughtful reviews and thank Sandra Garcia Jaramillo and Roger Andersson for their thoughtful commentary.

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Residential Mobility Among Children: A Framework for Child and Family Policy

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Abstract

More children move than almost any other age group in the United States, with nearly one in five children moving in 2011 alone. A considerable research base links moving, or residential mobility, with adverse outcomes across childhood, including depression, problem behaviors, risk taking, and deficits in achievement. Nonetheless, we lack a framework for understanding how residential mobility is associated with children's outcomes during different periods of development, such as early childhood, middle childhood, and adolescence. It is unlikely that moving itself is directly linked with children's outcomes. Rather, the changes in children's contexts concurrent with a move, such as changes in the child's family, neighborhood, peer group, and school, likely underlie the relationship between moving and children's well-being. In this article, we present a developmental-contextual framework for understanding the relationship between moving and adverse child outcomes. We illustrate our framework through a review of the literature and an empirical example. Evidence from the literature and our empirical example suggest that moving is associated with children's family, neighborhood, and peers and, to a lesser extent, school contexts, with possible consequences for child outcomes. These associations with related contexts may be more pronounced in later developmental periods. In conclusion, we identify knowledge gaps and provide tentative policy implications.

Introduction

The United States is a country with high rates of residential mobility (for example, Long, 1992). Children move more than adults, a trend pronounced among those children who were less than 10 years old and for whom mobility rates exceeded 13 percent in 2010 (U.S. Census Bureau, 2011b). For children who are of a racial or ethnic minority group or are living in poverty, multiple moves per year are common (Alexander and Entwisle, 1988; Schachter, 2004; Ziol-Guest and McKenna, 2013). Growing research employing diverse samples and a range of analytic strategies, including innovative ways to account for selection bias, points to adverse consequences associated with residential mobility, such as victimization, poor health, felony arrest, and compromised socioemotional development and achievement (Busacker and Kasehagen, 2012; Coley et al., 2012; Foster and Brooks-Gunn, 2012; Herbers et al., 2012; Voight, Shinn, and Nation, 2012). Given the high rates of residential mobility among U.S. children and youth and the evidence that links moving with unfavorable outcomes (for example, Jelleyman and Spencer, 2008), it is critical to understand the implications of moving across developmental periods and the manner in which co-occurring contextual shifts accompany residential mobility. Without this understanding, a sound foundation for policy interventions is lacking.

In this article, we develop a comprehensive theoretical framework to elucidate the pathways between residential mobility and children's outcomes. We examine residential mobility from a developmental-contextual perspective that recognizes that moving may not be an equivalent experience for all children during all developmental periods. We describe how relevant developmental contexts—notably families, neighborhoods, peers, and schools—may be key pathways linking residential mobility and children's outcomes. This article has two main sections: the first is theoretical and the second empirical. In the first section, we discuss the theoretical foundations that justify a developmental-contextual approach to residential mobility. Then, we critically review the literature on residential mobility and children's health and well-being for three developmental periods: early childhood, middle childhood, and adolescence. Next, we present four contextual pathways that may link residential mobility with children's outcomes: family, neighborhood, peers, and school. Building on the contextual pathways model, the second section provides an empirical example for exploring how residential mobility and children's contexts may be interrelated across development. We conclude with a discussion of current child and family policies for residentially mobile children and then make recommendations for further research and future policy.

Theoretical Foundations

Our theoretical model linking residential mobility with children's development is an ecological, developmental systems perspective (Bronfenbrenner and Morris, 2006; Lerner, 2006). This perspective views the developing child as being nested within multiple contexts, ranging from proximal to distal, and as being embedded within a system that entails dynamic relations between the child and these contexts and among the contexts themselves. Although all contexts are thought to influence children's development, those contexts in which the child regularly interacts (or are more proximal) may be particularly important for development, including family (Crosnoe and Cavanagh, 2010), neighborhood (Leventhal and Brooks-Gunn, 2000), peers (Bukowski, Brendgen,

and Vitaro, 2007), and school (Wentzel and Looney, 2007). This framework is relevant to the topic of residential mobility and child development, given that moving often requires changes in these proximal settings, and to the reorganization of the child's developmental system after a move. The manner in which that reorganization takes shape has implications for a child's development. For example, children interact daily with their parents, and the qualities of interactions influence development. Moving may alter child-parent interactions either temporarily or permanently, be-cause parents may become stressed in the short term or may be influenced by new neighborhood or professional contexts in the long term.

Building on the work of Elder (1995), Bronfenbrenner also argued that time is critical to human development, because each person is influenced by the timing of major events and transitions he or she experiences (Bronfenbrenner and Morris, 2006). Residential moves may have different implications for development, depending on whether moves occur during early childhood, middle childhood, or adolescence. As typically conceptualized, developmental periods encompass at least one major transition in a child's life, such as school entrance or exit, biological maturation, role shifts, and possibly cognitive alterations (Graber and Brooks-Gunn, 1996). Because the developmental challenges during these periods are relatively universal and require new modes of adaptation to biological, psychological, or social changes, moving may confer differential effects depending on when it occurs. Exhibit 1 demonstrates how childhood mobility may be related to children's out-comes through family, neighborhood, peer, and school contexts as moderated by developmental period.

Relatively limited research takes a developmental approach to studying the effects of residential mobility. Findings from two studies suggest that moving in early childhood (versus other

Exhibit 1

Conceptual Model of the Role of Residential Mobility in Child Development
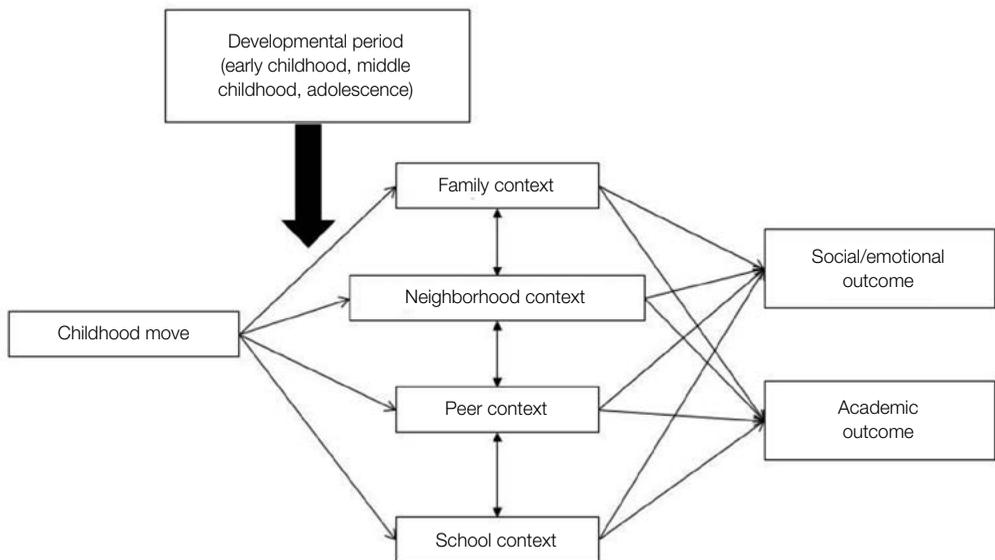
Note: Relationships are net child, family, and neighborhood covariates.

developmental periods) is associated with adverse achievement outcomes either concurrently (Heinlein and Shinn, 2000) or in adolescence (Haveman, Wolfe, and Spaulding, 1991), although only Haveman, Wolfe, and Spaulding's study used a representative dataset. Using longitudinal data from a national sample, Gillespie (2013) also found that moving at a younger age was associated with more problem behaviors than moving during adolescence. Swanson and Schneider (1999) instead found differential associations for residential mobility in early and late adolescence, with potential gains in math skills for moving early in adolescence and with adverse association with behavioral problems for moving in late adolescence. Finally, Coley et al. (2012) did not find that the timing of exposure to residential mobility moderated associations. In sum, residential mobility, contexts, and outcomes are likely not associated in a similar fashion across developmental periods; however, clear causal associations remain to be established. In the next sections, we briefly review how associations between residential mobility and children's outcomes may vary by developmental period based on distinct aspects of each period.

Early Childhood

During early childhood (or approximately birth to 54 months old), children experience rapid physical, cognitive, and socioemotional development and rely on parents to a great extent (Shonkoff and Phillips, 2000). Alterations to children's developmental contexts, notably the family, during this period could have lasting repercussions in a number of domains (for example, Duncan and Brooks-Gunn, 1997). A range of developmental contexts, including childcare and the neighborhood, are part of young children's ecology, but the family context is the most proximal and relevant context and, thus, is a likely pathway of residential mobility effects in early childhood. If the family is disrupted by a move, parents may not be as responsive to their children's needs or may monitor them less, perhaps resulting in deficits in socioemotional development (Smetana, 2011). Changes in the nature of the home environment also may mean compromises in the provision of a cognitively stimulating environment, potentially leading to shortfalls in cognitive development (Bradley, 1987). On the other hand, moving may confer benefits, particularly if logistical disruptions resulting from actually changing households are brief in duration and the quality of the home or neighborhood improves, which is possible, given the upward mobility of families with young children (Schachter, 2004).

Middle Childhood

During middle childhood (approximately 4 1/2 to 11 years of age), children transition to elementary school and then to middle school and continue to develop cognitively, physically, and socioemotionally. The children gain independence, which suggests a growing relevance of extrafamilial contexts, although parents remain of paramount importance (Eccles, 1999; Sameroff and Haith, 1996). The neighborhood is relevant in middle childhood because of the institutional resources beyond just schools, including recreational, social, and health programs and services (Leventhal, Dupéré, and Brooks-Gunn, 2009). Moreover, the neighborhood conveys norms and expectations for children and parents (Leventhal and Brooks-Gunn, 2000). Children who are likely to have direct access to all these neighborhood resources may also be connected to the resources via their parents, and moving away could decrease ease of access (Kan, 2007). In addition, children who move in middle childhood are likely to change schools, and thus need to adjust to new teachers

and peers. Children's adjustment to new teachers, expectations, and school climate are critical during this period as student-teacher relationships are important for achievement (Pianta et al., 2008). Depending on the nature and success of the adjustment, children could benefit from higher quality facilities or face adverse consequences if student-teacher relationship quality deteriorates (Hanushek, 2004). Finally, the quality of peer relationships may erode after a move, perhaps because of increases in feelings of loneliness and rejection (Hay, Payne, and Chadwick, 2004). In this period, family, neighborhood, peer (to a lesser extent), and school contexts are possible pathways that link residential mobility with children's development.

Adolescence

During adolescence (approximately 11 to 18 years of age), children develop close peer groups and critical thinking skills, experience puberty, and have exposure to diverse contexts, all while participation in risk-taking behaviors becomes normative (Steinberg and Morris, 2001). Mobile adolescents may have more opportunity to participate in risk-taking behaviors than stable youth because their parents may be distracted with requirements of the move, perhaps leading to less parental monitoring and more direct exposure to their neighborhoods (Haynie and Osgood, 2005). With a move to a new home and perhaps neighborhood or school, the loss of peer networks may have consequences for mobile youth because of the salience of peers during this period (Brown and Larson, 2009; Evans, Oates, and Schwab, 1992; Rubin et al., 2008). (The ubiquity of social media and smart phones, however, may mitigate these associations [Subrahmanyam and Greenfield, 2008].) Residentially mobile children often affiliate with more delinquent peers than their stable counterparts and may demonstrate more risk-taking behaviors as a result (Gasper, DeLuca, and Estacion, 2010; Haynie, Silver, and Teasdale, 2006). Thus, residential mobility may be linked to adolescents' development through any of the contexts reviewed because of their persistent (family and school) or growing (neighborhood and peers) relevance.

A Note on Studying Residential Mobility

We offer one cautionary note before we discuss the literature on residential mobility among children. Most of the residential mobility literature employs observational, cross-sectional designs, precluding causal conclusions. Moreover, selection bias is a persistent issue in the field, as unmeasured characteristics of the child, family, or neighborhood may explain associations between residential mobility and children's development (Leventhal and Newman, 2010). For example, maternal depression may lead families to move because of job instability and result in adverse child outcomes; thus the omitted variable, maternal depression, explains the association and not moving itself. Researchers have attempted to cope with selection bias by employing analytic approaches that better account for preexisting differences (including fixed effects analyses and propensity score matching). These attempts to overcome bias establish modest to nonexistent direct associations between moving and children's outcomes (Anderson, 2012; Gasper, DeLuca, and Estacion, 2012, 2010).

In addition, only a handful of studies have examined residential mobility from a developmental or a contextual perspective. Most extant research conceptualizes residential mobility in terms of recent mobility (moving within the past 2 years in the case of the National Longitudinal Study of

Adolescent Health [Add Health]), number of lifetime moves, or moves within a select number of years, based on limitations of the sample. Measuring residential mobility within developmental period is an important extension of the literature. Significant differences in the structure and quality of developmental contexts may be related to residential mobility compared with stability; however, limited research has taken a developmental-contextual approach. We address these topics in the following section.

Where We Are: Residential Mobility and Developmental Contexts

As discussed, residential mobility may be associated with child development through salient developmental contexts. In this section, we review theoretical and empirical evidence that demonstrate a plausible link between residential mobility and children's outcomes through family, neighborhood, peer, and school contexts. Each context focuses on a different or complementary set of processes or structures that vary in prominence during the course of child development.

We conducted an extensive review of the literature on residential mobility among children employing the following search engines: PsychInfo, ERIC, and JSTOR. The search terms "residential mobility" or "residential instability" and "child*" or "adolesc*" were employed. Citations from our selected articles also were cross checked with the articles found in the original search for inclusion in the review. Reviewed articles were limited to those from scholarly peer-reviewed publications, employing a nationally based or large-scale U.S. sample, and for quantitative studies, those publications that used comprehensive covariates. Because a limited number of studies used longitudinal samples, we were unable to restrict our review to longitudinal examinations of residential mobility across periods.

Family

Family members, most importantly parents, are the principal socialization agents of children, and as noted earlier, their primacy endures across childhood and adolescence (Collins et al., 2000). A move is likely to alter parent-child interactions, but the nature of the change is unclear. We propose that residential mobility is associated with children's outcomes through family stress, financial constraints, and instability.

Family stress models posit that with few economic resources and concomitant family economic pressure, parents evince emotional and behavioral problems, which give rise to interparental or interpartner conflict associated with inconsistent, harsh, and unsupportive parenting (for example, Conger and Donnellan, 2007). Recent work has employed natural experiments, randomized experiments, and conceptualized income and wealth in a variety of ways to demonstrate that constrained material resources lead to compromised interactions between children and parents (for example, harsh parenting), which then affects children's academic and behavioral functioning (Costello et al., 2003; Gershoff et al., 2007). Like family economic pressure, moving may be stressful for parents because it entails physically relocating to a new home, which may be accompanied by financial pressures associated with purchasing or renting a residence and possibly adjusting to a new job,

social network, and neighborhood (for example, Lee, Oropesa, and Kanan, 1994; South, Crowder, and Trent, 1998). These stressors in turn may result in suboptimal child outcomes in a cascading fashion as outlined in the family stress model (Myers, 2005).

Empirical evidence suggests that family stress and its related components are plausible mechanisms for explaining the association between residential mobility and a range of children's outcomes, and that the model is relevant across child development. Adam's (2004) review of the literature concluded that parental well-being may explain the association between residential mobility and children's outcomes. As a more recent example, in a study employing HLM analyses with comprehensive co-variates, Coley et al. (2012) found that higher average rates of residential mobility were associated with greater internalizing (or depressive and withdrawn symptoms) and externalizing (acting out and aggressive) behaviors in low-income children and adolescents through maternal psychological distress. In early and middle childhood, family stress is a relevant factor partially explaining as-sociations between residential mobility and subsequent high school completion (Haveman, Wolfe, and Spaulding, 1991). Mobile families also report considerable stress when asked directly about their experience of moving (Bradshaw et al., 2010), and children in such households have lower academic achievement than stable peers (Warren-Sohlberg and Jason, 1992).

Moving could lead to constrained financial resources, with consequences for the provision of a stimulating learning environment (Bradley and Corwyn, 2002). Families may move because they cannot afford their current housing situation (Holupka and Newman, 2011) or because of parental separation or divorce (South, Crowder, and Trent, 1998), or they may face immediate financial strains after a move because of the sheer cost of changing households. The economic toll, in turn, may lead to an inability on the part of families to provide stimulating materials and experiences, such as books or extracurricular activities, or to respond sensitively and in a developmentally ap-propriate manner with their children. No empirical evidence, to our knowledge, has demonstrated associations between residential mobility and the quality of the home learning environment.

In addition to extra familial stress and financial constraints, residential mobility likely has related implications for family instability. Research demonstrates that family structural changes are as-sociated with moving (Hoffmann, 2006; Tucker, Marx, and Long, 1998). It is not surprising that moving—particularly multiple times—often co-occurs with divorce, is particularly high among single-parent families, and frequently corresponds with parental job and family structure changes (Jelleyman and Spencer, 2008; Michielin and Mulder, 2008; Schachter, 2001). Chaos and family instability, in turn, are consistently associated with compromised child well-being (Cavanagh and Huston, 2006; Evans, 2006). Research that directly explores the links between residential mobility and children's outcomes through family instability suggests it is a plausible mechanism (Astone and McLanahan, 1994).

In sum, theoretical and empirical work indicates a link between residential mobility, the family, and children's outcomes for a range of behaviors throughout childhood. Again, simply moving may not lead to adverse developmental outcomes. Instead, moving may undermine parenting or result in constrained financial resources (or may co-occur with such events), potentially leading to children's adverse socioemotional and achievement across development. The exact nature, strength, and timing of these relationships are unknown. The specific processes, whether related to warmth and supportive parenting or the provision of stimulating resources, also remains an

unanswered question. We might presume, for example, that compromised maternal sensitivity would lead to problem behaviors (Connell and Goodman, 2002), whereas constrained resources would be associated with achievement deficits (Davis-Kean, 2005; Hart and Risley, 1995). Regardless of the specific process, it is likely that family processes and structures are operative across childhood and adolescence because of the prominence of parents across the life span (Grusec and Davidov, 2007).

Neighborhood

Neighborhoods are significant contexts for child and adolescent development and comprise institutional resources, social connections, and a set of norms and expectations for their residents (Leventhal and Brooks-Gunn, 2000). Neighborhoods should be considered in investigations of pathways of residential mobility and child development, because a move is likely accompanied by a change in neighborhood, necessitating adjustments on the part of family and child.

Social capital within the community (Coleman, 1988) is the theoretical framework often employed by researchers investigating residential mobility (for example, Scanlon and Devine, 2001). It is construed as access to community resources consisting of interpersonal connections that can be used by individuals for sharing information, establishing and enforcing social norms, and engaging in shared obligations and expectations. Children who move may have exposure to fewer such social resources than their stable peers, at least initially, because they and their families are not connected to new peers, neighbors, institutions, or information channels. Forming relationships and accessing knowledge of the best enrichment activities or healthcare facilities takes time. Mobile families also may relocate to neighborhoods characterized by greater residential instability than their more stable counterparts, further compromising access to resources because of the transient, and potentially ill-informed, nature of the population in such communities. In sum, with potentially less access to social capital, families and children may struggle to integrate into their communities, leading to compromised well-being (Dufur, Parcel, and Troutman, 2013). An important caveat to this model is that youth from families with low social capital (that is, fewer interpersonal and institutional connections to their neighborhood) may move more frequently than their peers whose families have greater social capital, because their families lack connections to their communities and have less success at building them (Pettit and McLanahan, 2003). Mobile families, that is, may move because they are not connected to their neighbors and communities.

Research generally supports the neighborhood pathways model. Evidence from nationally representative studies and a low-income sample demonstrates that residentially mobile parents had fewer social connections, experienced less instrumental support, and were less likely to know their children's friends than residentially stable parents (Gillespie, 2013; Haynie, South, and Bose, 2006b; Pribesh and Downey, 1999; South and Haynie, 2004; Tucker, Marx, and Long, 1998; Turney and Harknett, 2010). Furthermore, loss of social capital mediated the link between residential mobility and adolescents' outcomes in school-based and national samples (Hendershott, 1989; Hurd, Stoddard, and Zimmerman, 2012; Pribesh and Downey, 1999). In addition, qualitative studies of housing mobility programs found that youth who moved from high-poverty to low-poverty neighborhoods had a difficult time forming social ties and meaningful relationships and adjusting to acceptable norms of behavior in their new low-poverty neighborhoods (Briggs, Popkin, and

Goering, 2010; Clampet-Lundquist, 2004; Clampet-Lundquist et al., 2011), indicating that residence in a new neighborhood, particularly one of a different socioeconomic status, is accompanied by a range of challenges. Taken together, this work implies that youth and their families who move have fewer connections to and involvement in their neighborhoods than their counterparts who are residentially stable, which might account for the observed association between mobility and children's development.

It is important to note that it remains unclear when deficits in social capital among residentially mobile children emerge. Most research has been conducted with adolescents and none has compared associations across developmental periods. Social capital may not differ among movers and nonmovers in early and middle childhood because parents, for the most part, must be involved in their children's care, education, and activities (Izzo et al., 1999). Upon a move, parents may, by necessity, become engaged in educational and caregiving institutions when their children are younger, leading to connections within the community (Small, 2009). Among adolescents, however, the importance of school and peer contexts is increasing, so they may be less likely to benefit from their parents' connections and may experience lower levels of social capital than younger children as a result. If social capital declines subsequent to a move, adolescents' achievement *and* socioemotional behavior may suffer because they lack information from social networks that might promote participation in prosocial and achievement-oriented activities (Drukker et al., 2009; Duke, Borowsky, and Pettingell, 2012).

Peers

Developing relationships with peers is an integral part of healthy child development. Peer relationships become increasingly salient during adolescence (Brown and Larson, 2009) but are of great importance for children as well, with rejection and acceptance and popularity in elementary school having long-range consequences (Asher and McDonald, 2009). Peer groups are agents of socialization that can have consequences for individual children's achievement, internalizing, and externalizing behaviors, among numerous other attitudes and behaviors (Brown and Larson, 2009; Bukowski, Brendgen, and Vitaro, 2007). Depending on the distance of a move, children's peer groups and the quality of peer relationships may change. Moving to a new neighborhood, town, or school could disrupt ties with former peer groups and establishing new peer groups may prove difficult. On the other hand, peer networks frequently shift during middle childhood, in particular, and moving may not be associated with different qualities of peer networks during this period because their structure is likely to change anyway (Gifford-Smith and Brownell, 2003).

Numerous studies with the National Longitudinal Study of Adolescent Health (Add Health)[1] and other national samples find a link between residential mobility and youth behavioral and achievement outcomes via peer victimization and changing peer networks, including more deviant peers and smaller, less popular peer networks for mobile youth compared with their stable counterparts (Dupéré et al., unpublished; Haynie, Silver, and Teasdale, 2006; Haynie and South, 2005; Haynie, South, and Bose, 2006a; South and Haynie, 2004). Recent work employing fixed effects analyses

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[1] Add Health is a longitudinal study of a nationally representative sample of adolescents in grades 7 through 12 during the 1994–95 school year. Participants have since been followed across four waves.

to better account for preexisting differences between residentially mobile and stable adolescents questions these findings and suggests that peer groups of mobile adolescents systematically differed even before moving (Gasper, DeLuca, and Estacion, 2010). Moreover, it is unclear if the nature of these peer groups, including their orientation toward academics and participation in prosocial activities, are implicated in the residential mobility-child outcome relationship.

Qualitative studies also converge to suggest associations between residential mobility and the peer context. Bradshaw et al. (2010) found that youth in mobile military families experienced strains in their new peer relationships. Evidence from Moving to Opportunity, an experimental housing mobility program that randomly provided vouchers to families with children living in public housing in high-poverty neighborhoods to move to low-poverty neighborhoods (comparing them with families who remained in public housing in high-poverty neighborhoods), also reveals that children, adolescent boys in particular, who moved associated with deviant neighborhood peers and demonstrated problem behaviors in their new neighborhoods (Clampet-Lundquist et al., 2011).

A sizeable body of work examines connections between residential mobility and children's peer group characteristics (for example, delinquency and victimization). In general, it finds primarily behavioral consequences for residentially mobile adolescents who affiliate with deviant peers, with potential ancillary adverse associations with their achievement. Current research, however, does not elucidate whether moving is linked to children's achievement and social functioning via the quality of peer relationships (for example, support and closeness) (Cillessen and Mayeux, 2007; Wentzel, Barry, and Caldwell, 2004), suggesting an important direction for the field. In addition, extending the current literature to earlier developmental periods is a requisite next step.

School

School quality is another potential pathway linking residential mobility and children's outcomes. Mobile students in new schools must develop relationships with teachers, a formidable and not always successful task (Rumberger, 2003), and adjust to new school expectations and climate, critical features for students' success (Eccles and Roeser, 2011). Even if students move but do not change schools, their relationships could suffer if children experience difficulties associated with moving more generally, particularly in the context of family instability (Cavanagh and Huston, 2006). Student-teacher relationships characterized by greater closeness, warmth, and support and lower levels of conflict are associated with children's fewer behavior problems and higher achievement, especially in elementary and middle school (Hamre and Pianta, 2001; Pianta, Hamre, and Stuhlman, 2003; Wentzel, 1998). School climate, or a sense of belonging and school community, also is linked to children's behavioral outcomes (Wentzel and Looney, 2007).

Limited research addresses whether teacher relationships and school climate explain mobility-child development associations. Bradshaw et al. (2010) found that residentially mobile military children reported stressors from moving including those from developing new student/teacher relationships and adapting to a new school. A review of the literature on military families suggests that residentially mobile military children may be buffered by the adverse consequences of moving in part because of connections to school staff and teachers (Drummet, Coleman, and Cable, 2003). In addition, teacher support may help promote mobile children's favorable attitudes toward school (Gruman et al., 2008).

Inconsistencies exist in how the school context is conceptualized in the residential mobility literature in terms of student-teacher relationships and broader school characteristics. Future residential mobility research should consider these aspects. Children who move (versus those who are stable) may experience initial declines in relationship quality and climate, but whether such changes influence their behavior and achievement or are protracted is unknown. In sum, limited evidence suggests the potential role of the school context in connecting residential mobility to children's development, and considerably more research is needed in this area.

Incorporating Children's Contexts in Residential Mobility Research: An Illustration of the Approach

As reviewed, theory and research generally converge to suggest that residential mobility among children co-occurs with changes in relevant proximal contexts, and that these associations may shift, or vary in relevance, for children across developmental periods. No research to date has employed longitudinal data on children and related contexts to explore this premise, however. Our goal in this section is to provide an example of such a developmental-contextual approach to residential mobility among children. This study takes a step back to investigate what features of children's environment may change in conjunction with moving—that is, co-occurring contextual alterations that are potential antecedents and/or consequences of mobility (although we cannot determine directionality). We describe our effort to empirically examine this theoretical model using longitudinal data on a sample of more than 1,000 U.S. children.

We specifically examine how family, neighborhood, peer, and school contexts are associated with the number of times children moved (including no moves). We consider this topic for three developmental periods: early childhood, middle childhood, and adolescence because moving may be differentially associated with children's outcomes by developmental period. We hypothesize that residential mobility will be adversely associated with the family context across all three developmental periods, whereas the neighborhood, peer, and school contexts will be unfavorably associated with moving in middle childhood and adolescence only.

Method

We analyzed data from the NICHD Study of Early Child Care and Youth Development (SECCYD; NICHD Early Child Care Research Network, 1997). The SECCYD collected data from children and their parents, peers, teachers, and caregivers across a 15-year period starting in 1991 at 10 geographically diverse sites in the United States. To be selected for the study, a child had to be a singleton and healthy, and the child's mother had to be at least 18 years old and conversant in English. Participants were recruited for the study in hospitals around the time of the child's birth. Three developmental periods—early childhood (birth to 54 months of age), middle childhood (kindergarten through fifth grade) and adolescence (sixth grade through 15 years of age)—were the focus of this study. The sample reflected the economic, educational and racial-ethnic diversity of the catchment area at each site, and included 24 percent racial/ethnic-minority children, 10 percent low-education (less than a high school education) mothers, and 14 percent single-parent mothers.

As discussed, the threat of selection bias is pernicious in residential mobility research. We accordingly employed multiple regressions (either OLS or logistic depending on the nature of the outcome) with covariates to account, to the extent possible, for preexisting differences between children who moved and those who did not. Covariates, taken from around the time the child was born and reported by the mother, included child birth order, Hispanic status, race, gender, and percent of unemployed residents in the neighborhood (census blockgroup); maternal education, age, marital status; family income/needs ratio; and study site[2] (see exhibit 2). A change in school (not school promotion but change during the academic year) in middle childhood and adolescence also was employed as a covariate in those periods. In addition, for each analysis conducted in middle childhood and adolescence, a lagged measure of the context of interest from the previous period was employed as a covariate. Finally, missing data were an issue in this longitudinal study with between 0 and 35 percent missing data, notably among later waves of data collection. To mitigate the loss of data, we employed multiple imputation with 20 multiply imputed datasets using Stata 12.0 procedures (Allison, 2001). In addition, we employed only the sample of children who participated in all four waves of data collection ($N = 1,056$).

Several variables were used to operationalize aspects of the contexts under investigation. See exhibit 3 for child context variables used across developmental periods. It is unfortunate that

Exhibit 2

Covariates Used in Regression Analyses

Variable	Measure	Source
Child characteristics		
Child birth order	Order in which study child was born (= 1 if no siblings).	Mother
Hispanic	Yes = 1; no = 0.	Mother
White	Yes = 1; no = 0.	Mother
African American	Yes = 1; no = 0.	Mother
Gender	Male = 1; female = 0.	Mother
Change in school	School transition not during summer months; sum within developmental period.	Administrative records
Maternal characteristics		
Education	Years of education at time child born (example: 12 = high school graduate; 16 = college graduate).	Mother
Age	In years at time child was born.	Mother
Marital status	Whether or not mother married at time child born (yes = 1; no = 0).	Mother
Family income/needs	Total household income divided by poverty threshold for respective year and household size.	Calculated from mother-reported income
Community characteristics		
Percent who are unemployed	Percent of unemployed adults more than 18 years old in blockgroup.	U.S. Census Bureau
Site	Site of data collection (1 of 10 sites across the United States); dummy coded.	Administrative records

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[2] We also tested additional specifications of our analytic model, including those with more covariates and different specifications of residential mobility (one move and multiple moves versus no move). Results were similar across analytic technique and are available, on request, from the first author, who completed the analyses.

Exhibit 3

Child Context Variables and Measures With Developmental Period (1 of 2)

Variable	Measure	Source	Developmental Period
Family context			
Proportion of time father in home	Percent of time within developmental period that father lived with family.	Reported from mother annually.	EC, MC, Adol
Change in maternal marital status	Indexed if marital status changed within developmental period (1 = yes; 0 = no).	Reported from mother annually.	EC, MC, Adol
Change in parental employment	Indexed if employment status (employed versus no) changed within a developmental period (1 = yes; 0 = no).	Reported from mother annually.	EC, MC, Adol
Maternal sensitivity	Observational measure and composite (sum) of supportive presence, respect of autonomy, hostility with higher score (from 5 to 21) indicating more sensitivity.	The NICHD Study of Early Child Care Parent-Child Interaction Scales (Owen, Klausli, and Murrey, 2000); collected from every 6 months (EC) to 2 years.	EC, MC, Adol
Quality of home learning environment	Semistructured interview; quality composite sum of responsiveness, learning materials, and harsh parenting higher score (from 1 to 59) indicate higher quality.	Home Observation for Measurement of the Environment (Bradley and Caldwell, 1979); collected from every 12 months (EC) to 2 years.	EC, MC, Adol
Neighborhood context			
Neighborhood residential instability	Percent of residents who lived in a blockgroup more than 5 years.	U.S. Census Bureau decennial census estimates; 1990 census = EC; 2000 census = MC, Adol; calculated annually.	EC, MC, Adol
Social capital	Questionnaire with four items about involvement with neighborhood groups; higher scores indicate more involvement (from 4 to 16).	Reported from mother; neighborhood social involvement (from Fast Track Project) (Pinderhughes et al., 2001); collected in third and fifth grades.	MC
Social capital	Questionnaire with 21 items about activities that parent participates in; higher scores indicate more involvement in neighborhood (from 0 to 21).	Reported from mother; activities in communities (Furstenberg et al., 1999); collected at 15 years old.	Adol

Exhibit 3

Child Context Variables and Measures With Developmental Period (2 of 2)

Variable	Measure	Source	Developmental Period
Peer context			
Number of friends	Count of number of friends in peer group.	Reported by mother at 54 months in EC; third and fifth grade in MC.	EC, MC
Positive peer group	Questionnaire with nine items about quality of child's peer group; higher scores indicate positive peer group (5 to 45).	Reported by mother; kids with my kid; collected third and fifth grades.	MC
Total peer group quality	Questionnaire with 15 items about positive and negative qualities of peer group; higher scores indicate more positive peer characteristics (5 to 75).	Reported by adolescent; what my friends are like (Oliveri and Reiss, 1987); collected at 15 years old.	Adol
School context			
Low-income school	Percent of students who have free/reduced price lunch within school.	National Center for Education Statistics; reported annually.	MC, Adol
School diversity	Percent of students who are a racial/ethnic minority within school.	National Center for Education Statistics; reported annually.	MC, Adol
Positive classroom climate	Observational measure; sum of overcontrol, chaos, negative emotional climate, teacher detachment; higher score is more positive (20 to 41).	Classroom Observation System (NICHD Early Child Care Research Network, 2004); collected third and fifth grades.	MC
Classroom instructional quality	Observational measure; sum of richness of instructional methods, productive use of time, evaluative feedback; higher score is higher quality (5 to 18).	Classroom Observation System (NICHD Early Child Care Research Network, 2004); collected third and fifth grades.	MC

Adol = adolescence. EC = early childhood. MC = middle childhood.

not all variables were consistently collected across developmental periods, leading to variation in measurement over time. When multiple measures of the same construct were collected across one developmental period, an average or index was employed to capture the context within that period. Across all measures, higher scores indicated higher quality contexts. With few exceptions, mothers were the primary respondents across measures.

The focal variable of interest was residential mobility. A change in blockgroup from one year to the next was indexed as a move, which was then summed across years for the developmental period under investigation, creating a continuous measure of residential mobility for each developmental period.[3]

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[3] We are not examining the distance of the move for two reasons: (1) available data precluded this approach because all blockgroup identifiers were dummy-coded, and (2) although it is possible that contexts may change *more* the greater the distance of a move, we contend that a move of any distance will be associated with related contextual changes. We encourage future analyses to more carefully examine how distance of a move moderates associations.

The family context incorporated measures of structural change, maternal sensitivity, and quality of the home. Structural change variables included the proportion of the time that the father lived in the home and whether change in maternal marital status or parental employment status was reported by the mother. Maternal sensitivity was measured by videotaped mother-child structured observations at regular intervals across periods (Owen, Klausli, and Murrey, 2000) and was a composite of supportive presence, respect for autonomy, and hostility. Quality of the home learning environment was measured at regular intervals by the Home Observation for Measurement of the Environment (HOME) inventory, a semi-structured interview (Bradley and Caldwell, 1979). The quality composite combined the responsiveness, learning materials, and harsh parenting subscales.

Neighborhood context measures included U.S. Census measures at the blockgroup level of residential stability (the proportion of residents who were in their household for at least 5 years) and parental reports of social capital and safety. Neighborhood social capital was assessed by measures of parental social involvement (for example, how many of your neighbors do you say you know well) measured in middle childhood (Pinderhughes et al., 2001). When the child was 15 years old, parents were administered a different set of questions about neighborhood social involvement (Furstenberg et al., 1999), which assessed the number of times in the past year the parent participated in neighborhood activities (for example, library, volunteer activities, community watch program).

The peer context was indicated by the number of peers in one's group of friends (early and middle childhood only) and measures of peer group quality as reported by the mother or child during middle childhood and adolescence, respectively. In middle childhood, the mother was asked to assess the quality of the child's peer group with a measure designed for the study. Children also responded to a questionnaire about the positive or negative qualities of their social network in adolescence (Oliveri and Reiss, 1987).

Finally, school structural characteristics, including the school-level percent of students receiving free or reduced price lunch and the proportion of students of an ethnic or racial minority background (as reported by the NCES), were investigated in middle childhood and adolescence in addition to several measures of teacher and instructional quality. The middle childhood period benefitted from the availability of systematic classroom observations taken on several occasions through the Classroom Observation System (COS, see NICHD Early Child Care Research Network, 2002). An observational measure, the COS focused on the child's activities, behavior, and interaction with the teacher and whole classroom. Positive climate and classroom instructional quality were employed in analyses.

Analytic Strategy

To analyze the association between residential mobility and children's developmental contexts, we took a multiple regression approach (OLS or logistic, depending on the nature of the outcome). Within each developmental period (early childhood, middle childhood, and adolescence), we predicted the quality of each child context from the number of within-period residential moves and all child, family, and community covariates. We also included the quality of each context from the previous developmental period as an additional covariate when available. Finally, all results are combined across 20 multiply-imputed datasets per Stata built-in procedures.

Results

The results of our regression analysis predicting the quality of each context from residential mobility (while incorporating various controls) are presented in exhibit 4. The results generally imply that, with the exception of the school context, the greater number of times that children moved, the lower quality contexts the children experienced. The family context in particular shifted concurrent to residential moves. We review findings by context and developmental period.

In the family context, the more times a child moved during early childhood, the less likely it was for the father to be present in the home. In middle childhood, children were 46 percent more likely to experience a change in maternal marital status and 74 percent more likely to experience a change in parental employment status for every additional move. Children also experienced a lower quality of the home environment the more times they moved in this period. In adolescence, a similar pattern was found with the previous two periods. That is, adolescents who moved more times were significantly less likely to live with their father and significantly more likely to have experienced more parental marital and employment instability.

A limited number of significant associations were found between the neighborhood context and childhood residential mobility. In early childhood, children experienced neighborhoods with a significantly less residentially stable population (middle childhood, too), the more times they

Exhibit 4

OLS and Logistic (OR) Regression Coefficients (with standard errors) Predicting Children's Contexts From Residential Mobility, by Developmental Period

Context Indicator	Early Childhood		Middle Childhood		Adolescence	
Family						
Percent of time father in home	− 1.41	(0.59)*	− 2.99	(0.64)	− 4.40	(1.04)***
Change in maternal marital status[a]	1.11	(0.08)	1.46	(0.09)***	1.38	(0.19)*
Change in parent employment status[a]	0.97	(0.12)	1.74	(0.14)***	1.79	(0.23)***
Maternal sensitivity	− 0.07	(0.04)†	0.02	(0.04)	0.06	(0.22)
HOME	− 0.11	(0.08)	− 0.40	(0.10)***	− 0.20	(0.17)
Neighborhood						
Percent who were in same HH past 5 years	− 1.35	(0.39)***	− 0.97	(0.29)***	− 0.24	(0.40)
Neighborhood parental social involvement[b]	—		− 0.24	(0.05)***	− 0.11	(0.15)
Peers						
Number of peers	− 0.04	(0.03)	− 0.04	(0.01)***	—	
Positive peer interaction	− 0.09	(0.07)	− 0.18	(0.10)†	− 0.51	(0.26)†
Friendship quality	—		− 0.00	(0.01)	− 0.00	(0.02)
School						
Percent who receive a free lunch	—		− 0.00	(0.00)	0.00	(0.00)
Percent who are an ethnic/racial minority	—		0.86	(0.54)	0.24	(0.62)
School delinquency problems	—		− 0.00	(0.01)	0.07	(0.08)
Teacher has a positive relationship with child	—		− 0.22	(0.17)	—	
Positive emotional climate	—		0.02	(0.02)	—	
Instructional quality	—		0.04	(0.07)	—	

HH = household. HOME = Home Observation for Measurement of the Environment. OLS = ordinary least squares. OR = odds ratio.

[a] *Coefficient is an odds ratio.*

[b] *Different indicator used across developmental periods.*

* *p* < .05. *** *p* < .001. † *p* ≤ .10.

moved. Mothers who moved more times when their children were in middle childhood also reported significantly less social involvement in their neighborhoods. No significant associations between the neighborhood context and childhood residential mobility arose in adolescence.

Scant evidence was found to indicate an association between peer context and childhood residential mobility. We found modest but significant reductions in the number of peers for each additional move in middle childhood, but we found no significant associations between residential mobility and the school context during middle childhood or adolescence.

Implications

Results from the multiple regression analyses generally support a developmental-contextual approach to residential mobility among children. Our expectation that the family context would be unfavorably associated with residential mobility in a similar fashion across development was partially met in that moving was adversely associated only with the quality of the home learning environment in middle childhood, which may have potential implications for children's achievement during this period. In middle childhood and adolescence, changes in family structure were associated with residential mobility. These findings, along with related evidence (for example, Schachter, 2004), suggest that family instability co-occurs with residential moves, and further implies that this pattern may be more marked during later rather than earlier developmental periods.

The neighborhood context also appears to be associated with children's residential mobility in early and middle childhood. Moving more during these periods was associated with living in neighborhoods with higher rates of residential mobility. Children in these new neighborhoods may struggle to integrate and face victimization or lack of social support, as related research suggests (Ainsworth, 2002; Foster and Brooks-Gunn, 2012), although our peer models do not bear this out. Such neighborhoods also may be conducive to participating in problem behaviors (Beyers et al., 2003), and limited parental involvement may have unfavorable consequences for children's behavior as well (Duke, Borowsky, and Pettingell, 2012). In sum, residentially mobile families' neighborhood social capital *may* shift (or already be low); however, these associations are not consistent across developmental periods, and we cannot be certain of the implications for children's behavior and achievement.

The peer and school contexts had very few associations with childhood residential mobility. The number of peers in middle childhood was significantly lower among residentially mobile children as compared with stable children, but the number in absolute terms overall was low. The formation of peer groups is a central task across development (Rubin et al., 2008), and making friends may occur naturally for residentially mobile children. Perhaps for children who relocated to neighborhoods with higher rates of residential instability, forming friendships was a notable challenge, a question future research should investigate. Lastly, future research should examine the implications of the distance of a move for peer groups and schools, because we are unsure at present if move distance would exacerbate associations.

Results indicated that middle childhood was a period when children's contexts may be the most likely to change concurrent with a residential move. Children who moved generally experienced lower quality contexts than children who did not. Given the importance of middle childhood to

subsequent cognitive and social/emotional development (Magnuson, Duncan, and Kalil, 2006), compromised developmental contexts during this period could have lasting consequences. Middle childhood has received relatively little attention in the residential mobility literature, but our findings suggest that middle childhood is a period when mobile children experience several contextual changes. As a consequence, understanding the potential consequences or antecedents of moves and associated contextual changes in middle childhood is an important extension of the literature. Given the potential for long-term ramifications, supporting mobile families with children through this transition may be a worthy investment.

Policies for Residentially Mobile Children

This section reviews the limited federal policies regarding residentially mobile children. Our review of policies for residentially mobile children will then inform our final reflections on future research and policy approaches to residential mobility among children. Federal policies for residentially mobile children are limited to select groups including children of military parents, migrant workers, children in foster care, those receiving housing assistance, and the homeless. These policies focus almost exclusively on the school context and children's education (with the exception of children whose families receive state or federal housing assistance;[4] Gibson and Hidalgo, 2009; The Council of State Governments, 2010). The common goals of these programs include easing progress toward graduation and persistence in school by streamlining administrative processes and providing support services or encouraging familial stability (as in the case of foster children). For example, if a child moves from one state to another, the sending school district transmits the child's records, and the receiving one ensures that the child is properly placed in courses, provided individualized advising to ensure on-time graduation, and has requirements (for example, state history) waived to prevent schedule overloads or a late graduation. Nearly all these programs are administered through state or local education agencies with funding from the U.S. Department of Education. Despite more than two decades of implementation, a paucity of research into the efficacy of these programs remains (Cunningham, Harwood, and Hall, 2010; De Pedro et al., 2011).

Children also experience relocation through housing programs (for example, receipt of a housing voucher may necessitate a move). Although more families seek than receive assistance, these mechanisms both provide housing opportunity and encourage families to relocate. A recent review of these relocation programs concluded that the educational benefits conferred were limited (Johnson, 2012) and suggested several reasons, relevant to our approach to residential mobility, for the programs' lackluster effects. Johnson (2012) observes that children and families feel disconnected from peers, neighbors, and schools after relocating and posits that it is the reliance on children, families, and neighbors to facilitate a smooth transition that ultimately limits mobility programs' efficacy. In other words, adjustments to contextual changes prove challenging, and relatively few supports are systematically provided to ease the transition.

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[4] Fostering Connections to Success and Increasing Adoptions Act of 2008; McKinney-Vento Homeless Assistance Act of 1987.

The average family with children who moves does not receive assistance, support, or flexibility in terms of relocation or schooling. Employers may offer relocation assistance programs by providing information about the institutions and resources in the community, but the scope, availability, and consumption varies widely (Eby and Allen, 1998). In the final section, we reflect on extant policies (or lack thereof) and the present state of the literature based on our theoretical model. We then conclude with tentative policy recommendations for all children who experience residential mobility.

Residential Mobility and Child Development: The State of the Literature

The framework and supporting empirical evidence presented in this article situates children's residential mobility in a developmental-contextual perspective. Despite the evidence reviewed and novel results, considerable gaps in knowledge remain, particularly those that can inform policy, and here we provide recommendations for future research. We focus on four main themes: pathways linking residential mobility to child outcomes, developmental differences in associations, a policy-focused approach to research, and methodological limitations.

Pathways

A requisite next step is to make a systematic effort to examine contextual pathways—family, neighborhood, peers, and school—across all developmental periods. Contextual pathways have been analyzed in a piecemeal fashion and without a comprehensive framework that can weigh the relative contributions of each: the family, neighborhood, peers, and school. Our analyses are a first step in this direction, but clearly additional studies are required to reinforce (or refute) our findings, ones that address the limitations of our approach such as the restricted age range, sociodemographic mix, and lack of consistent variables across periods. In addition, research is needed to delineate if elements of the contexts considered are relevant for which aspects of development.

Current research demonstrates that the family context is a relevant pathway for explaining the link between mobility and children's behavior. Furthermore, these links may be more evident for achievement than socioemotional outcomes, perhaps more in support of the family financial resources model than the family stress model. One might anticipate associations with achievement to be evident for residential mobility because it could impede a family's ability to invest in their children and provide developmentally enriching experiences (Raver, Gershoff, and Aber, 2007; Yeung, Linver, and Brooks-Gunn, 2002). On the other hand, recent research links residential mobility to emotional and behavioral functioning through compromised maternal well-being (Coley et al., 2012). Thus, it remains critical for policymakers to understand which family model (if either) may lead to which adverse developmental outcome to have knowledge to intervene with appropriate services. For example, if the family resources model is relevant, providing residentially mobile children access to stimulating environments and programs may prove beneficial. If parenting is compromised concurrent with a move, however, coaching, guidance, and supports for mobile parents could be a recommended step.

The neighborhood context also may be a relevant pathway, particularly the amount of social capital or intergenerational closure and connection to residents in the neighborhood that parents have built. Our results and much of the relevant literature suggest that families struggle, at least in the short term, to form relationships and obtain information after moving (Gillespie, 2013; Pettit, 2004; Pettit and McLanahan, 2003), perhaps the most relevant indicators for achievement outcomes. Moreover, these associations may be conditioned by children's developmental status (Pettit, 2004). When these social connections may be the weakest and what the policy implications are for children remain pertinent issues.

Although our results demonstrated few significant associations for the peer context, we argue that researchers should continue to probe this context. Examining affiliations with delinquent or antisocial peers in middle childhood and earlier is a recommended next step, but one out of our research because of limitations in extant data. Moreover, researchers may consider evaluating schools' buddy programs, those that match children who move to the school with a prosocial peer (Hektner, August, and Realmuto, 2003). Do children in such programs experience less victimization or display less aggression? Evaluating extant programs would provide theoretical and programmatic evidence for the peer context.

As discussed, school quality has received little attention as a potential pathway. Limited research (including our findings) supports this pathway, but additional research is needed because all (or nearly all) children attend school. If proactive policies *can* improve mobile children's achievement levels, one of the most accessible avenues of intervention is through the public school system. Targeted school-based interventions may not be a successful point of intervention, however, given the lack of evidence that residential mobility is associated with the school context. Other contexts have demonstrated associations with child development, so they may be a more viable point of intervention.

Development and Residential Mobility

Drawing firm conclusions on developmental differences in the contextual consequences of residential mobility for children, from both the extant literature and our empirical findings, is challenging. Our findings and the literature suggest that the timing of moving *may* matter. The first challenge in identifying relevant periods is that very few studies have employed longitudinal data to actually compare whether the timing of a move has differential associations with children's development. Without longitudinal analyses comparing the same individuals over time, identifying developmental differences in associations between moving and child outcomes is virtually impossible. Studies that have identified developmental differences have not generally included developmental contexts or developmental periods as this study broadly defines them (early childhood, middle childhood, and early adolescence) but instead have examined timing within one developmental period.

The preponderance of extant research has focused on adolescence as opposed to childhood, and nearly no work directly examines young children. Our findings suggest that more developmental contexts shift in middle childhood than early childhood or adolescence. The significance of the early childhood period for phenomena like poverty and socioeconomic status, however, through related changes in the family context has been confirmed in related literature (Duncan and Brooks-Gunn, 1997; Hart and Risley, 1995), underscoring the potential importance of this developmental

period for understanding the consequences of residential mobility. We may anticipate that contexts shift during middle childhood and adolescence, when residential mobility is demographically less common than in early childhood (U.S. Census Bureau, 2011a), which implies that families relocate concurrent to changing family structure. As such, changes in contexts beyond the neighborhood or home are likely during these periods. Current research, ours included, is inconclusive but suggests that contextual shifts may be more common in later than earlier developmental periods.

Future Research: A Policy-Focused Approach

Although it is challenging to make definitive statements about how residential mobility, children's contexts and outcomes, and developmental timing are associated, given the extant literature, we provide tentative policy reflections, notably those with research implications. First, future research should strategically approach studies of residential mobility by considering which pathways during which developmental periods are amenable to policy intervention and focus efforts there. For example, children are almost wholly reliant on parents during early childhood and also do not have universal access to affordable childcare or educational opportunities, which could be difficult to obtain after moving because of long waitlists at high-quality care facilities and constrained resources after moving. Given these developmental and economic factors, future research should investigate this developmental period with regards to the family context and access to affordable, high-quality care, with links to child outcomes. In addition, instead of investigating associations between residential mobility and affiliation with delinquent peers, researchers may be advised to consider how interventions focused on the peer group in adolescence, as discussed, may ameliorate the negative effects of the transition (or not). In sum, researchers should continue to probe child development-mobility associations while pursuing applied and policy-relevant research.

Second, the focus in the literature on social capital as a pathway linking residential mobility and children's development may reveal social capital as a potential policy lever. The scope, cost, and venue of intervention could be significant, perhaps resembling Promise Neighborhood-type inter-ventions to promote intergenerational relationships and integrate newcomers; however, the actual benefits for children may be minimal, given limited effect sizes. Related efforts made by school pro-grams that promote social connections have proven effective in reducing school mobility through the promotion of social capital among parents (Fiel, Haskins, and Turley, 2013). Examinations of existing neighborhood-based programs should explore the efficacy of similar approaches, with an eye toward the way in which new residents adjust to neighborhoods. Because of the high cost and extensive effort involved, we are reluctant to recommend such policies at present.

Third, policy initiatives that relocate families with children to alternative housing should weigh the potential benefits of the new residence (lower poverty neighborhood, higher quality housing, and so on) with the possible pitfalls of moving. Beyond the allocation of housing or rental assistance, supports and services provided to relocating families, and an evaluation of these programs, may be critical to both ease the transition and determine if and which services work for whom and when. Evaluations of mobility-assistance programs that identify critical components, or contexts, that ease the transition of a move are an important next step to determine which, if any, approaches are recommended on a broader scale.

Fourth, no policies are directed at the general population of mobile children, although mobility is a relatively common event. What currently exists is a patchwork of initiatives provided by schools and community groups. Whether additional policies are needed is unclear because existing policies have not been evaluated to determine their efficacy (as a whole or individual components)—a critical next step—however, current research provides sufficient insights into the underlying mechanisms of mobility on child outcomes and links to inform policymaking efforts. First, the McKinney-Vento and Fostering Connections Acts both enable children to remain in the school of origin even if they relocate out of their original district. It is reasonable to extend these requirements to infants and preschool-aged children, particularly given the concurrent upheaval among the family unit. Transferring school records and amending graduation requirements also are reasonable requirements for districts that receive and send residentially mobile children, notably those with high mobility rates. Given demonstrated associations between residential mobility and students dropping out of high school (Galster, 2012), efforts should be made to mitigate this threat to every extent possible by lowering administrative barriers to graduation (Rumberger, 2003).

Lastly, the ubiquity of the selection bias problem cannot be ignored, but perhaps this issue should not limit our ability to draw conclusions about, or to assist with, residentially mobile children. Residential mobility is typically an obvious event. An address change necessitates administrative changes that *could* be used as an indicator of other co-occurring contextual transitions, which our findings and related research suggests. Perhaps residential mobility should be used as a screener in schools, with healthcare providers, and other professionals who regularly interact with children to indicate that other changes could be present. If moving occurs with other adverse experiences (Dong et al., 2005), interventions may be advised; however, the targets of interventions should be co-occurring changes or problems and not the move itself.

Methodological Recommendations

Finally, most of the extant research employs methodologically weak designs, such as cross-sectional studies and analyses that typically employ only modest covariates to adjust for preexisting factors that select families into mobility (Leventhal and Newman, 2010). These weaknesses leave open questions about whether differences are attributable to the selection effect. To address this concern, we strongly recommend that future studies use rigorous analytic approaches, like several of the studies reviewed (for example, propensity score matching and fixed effects) and harness longitudinal data that can better account for preexisting differences. Such research could bolster confidence that moving per se is adverse for children's outcomes because, if it is not, policy efforts aimed at this population may be misguided.

In addition, future studies should take a developmental approach with longitudinal data, should employ covariates appropriate to the developmental period of the child (for example, temperament among young children), and must incorporate lagged measures of the outcome under investigation. Numerous factors account for why families move and how children develop, and some account for both simultaneously. Statistically controlling for a variety of neighborhood, family, parent, and child characteristics in nonexperimental investigations of residential mobility is critical for obtaining relatively unbiased estimates of the association between moving and children's outcomes.

Conclusion

In sum, the literature suggests that residential mobility should be considered in relation to children's developmental status and their social contexts. We argue that moving, taken alone, is not likely to adversely influence children. Instead of independent direct associations, children who move at particular times and with related contextual changes may face adverse developmental consequences. Future research should focus on developmental and contextual factors, particularly with an eye toward examining the most likely paths of successful intervention, to inform policy efforts.

Acknowledgments

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Profiles of Housing and Neighborhood Contexts Among Low-Income Families: Links With Children's Well-Being

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Abstract

Low-income families face numerous constraints but also opportunities in accessing affordable, decent, and stable housing in safe neighborhoods. These factors, in combination with individual preferences and priorities, lead to a diverse array of housing experiences. This study assessed the housing and neighborhood profiles of a representative sample of low-income families with children living in high-poverty urban neighborhoods in Boston, Chicago, and San Antonio (N = 2,393). Latent class analyses delineated four profiles of housing and neighborhood characteristics with distinct patterns of housing cost, housing problems, neighborhood disorder, residential instability, and homeownership. Profile 1 featured high cost, high housing and neighborhood problems, moderate residential instability, and high private rentals; Profile 2 featured high cost, low housing problems and neighborhood disorder, moderate residential instability, and prevalent owned homes and private rentals; Profile 3 featured low cost, and high housing problems, neighborhood disorder, residential stability, and assisted housing; and Profile 4 featured low cost, low housing problems and neighborhood disorder, high residential instability, and high assisted housing. Maternal, family, and broader community characteristics varied across these profiles, suggesting the endogeneity between families and their housing and neighborhood contexts. Individual fixed-effects regression models found that housing and neighborhood profiles were associated with children's functioning, with the primary pattern indicating that Profile 2 was associated with superior reading skills and fewer emotional and behavioral problems among children than other housing and neighborhood profiles. The results

Abstract (continued)

highlight the importance of assessing families' holistic bundle of housing and neighborhood characteristics rather than attempting to isolate unique effects of characteristics that are inherently interrelated.

Background

The recent housing crisis focused new attention on housing and neighborhoods as central contexts for children's healthy growth and development. Although various characteristics of housing (for example, quality and homeownership) have received notable scholarly and policy attention in relation to children's development (Newman, 2008), insufficient previous research has addressed the interrelated nature of the housing and neighborhood characteristics that low-income urban families experience. This article investigates the multifaceted nature of low-income families' housing and neighborhood contexts. It adds to existing literature by assessing how multiple aspects of housing and neighborhood characteristics bundle together into distinct patterns, which we term housing and neighborhood "profiles." After establishing the existence of such profiles empirically through advanced person-based analytic techniques in a representative sample of low-income families, we explore the associations of these profiles with children's functioning, adjusting for factors that differentially select families into housing and neighborhood contexts and hence might bias measured associations with child functioning.

This study is based on developmental contextual theory, which argues that proximal contexts, such as homes and neighborhoods, are inextricably linked to human development (Bronfenbrenner and Morris, 1998). We draw more specifically from the developing ecobiodevelopmental (Shonkoff, 2010; Shonkoff and Garner, 2012) and chaotic systems (Bronfenbrenner and Evans, 2000; Evans and Kim, 2013) frameworks that highlight the harmful role that disorder and instability in children's housing and neighborhood contexts play in limiting their growth and development. These models argue that in comparison to their peers, children who experience more environmental chaos, disorder, stress, and instability in their housing and neighborhood contexts will show greater biological and physiological deficits that will translate into less advanced cognitive, behavioral, and emotional functioning.

Interrelations Among Central Characteristics of Housing and Neighborhood Contexts

Previous research has identified numerous characteristics of housing—including quality, affordability, ownership, stability, and neighborhood safety—that interrelate in complex ways to define families' housing experiences and that might contribute to children's development (Leventhal and Newman, 2010). Although much past research treated these factors as distinct and independent characteristics, we argue in this article that they are integrally interrelated, which warrants research that directly assesses the complex patterns across multiple housing and neighborhood characteristics.

One of the central aspects defining families' housing contexts is the quality and safety of the physical unit (Newman, 2008). Structural deficiencies, lack of working utilities, and environmental conditions such as rodent or pest infestation, peeling paint, mold, and limited light or fresh air are housing problems that low-income families in the United States experience (Bradman et al., 2005), with poor families being two to three times more likely than economically advantaged families to experience such housing deficiencies (Evans, 2004; Holupka and Newman, 2011). Families might live in structurally deficient housing because they lack economic or social resources to access better housing (Evans, 2004; Holupka and Newman, 2011) or because high housing costs in comparison to family income inhibit their ability to invest in adequate upkeep and maintenance.

Low-income families are particularly likely to live in unaffordable housing; 70 percent of low-income families in 2003 experienced cost burden, defined as paying more than 30 percent of family income for housing costs (Joint Center for Housing Studies, 2005). Housing costs are also inextricably tied to the type and stability of housing. Home prices and rents increased dramatically in the late 1990s and early 2000s because of demand in the housing market and rising family incomes (Joint Center for Housing Studies, 2005; Quigley and Raphael, 2004). As costs increased, the number of low-cost and subsidized housing units decreased, with estimates of the gap between demand for and supply of low-cost housing at about 5.2 million units nationally in the early 2000s (Joint Center for Housing Studies, 2005). Moreover, estimates in 2008 found that only 31 percent of households eligible for government housing subsidies actually received assistance (Turner and Kingsley, 2008). Together, these figures indicate substantial unmet demand for low-cost and government-subsidized housing. On the other hand, increasing numbers of low-income families have turned to homeownership (Savage, 2009). Homeownership, as compared with renting, might bring the notable benefits of residential stability and greater housing quality because of greater investment (Newman, 2008). For low-income families in particular, however, homeownership is often tied not only to unaffordable costs, but also to residential instability (Herbert and Belsky, 2006). In response to greater experiences of disorder and instability in housing, neighborhoods, and family lives, both renters and homeowners with low incomes move more frequently than their economically advantaged counterparts (Coulton, Theodos, and Turner, 2012; Crowley, 2003; Herbert and Belsky, 2006; Holupka and Newman, 2011; Sandel and Wright, 2006).

Past research also highlights the interconnection between housing characteristics and the neighborhood contexts in which housing is embedded. Subsidized and low-cost housing are often clustered together in inner-city neighborhoods, with recent estimates finding growing rates of concentrated poverty in such neighborhoods in the past decade (Clark and Morrison, 2012; O'Hare and Mather, 2003; Sharkey, 2012). Low-income urban neighborhoods, on average, have fewer institutional resources and higher rates of crime, violence, disorder, and social isolation than more advantaged neighborhoods (Leventhal, Dupéré, and Shuey, forthcoming; Sampson, 2012). Low-income families from neighborhoods with concentrated poverty identify neighborhood violence and disorder as central areas of concern, contributing to dissatisfaction with their residential choices and desires to move (Goering and Feins, 2003).

In short, research demonstrates that low-income families face a variety of constraints and limitations in their housing and neighborhood contexts. Although extensive research has addressed individual aspects of the housing and neighborhood contexts that low-income families experience

(see Conley, 2001; Evans, Wells, and Moch, 2003; Krieger and Higgins, 2002; and Leventhal and Newman, 2010, for reviews), little research has attempted to understand how those aspects fit together into a holistic profile of families' proximal contexts. A handful of studies have addressed how two or three aspects of housing and neighborhood interrelate, and many studies have focused on the different experiences of families in owned, privately rented, or government-subsidized housing. For example, research found that low-income households in private-market rentals experience difficulty finding affordable and decent-quality housing (Murray, 1997) and that low-income families are likely to change residences because of unaffordable housing costs and in pursuit of safe, decent-quality housing (Crowley, 2003; Kull, Coley, and Lynch, unpublished), suggesting that higher quality and affordable housing might coincide with higher residential stability. In a qualitative analysis of low-income mothers' budgeting of family finances, Edin and Lein (1997) observed that low-income families made tradeoffs among housing costs, type, crowding, and neighborhood quality that resulted in distinct combinations of housing characteristics. They specifically found that families who doubled up with friends or family members incurred lower housing costs and experienced more crowding, whereas families who maintained government-assisted units experienced low costs and less crowding. Families in private-market rentals, by contrast, had higher housing costs but also higher neighborhood quality than the other groups.

Together, this research suggests that housing and neighborhood characteristics interrelate in important ways among low-income families facing limited economic resources and perhaps restricted housing options. Little previous research has assessed the interrelations among these characteristics in a comprehensive and quantitative manner, however, and much of the past research on interrelations drew from small, select samples. As an exception, in one of the most comprehensive quantitative analyses to date, Coulton, Theodos, and Turner (2012) analyzed 10 communities across the country to assess how housing, economic, and family factors were associated with mobility and stability in urban neighborhoods. The study identified three distinct profiles of families: those who remained in (stayers), left (movers), or entered (new residents) high-poverty urban neighborhoods; each of these profiles contained three subprofiles of families, with some experiencing distress, others in satisfactory housing situations, and still others whose residential stability was driven by life-stage issues. Together, the limited previous research suggests that, to understand the full housing experiences of low-income families, we must identify how housing and neighborhood factors are linked together in particular patterns.

Housing and Children's Development

One of the central reasons to increase understanding of low-income families' housing and neighborhood contexts is to better delineate repercussions for children's health and development. Existing research suggests that numerous aspects of housing and neighborhoods are associated with child well-being. Substandard housing quality consistently predicts children's compromised cognitive and socioemotional development (Coley et al., 2013), an association often attributed to exposure to environmental toxins like lead and pesticides and to other related stressors (Evans, 2004; Krieger and Higgins, 2002). Frequent residential moves also are associated with detriments to functioning, particularly cognitive skills and school outcomes as a result of disruptions in educational continuity and social relationships (Evans, 2006; Pribesh and Downey, 1999; Ziol-Guest and Kalil, 2013). Research on homeownership has suggested that low-income children living in owned homes display

superior academic and behavioral skills than their peers in the private rental market (Aaronson, 2000; Boyle, 2002; Haurin, Parcel, and Haurin, 2002), but these findings were called into question by studies employing more rigorous methods for handling selection effects (Barker and Miller, 2009; Holupka and Newman, 2012). Less empirical work has attended to associations between housing cost burden and children's development, but Harkness, Newman, and Holupka (2009) found that geographic differences in housing prices are not consistently associated with child and adolescent functioning (Harkness and Newman, 2005; Harkness, Newman, and Holupka, 2009; see also Kull and Coley, unpublished). Finally, neighborhood disorder, which might limit children's access to supportive services and relationships and inhibit their sense of safety and security, is similarly associated with children's poor cognitive and behavioral functioning in both experimental and nonexperimental studies (Leventhal, Dupéré, and Shuey, forthcoming; McWayne et al., 2007; Vaden-Kiernan et al., 2010).

Limitations of Prior Research

Although research has highlighted linkages between children's functioning and housing quality, stability, ownership, and cost and neighborhood disorder (Leventhal, Dupéré, and Shuey, forthcoming; Leventhal and Newman, 2010), scant attention has been paid to how interrelations among multiple housing and neighborhood characteristics might affect child development. A handful of studies have argued for mediational models, for example finding that higher housing costs might buy better housing and neighborhood quality, thereby supporting healthy child development (Kull and Coley, unpublished; see also Aaronson, 2000; Barker and Miller, 2009; Plybon and Kliewer, 2001). Others assess the relative independent contributions of multiple housing or neighborhood characteristics. Coley et al. (2013) took such an approach, examining the unique associations among housing quality, type (homeownership and assistance), affordability, and stability with low-income children's development, finding that substandard housing quality was the most salient predictor of children's poor emotional and behavioral functioning.

In this article, we argue that the combined effects of housing and neighborhood characteristics on children's development might be obscured when features are presumed to function in an independent and unrelated fashion. Just as aspects of families' housing and neighborhood characteristics are likely integrally related, such relationships might have unique import for children's development. Employing data and analytic techniques that allow for a comprehensive assessment of patterns and interrelations among the many individual characteristics of housing and neighborhood contexts is necessary to delineate distinct and replicable profiles of contexts and, in turn, to test the predictive validity of such profiles to children's development.

In addition to the extant research's limited attention to interrelations among various characteristics of housing and neighborhood contexts, several other methodological limitations inhibit confidence in its results on housing and children's development. Those limitations include (1) the use of small, nonrepresentative samples, limiting generalizability; (2) the prevalence of nonexperimental and cross-sectional research designs, raising concerns about causation, directionality, and endogeneity bias; and (3) the limited use of covariates and measurement techniques to help adjust for potential endogeneity biases (see Leventhal, Dupéré, and Shuey, forthcoming; Leventhal and Newman, 2010, for reviews). Indeed, several individual and family characteristics might underlie both housing and

neighborhood choice and children's outcomes, including a complex array of personal preferences and resources, cultural norms, and housing needs and broader economic and policy contexts (Dohmen, 2005; Flippen, 2001; Kull, Coley, and Lynch, unpublished; Murray, 1997; Santiago et al., 2010; Schacter, 2001; Sharkey, 2012). In turn, measured associations between housing and neighborhood contexts and children's functioning might not be causal links, but rather driven by these other factors (often termed *selection bias* or *endogeneity bias*). In addition to random-assignment experiments, a range of quasi-experimental designs and rigorous analytic techniques have been employed to help adjust for endogeneity bias and move closer to identifying causal relationships (for example, Barker and Miller, 2009; Coley et al., 2013; Holupka and Newman, 2012). This literature highlights the importance of identifying and addressing correlates of housing and neighborhood contexts and potential sources of bias.

Present Study: Identifying Profiles of Housing and Neighborhood Contexts and Delineating Associations With Children's Development

To address the limitations noted and to enhance our understanding of housing and neighborhood contexts and child development, we address two primary research questions. First, we ask whether distinct, replicable profiles of housing and neighborhood contexts exist among low-income urban families. To address this question, we used a person-oriented analytic approach (latent class analysis) to assess interrelationships and patterns among multiple aspects of housing units (problems and homeownership), housing experiences (cost and residential instability), and neighborhood contexts (disorder) and to identify distinct profiles of housing and neighborhood contexts. Second, we ask whether the identified profiles of housing and neighborhood contexts were associated with low-income children's development in central domains of well-being, including reading and math skills, emotional problems, and behavioral problems. We addressed this question by using individual fixed-effects regression models, an analytic technique that adjusts for unmeasured, time-invariant sources of bias. Using a randomly drawn and representative sample of low-income families in high-poverty neighborhoods in three cities, this article overcomes limitations in previous housing research which generally has examined one or two aspects of housing in isolation, failing to consider the complexity and interrelatedness of housing and neighborhood characteristics that constitute families' housing and neighborhood profiles.

Method

In the following paragraphs we describe the procedures used to procure the sample of families assessed in this study, describe how we measured the primary constructs of interest, and delineate the analytic techniques employed to analyze the data.

Participants

Our analyses draw on data from the main survey component of the Three-City Study, a longitudinal, multimethod study of the well-being of low-income families with children in the wake of welfare reform (for a detailed description of the research design, see Winston et al., 1999). The Three-City Study began in 1999, when a stratified random sampling frame was used to select a

sample of approximately 2,400 households residing in moderate-poverty (more than 20 percent of families in poverty) and high-poverty (more than 40 percent of families in poverty) neighborhoods in Boston, Chicago, and San Antonio. Eligible families included a child age 0 to 4 or 10 to 14 years old (designated as the "focal child") residing with a female caregiver and had a family income of less than 200 percent of the federal poverty line. More than 90 percent of caregivers in the study were biological mothers; others were grandmothers or other caregivers. We refer to all caregivers as "mothers." The first wave screened 40,000 households to assess whether they met eligibility requirements, with a 90-percent response rate; of families deemed eligible, 83 percent completed interviews, leading to an overall response rate of 74 percent. Focal children and mothers were reinterviewed in 2000 to 2001 (88 percent retention) and again in 2005 (80 percent retention of wave 1 respondents). During each wave, mothers participated in 2-hour, in-home interviews, and children participated in assessments. Interviews were completed in English or Spanish with ACASI (Audio Computer Assisted Survey Interviewing) used to improve the validity of reporting on sensitive topics. Probability weights, adjusting for the sampling framework and differential nonresponse, were incorporated in all analyses, making the sample representative of low-income families in low-income neighborhoods in the three cities. The analytic sample included all participating families with valid wave 1 weights (N = 2,393).

Measures

Housing and Neighborhood Characteristics

Housing and neighborhood characteristics were reported by mothers and through observational reports by interviewers at each wave. Housing problems were assessed using mother reports and interviewers' observations. Mothers reported on eight items covering structural, maintenance, and environmental deficiencies, including leaking roofs, broken windows, rodents, heater or stove not working, peeling paint, or exposed wiring. An additional four items drawn from the Home Observation for Measurement of the Environment (HOME) Inventory (Bradley and Caldwell, 1979)—addressing internal and external structural deficiencies, lack of light, and cleanliness—were assessed by interviewers' observational ratings. Items were coded to reflect the presence or absence of each housing problem indicator and were summed into a count variable of housing problems.

Because of the interconnection between individual housing units and the neighborhoods encapsulating them, we also considered neighborhood disorder. Mothers reported on seven neighborhood problems, such as abandoned houses, burglaries and thefts, and unsafe streets (1 = *not a problem*, 2 = *somewhat of a problem*, 3 = *a big problem*) drawn from Elliott et al. (1996). Items were averaged to create a total score of neighborhood disorder (α_{1-3} = 0.86 to 0.88). Residential instability was evaluated by mothers' reports on whether the family had moved in the past year. Housing cost was delineated by a proportion of total housing costs, including utilities, divided by total household income, both reported by mothers, with costs capped at 100 percent of income. Mothers also reported whether their home was owned or rented.

Child-Functioning Measures

At each wave of the survey, core areas of child development were assessed using well-validated measures for all children ages 2 and older. Trained field interviewers directly evaluated children's

cognitive skills by administering the Woodcock-Johnson Psycho-Educational Battery Revised Letter-Word Identification and Applied Problems subtests (Woodcock and Mather, 1989; Woodcock and Muñoz-Sandoval, 1996). Standard scores were used in analyses, representing children's reading and math skills, respectively. Mothers reported on emotional and behavioral problems of all children ages 2 and older using the Child Behavior Checklist (CBCL; Achenbach, 1992, 1991; Achenbach and Rescorla, 2001). The CBCL internalizing scale (α_{1-3} = 0.83 to 0.95) focused on emotional problems including anxiety, depression, withdrawal, and somatic complaints, whereas the externalizing scale (α_{1-3} = 0.90 to 0.95) assessed behavioral problems such as aggression and rule-breaking behaviors. Standard scores (t-scores) were used as continuous measures of emotional and behavioral problems.

Individual, Family, and Community Covariates

Mothers also reported on a variety of individual and family characteristics.. Maternal age was reported in years, and an indicator distinguished biological mothers from other caregivers. Maternal race or ethnicity was designated as African American, Hispanic, or White or other. An immigrant indicator variable signified whether the mother was born outside of the United States. Socioeconomic variables included mothers' education level, assessed with a continuous measure (1 = *less than high school* to 9 = *professional degree*), an indicator of whether mothers were engaged in paid employment, and an indicator of Temporary Assistance for Needy Families (TANF) receipt. Total household income in relation to the poverty line indicated each family's income-to-needs ratio. Maternal marital status was designated as married, cohabiting, or single, and a count variable delineated the total number of residents in the household. Mothers also reported child gender and child age in months. Finally, each family's city of residence was designated as a proxy for differences in housing policies, availability, and cost at the city level. Exhibit 1 presents an overview of all study variables and measures.

Analytic Techniques

Within the analytic sample, a moderate level of data were missing, ranging from 3.2 to 28.5 percent on the housing and neighborhood characteristics, from 18.5 to 28.3 percent on child outcomes, and from 0.8 to 28.7 percent on individual, family, and contextual variables. Missing data were imputed using a bootstrap-based Expectation Maximization Bayesian algorithm (Honaker and King, 2010) in R to create 10 complete datasets. All analyses incorporated probability weights that adjusted for the sampling framework and differential response, enabling us to make inferences to our population of interest: low-income mothers and children living in low-income neighborhoods in Boston, Chicago, and San Antonio.

The first goal of this research was to assess interrelations among housing cost, housing problems, neighborhood disorder, residential instability, and homeownership to identify housing and neighborhood profiles within this representative sample of low-income urban families. We conducted latent class analysis, a person-based analytic technique that seeks to identify unobserved subgroups of cases that show similar patterns across a set of variables based on a probability model (Wang and Wang, 2012), to assess patterns in housing and neighborhood characteristics at each wave. We used the Bayes Information Criterion (BIC) and the Lo-Mendell-Rubin likelihood ratio test (Lo, Mendell, and Rubin, 2001) to identify the optimal number of classes. We performed latent class

Exhibit 1

Study Variables and Measurement

Study Variables	Measures
Housing and neighborhood	
Housing cost	Index of housing costs, including rent or mortgage and utilities, to total household income.
Housing problems	Index of 12 items: 8 mother-reported items on structural, maintenance, and environmental deficiencies; 4 interviewer-reported items drawn from HOME inventory (Bradley and Caldwell, 1979) on internal and external structural deficiencies and lack of light.
Neighborhood disorder	Seven mother-reported items on neighborhood problems such as abandoned houses, burglaries and thefts, and unsafe streets (Elliot et al., 1996).
Residential instability	Dichotomous variable of whether family moved in past year.
Homeownership	Dichotomous variable of whether home is owned or rented.
Child functioning	
Math skills	Directly assessed using Applied Problems subtest from the WJ-R (Woodcock and Johnson, 1989).
Reading skills	Directly assessed using Letter Word subtest from the WJ-R (Woodcock and Johnson, 1989).
Emotional problems	Mother-reported internalizing subscale from CBCL (Achenbach, 1992, 1991; Achenbach and Rescorla, 2001) of anxiety and depressive symptoms.
Behavioral problems	Mother-reported externalizing subscale from CBCL (Achenbach, 1992, 1991; Achenbach and Rescorla, 2001) of aggressive behaviors and rule-breaking.
Covariates	
Biological mother	Dichotomous variable of whether respondent is biological mother.
Maternal race or ethnicity	Categorical variable of White or Other, African American, or Hispanic.
Immigrant status	Dichotomous variable of whether respondent was born outside the United States.
Maternal education level	Continuous variable of educational attainment.
Maternal employment	Dichotomous variable of whether respondent is engaged in paid employment.
TANF receipt	Dichotomous variable of whether respondent is receiving TANF.
Income-to-needs ratio	Continuous variable of family income-to-needs ratio, based on household size, family income, and poverty thresholds.
Maternal marital status	Categorical variable of married, cohabiting, or single.
Household size	Continuous variable of number of people living in household.
Child age	Continuous variable coded in months.
Child gender	Dichotomous variable of male or female.
City	Categorical variable of residence in Boston, Chicago, or San Antonio.

CBCL = Child Behavior Checklist. HOME = Home Observation for Measurement of the Environment. TANF = Temporary Assistance for Needy Families. WJ-R = Woodcock-Johnson Psycho-Educational Battery-Revised.

analysis in M*plus* software (Muthén and Muthén, 1998–2010) on 1 imputed dataset, randomly selected from the 10 imputed datasets, to produce results for the Lo-Mendell-Rubin test, which cannot be conducted when using multiply imputed data. Models fit two through seven classes and used random sets of starting values for initial-stage (N = 1,000) and for final-stage (N = 250) optimizations to avoid convergence on the local maxima (Wang and Wang, 2012).

After conducting the latent class analysis, we conducted descriptive analyses to assess differences in individual, family, and neighborhood characteristics across the identified housing and neighborhood classes (which we term "profiles") using no-constant ordinary least squares regression models with post estimation comparisons. These analyses employed data from all three waves of the survey and included a Huber-White adjustment to standard errors for the inclusion of multiple data points from each individual.

A third set of analyses used individual fixed-effects regression models to assess associations between classes of housing and neighborhood characteristics and children's socioemotional and cognitive functioning across the three waves of the panel. Fixed-effects models present a conservative modeling approach, capitalizing on change over time in the variable of interest (housing and neighborhood profiles) and controlling for omitted variable bias derived from all factors that have a time-invariant association with children's functioning (Duncan, Magnuson, and Ludwig, 2004; Johnson, 2005). Thus, these models also control for factors that we measured, such as maternal race or ethnicity and city, that were stable over time and hence cannot be included in a fixed-effects model. Models also adjusted for key measured, time-varying child and family characteristics that are associated with housing selection and child functioning in previous research, including child age, biological mother status, maternal education level, maternal employment, TANF receipt, maternal marital status, and household size.[1] Initial model estimations also assessed random-effects regression models[2] to test the assumption that unobserved individual differences are random and uncorrelated with the primary variables of interest in the model. Results from Hausman tests of systematic differences between the coefficients from the random- and fixed-effects models found significant differences across all the models (results not shown), suggesting that the random-effects models were inconsistent. Hence, we present the more conservative fixed-effects regressions testing the association between housing profiles and children's math skills, reading skills, emotional problems, and behavioral problems.

Results

In the following section we first describe results from the latent class analysis, detailing the four profiles that emerged and how they vary on housing and neighborhood characteristics. We then describe how the profiles vary on child and family characteristics and child functioning measures. In the final section we provide an overview of the fixed effects model results.

Latent Classes of Housing and Neighborhood Characteristics

Results of the latent class analysis identified a four-class solution that showed a low BIC value and a significant Lo-Mendell-Rubin statistic (p = .02), suggesting that the four-class solution fit best at wave 1. In waves 2 and 3, the four-class solution was replicated, with the resulting classes in waves 2 and 3 sharing the same descriptive profiles as those in wave 1, supporting the replicability and validity of our latent class solution.

[1] We did not include family income as a covariate because it was part of the housing cost measure.

[2] The random-effects models included additional time-invariant covariates, including child gender, maternal race or ethnicity, immigrant status, and city.

Exhibit 2 presents descriptive data on the four housing profiles, with data first pooled across all waves and then separated by wave to show the consistency in patterns. Although housing assistance was not included in the latent class analyses or the multivariate models—both because latent class analyses cannot handle categorical variables and because of reliability concerns about individual reports of housing subsidies—we consider assisted versus private rentals in these descriptive analyses.

Exhibit 2

Housing and Neighborhood Characteristics for Full Sample and Across Profiles

Housing and Neighborhood Characteristics	Full Sample		Profile 1 (6.43%)		Profile 2 (9.99%)		Profile 3 (25.82%)		Profile 4 (57.77%)	
	M/%	(SD)	M/%	(SD)	M/%	(SD)	M/%	(SD)	M/%	(SD)
Stacked waves										
Housing cost	0.36	(0.27)	0.80[abc]	(0.22)	0.85[ade]	(0.19)	0.27[bd]	(0.18)	0.28[ce]	(0.17)
Housing problems	1.74	(1.43)	2.89[ab]	(1.09)	1.00[acd]	(1.14)	2.98[ce]	(1.17)	1.19[bde]	(1.16)
Neighborhood disorder	1.75	(0.60)	2.08[ab]	(0.58)	1.51[acd]	(0.51)	2.14[ce]	(0.54)	1.58[bde]	(0.54)
Residential instability	23%		23%		21%		19%[a]		25%[a]	
Home owned	24%		28%[ab]		39%[acd]		17%[bce]		23%[de]	
Home rented	76%		72%[ab]		61%[acd]		83%[bce]		77%[de]	
Assisted	48%		32%[ab]		24%[cd]		58%[ac]		50%[bd]	
Private	28%		40%[ab]		37%[cd]		26%[ac]		26%[bd]	
Wave 1										
Housing cost	0.37	(0.29)	0.84[abc]	(0.17)	0.91[ade]	(0.14)	0.22[bdf]	(0.15)	0.27[cef]	(0.16)
Housing problems	1.58	(1.44)	3.08[abc]	(0.72)	0.50[ade]	(0.62)	3.67[bdf]	(0.50)	0.83[cef]	(0.77)
Neighborhood disorder	1.81	(0.60)	1.96[ab]	(0.63)	1.59[acd]	(0.58)	2.09[ce]	(0.55)	1.73[bde]	(0.59)
Residential instability	24%		23%		17%[a]		19%[b]		27%[ab]	
Home owned	20%		23%		34%[ab]		16%[a]		18%[b]	
Home rented	80%		77%		66%[ab]		84%[a]		82%[b]	
Assisted	51%		32%[ab]		27%[cd]		59%[ac]		54%[bd]	
Private	30%		46%[ab]		39%[c]		24%[ac]		28%[b]	
Wave 2										
Housing cost	0.34	(0.26)	0.80[ab]	(0.26)	0.79[cd]	(0.20)	0.26[ac]	(0.18)	0.25[bd]	(0.15)
Housing problems	1.53	(1.44)	3.16[ab]	(1.00)	0.75[ac]	(0.91)	3.16[cd]	(0.97)	0.82[bd]	(0.93)
Neighborhood disorder	1.75	(0.61)	2.03[ab]	(0.60)	1.57[ab]	(0.54)	2.04[bc]	(0.61)	1.63[bc]	(0.56)
Residential instability	23%		20%		27%[a]		14%[ab]		27%[b]	
Home owned	22%		30%[a]		45%[bc]		12%[abd]		23%[cd]	
Home rented	78%		70%[a]		55%[bc]		88%[abd]		77%[cd]	
Assisted	48%		33%[ab]		19%[cd]		58%[acd]		50%[b]	
Private	29%		37%		36%		31%		27%	
Wave 3										
Housing cost	0.40	(0.27)	0.76[abc]	(0.22)	0.84[ade]	(0.22)	0.31[bd]	(0.19)	0.33[ce]	(0.19)
Housing problems	2.12	(1.34)	2.47	(1.34)	1.87[a]	(1.32)	2.34[ab]	(1.32)	2.01[b]	(1.32)
Neighborhood disorder	1.70	(0.59)	2.26[ab]	(0.46)	1.34[ac]	(0.34)	2.26[cd]	(0.46)	1.37[bd]	(0.38)
Residential instability	22%		24%		20%		24%		22%	
Home owned	29%		32%		40%[a]		22%[a]		30%	
Home rented	71%		68%		60%[a]		78%[a]		70%	
Assisted	46%		32%[ab]		25%[cd]		56%[ace]		46%[bde]	
Private	25%		36%		35%		22%		24%	

M/% = mean or percent. SD = standard deviation.
Note: Within each row, matched superscript letters are significantly different from one another at p < .05.

Before turning to the housing and neighborhood profiles, we bring attention to the characteristics of the sample as a whole, presented in the first column. Within this high-poverty urban sample, we find the average housing cost in the unaffordable range, with families paying 36 percent of their total incomes toward housing. Housing problems were moderately high, with families averaging fewer than two major structural, safety, or maintenance deficiencies. Mothers reported neighborhood disorder averaging between "not" and "somewhat of" a problem. In relation to residential instability, nearly one-fourth of families moved in the year before the interview. Finally, about one-fourth of families lived in owned homes and three-fourths lived in rented homes, including nearly one-half of the total sample in government-assisted rental units.

The remaining columns of exhibit 2 present the housing and neighborhood characteristics across the four identified profiles. Within each row, matched superscripts indicate statistically significant differences between profiles. Profile 1, the smallest group, had high housing cost (higher than Profiles 3 and 4), housing problems, and neighborhood disorder (higher than Profiles 2 and 4). Residential instability was moderate, as was the prevalence of homeownership, although Profile 1 had a higher rate of private rentals and lower rate of government-assisted housing than Profiles 3 and 4. In short, the distinguishing features of Profile 1 were high cost, poor quality, and private rentals. Profile 2, also a small group, similarly had high housing cost (higher than all other profiles, at 85 percent of household income). By contrast to Profile 1, however, Profile 2 had low housing problems and neighborhood disorder (the lowest of any profile). Residential instability was moderate, but Profile 2 was distinguished by the highest rate of homeownership, high private rentals, and the lowest rate of government-assisted housing. In summary, Profile 2 was characterized by high cost, high quality, and homeownership or private rentals.

Profile 3 showed many extremes, with the lowest housing cost, highest housing problems and neighborhood disorder, lowest residential instability, lowest homeownership rates, and highest assisted-housing rates. By contrast, Profile 4—by far the largest group—had low housing cost (lower than Profiles 1 and 2), housing problems, and neighborhood disorder (better than Profiles 1 and 3). Profile 4 also exhibited the highest residential instability of all the profiles, moderate levels of homeownership and private rentals, and relatively high levels of government-assisted housing. In short, Profiles 3 and 4 shared low cost and high assisted housing, but Profile 3 had very high housing and neighborhood problems and low residential instability, whereas Profile 4 had low housing and neighborhood problems but higher residential instability. Exhibit 2 shows that the characteristics of the four profiles were very consistent across the three waves, indicating the validity of the latent class structure.

Stability in Profile Membership

Although characteristics of the profiles were consistent across the three waves, crosstabulations found that profile membership was much less consistent. From the wave 1 profile groupings, 46 percent of respondents moved into a different housing and neighborhood profile by wave 2 (about 1 1/2 years later). From wave 2 to wave 3 (a 4 1/2-year period), 52 percent of respondents similarly switched profiles. This variability highlights the instability in low-income families' housing. It also is important for supporting the feasibility of individual fixed-effects modeling, which requires individual variation.

Demographic and Community Characteristics Across Profiles

Exhibit 3 presents bivariate associations between the four housing and neighborhood profiles and maternal, family, child, and community characteristics to provide a descriptive view of the families across the profiles. Significant differences in characteristics across the profiles are indicated by shared superscripts in each row. Profile 1, with high housing cost, poor housing and neighborhood quality, and high prevalence of private rentals, was distinguished by high proportions of nonbiological mothers, Whites, and African Americans, and relatively low proportions of Hispanics and immigrants. Profile 1 also showed low human and financial capital, with low maternal education levels and employment rates and the lowest income of any profile. This group further reported the lowest rate of maternal marriage and the largest household size. Profile 1 was particularly prevalent in Chicago.

Exhibit 3

Demographic Characteristics for Full Sample and by Housing and Neighborhood Profile

Demographic Characteristics	Full Sample (100.00%)		Profile 1 (6.43%)		Profile 2 (9.99%)		Profile 3 (25.82%)		Profile 4 (57.77%)	
	M/%	(SD)	M/%	(SD)	M/%	(SD)	M/%	(SD)	M/%	(SD)
Maternal and family characteristics										
Biological mother	90%		85%[a]		85%[b]		91%		92%[ab]	
White	6%		8%[a]		9%[b]		4%[ab]		6%	
African American	41%		52%[ab]		38%[ac]		50%[cd]		36%[bd]	
Hispanic	53%		40%[ab]		53%[a]		46%[c]		58%[bc]	
Immigrant status	21%		18%[a]		27%[ab]		17%[bc]		23%[c]	
Maternal education level	3.83	(2.13)	3.62[ab]	(2.06)	4.08[ab]	(2.27)	3.71[b]	(2.07)	3.86	(2.14)
Maternal employment	51%		34%[ab]		36%[cd]		52%[ac]		54%[bd]	
TANF receipt	23%		20%[ab]		11%[acd]		28%[bc]		24%[d]	
Income-to-needs ratio	1.03	(0.68)	0.54[ab]	(0.45)	0.57[cd]	(0.54)	1.04[ace]	(0.61)	1.17[bde]	(0.69)
Mother single	58%		66%[ab]		51%[ac]		62%[c]		57%[b]	
Mother cohabiting	9%		11%		6%[ab]		12%[a]		9%[b]	
Mother married	32%		24%[ab]		43%[acd]		26%[ce]		34%[bde]	
Household size	4.78	(1.78)	5.14[a]	(2.05)	4.71	(1.65)	4.93[b]	(1.91)	4.69[ab]	(1.70)
Child characteristics										
Child age (months)	120	(68.63)	122	(60.05)	117[a]	(63.35)	131.30[ab]	(70.04)	114.80[b]	(68.20)
Male child	49%		47%		53%		49%		48%	
Community characteristics										
Boston	33%		30%		34%		30%[a]		35%[a]	
Chicago	33%		48%[a]		39%[b]		41%[c]		27%[abc]	
San Antonio	33%		22%[a]		27%[b]		29%[c]		38%[abc]	
Child outcomes										
Math skills	462	(74.31)	473	(58.02)	472	(56.18)	476.20[a]	(52.34)	469[a]	(58.57)
Reading skills	472	(56.80)	467	(73.35)	464	(72.81)	467.70[a]	(69.77)	459[a]	(76.48)
Emotional problems	50.9	(10.91)	52.6[ab]	(10.46)	49.1[ac]	(10.31)	52.90[cd]	(11.12)	50.1[bd]	(10.82)
Behavioral problems	51.6	(10.67)	52.8[ab]	(10.64)	49.1[acd]	(9.95)	54.60[ce]	(10.78)	50.6[bde]	(10.44)

M/% = mean or percent. SD = standard deviation. TANF = Temporary Assistance for Needy Families.
Note: In each row, matched superscript letters are significantly different from one another at p < .05.

Profile 2, which also had very high housing cost but had high housing and neighborhood quality and homeownership, showed a mixed picture in terms of maternal and family characteristics. This group was relatively likely to contain nonbiological mothers who were White or Hispanic and were immigrants as primary caregivers. They had the highest levels of education and marriage and the lowest rate of TANF receipt, but they also had low maternal employment and very low incomes. Profile 3, which shared poor housing and neighborhood quality with Profile 1 but had lower residential instability, more assisted housing, and lower housing cost, was distinguished by a high prevalence of African Americans and few immigrants. Mothers had low education levels but high rates of both employment and TANF receipt and moderate income. Marriage rates were low and family size relatively high.

Profile 4, which had high housing and neighborhood quality and low housing cost but high residential instability and prevalence of government-assisted housing, stood out with regard to several characteristics. This profile had the highest prevalence of biological mothers and Hispanics and the lowest prevalence of African Americans. The maternal employment rate was the highest of any profile, whereas education levels, TANF receipt, and marriage rates were all about average. Profile 4 also had the smallest household size and the highest income-to-needs ratio. This group was most likely to reside in San Antonio and least likely to be in Chicago.

These numerous, significant differences across housing and neighborhood profiles highlight that families are not randomly assigned to these contexts. Personal and family characteristics are likely to influence housing preferences, opportunities, and constraints; they also might affect maintenance or financial behaviors that influence housing quality and costs. At the same time, housing and neighborhood contexts might influence personal and family characteristics, affecting parental access to jobs and other resources and influencing both family and child functioning. In the next set of analyses, we sought to adjust for these selection processes in modeling associations between housing and neighborhood profiles and child functioning.

Housing and Neighborhood Profiles and Child Functioning

Exhibit 4 presents results from individual fixed-effects models predicting the four measures of child functioning (math skills, reading skills, emotional problems, and behavioral problems), controlling for time-varying characteristics of children, mothers, and families. Profile 4 was the omitted group, and hence the coefficients for the other profile groups in exhibit 4 indicate the effects of being in each group in comparison to being in Profile 4. Significant differences between other profiles (derived through post hoc testing) are shown using matching superscripts. A few significant differences among housing and neighborhood profiles emerged in relation to children's cognitive skills. One pattern indicated that children in Profile 2 outperformed their peers in Profile 3 in reading skills (as shown by matching superscripts), a difference of 0.14 standard deviations (SDs). Children in Profile 2 also had marginally higher reading skills than peers in Profile 4 (0.10 SDs). In terms of emotional and behavioral problems, this pattern strengthened. Children in Profile 2 had significantly lower emotional problems than those in Profiles 3 and 4, differences of 0.28 SDs and 0.19 SDs, respectively, and marginally lower emotional problems than children in Profile 1, a similarly sized difference of 0.23 SDs. Likewise, children in Profile 2 had lower behavioral problems than peers in Profiles 3 (0.33 SDs) or 4 (0.19 SDs). Children in Profile 4 were lower than those in Profile 3 in terms of behavioral problems, a difference of 0.14 SDs.

Exhibit 4

Individual Fixed-Effects Regression Analyses Predicting Child Outcomes

Variables	Math Skills		Reading Skills		Emotional Problems		Behavioral Problems	
	Coef	(SE)	Coef	(SE)	Coef	(SE)	Coef	(SE)
Profile 1	0.71	(3.46)	3.43	(4.08)	0.38[a+]	(1.07)	− 0.17	(1.08)
Profile 2	3.43	(2.93)	5.87[+a]	(3.57)	− 2.10*[a+b]	(0.98)	− 2.00*[c]	(0.80)
Profile 3	0.00	(2.17)	− 1.93[a]	(2.53)	0.91[b]	(0.61)	1.48*[c]	(0.58)
Covariates								
Child age	0.72**	(0.03)	0.95**	(0.03)	0.01	(0.01)	0.02**	(0.01)
Biological mother	4.17	(6.24)	4.06	(8.24)	− 0.51	(2.02)	0.98	(1.77)
Education level	0.30	(0.76)	1.03	(0.90)	0.23	(0.20)	0.17	(0.22)
Employment	3.86	(2.46)	3.03	(2.73)	− 0.39	(0.72)	− 0.67	(0.66)
Mother cohabiting	2.21	(3.35)	1.65	(3.85)	− 0.86	(1.11)	− 0.79	(0.99)
Mother married	2.78	(3.04)	0.63	(4.02)	− 0.49	(0.91)	− 0.52	(0.87)
Household size	2.37**	(0.84)	3.22**	(0.95)	0.13	(0.22)	0.51*	(0.21)
TANF receipt	− 1.74	(2.77)	− 1.07	(3.21)	− 0.41	(0.75)	− 1.71*	(0.68)
Constant	359.74**	(8.99)	315.33**	(10.98)	49.32**	(2.27)	46.11**	(2.25)

Coef = coefficient. SE = standard error. TANF = Temporary Assistance for Needy Families.

**p < .01. *p < .05. +p < .10.

*Notes: In each column, matched superscript letters are significantly different from one another at p < .05, with superscript +
representing differences at p < .10. Profile 4 is the excluded comparison group.*

Discussion

The goals of this study were (1) to illuminate comprehensive profiles of low-income urban families'
housing and neighborhood characteristics (housing cost, housing problems, neighborhood disorder,
residential instability, and homeownership) to delineate the broader "housing bundle" experienced
by economically disadvantaged urban families, and, in turn, (2) to assess whether housing and
neighborhood profiles were associated with children's core cognitive, emotional, and behavioral
skills essential for future life success. Results from this work suggest the validity of four distinct
profiles of low-income urban families' housing and neighborhood contexts, which were replicated
across multiple waves of data, showed clear patterns with parental and family characteristics, and
were predictive of children's development. Before discussing the intricacies of the housing and neigh-
borhood profiles, we highlight the overarching finding that low-income families did not cluster
simply into "good" or "bad" housing and neighborhood profiles, but rather that each profile shared
more and less desirable characteristics. Moreover, one profile (Profile 2) consistently predicted
children's enhanced cognitive and socioemotional functioning. Illustrating the complexity of low-
income families' housing, this profile showed low housing problems and neighborhood disorder and
high rates of homeownership and private rentals, but it also showed extremely high housing cost.

Multifaceted Profiles of Housing and Neighborhood Characteristics

Our results revealed four distinct profiles of housing and neighborhood characteristics that were
replicated across the three waves of data, with distinguishing features of (1) high cost, poor quality,
and private rentals; (2) high cost, high quality, and homeownership or private rentals; (3) low cost,

low quality, assisted housing, and low instability; (4) low cost, high quality, assisted housing, and high instability. Although all the housing and neighborhood factors considered contributed to the four profiles, the most distinguishing features in these profiles were housing problems, neighborhood disorder, and housing cost; two groups had high housing problems and neighborhood disorder, and two were low in both; similarly, two groups had very high housing cost (averaging 80 percent or more of family incomes), whereas the other two groups had average costs in the affordable range (less than 30 percent of family income). Considering only these characteristics made the housing and neighborhood profiles appear to be a rather simple two-by-two matrix, albeit with some perhaps surprising patterns. That is, housing cost was not associated with housing problems and neighborhood disorder in a simple linear fashion; one of the groups with high cost (Profile 2) had the lowest housing problems and neighborhood disorder, whereas the other group with high cost (Profile 1) had high housing problems and neighborhood disorder. The same distinction emerged between the two groups with affordable housing cost (Profiles 3 and 4). These results contradict previous research suggesting that higher housing costs buy better housing and neighborhood quality for low-income families (Kull and Coley, unpublished), suggesting that patterns are more complex when concurrently accounting for other aspects of housing.

An even more complex picture of the housing and neighborhood profiles emerges when considering residential instability and homeownership (and receipt of assistance), which provides a second important lesson from this research: homeownership does not necessarily engender lower residential instability. Although the profiles with higher housing costs had higher homeownership and lower receipt of government assistance than the profiles with low costs, differences emerged within pairs as well. When compared with Profile 2, Profile 1 had significantly fewer homeowners and more renters, but a similar level of residential instability. On the other hand, Profiles 3 and 4 had a high prevalence of assisted housing, but Profile 4 had higher homeownership and residential instability than Profile 3. Indeed, the most residentially stable group (Profile 3) also enjoyed low costs but the highest housing problems and neighborhood disorder, lowest homeownership, and highest government assistance. These results suggest that in this low-income, urban sample, homeownership did not provide greater residential stability than renting. In short, the profiles identified in this work indicate consistent patterns in the manner in which families' housing cost, housing problems, neighborhood disorder, residential instability, and homeownership status bundle together. None of the profiles could be characterized as showing either desired or undesired patterns across all five housing and neighborhood characteristics, a finding consistent with previous research indicating that low-income families with limited economic and social resources face complex tradeoffs among various aspects of their housing and neighborhood contexts (Coulton, Theodos, and Turner, 2012; Crowley, 2003; Edin and Lein, 1997).

Although not a primary focus of this article, our descriptive analyses of demographic and community characteristics that distinguish each profile suggest endogeneity between families and their housing and neighborhood contexts. Future research should attend to potential directionality and causality in these associations, seeking to determine to what extent more well-functioning and resourced families are selecting into, or able to maintain, higher quality and more stable housing in relatively safe neighborhoods and, similarly, the extent to which higher quality and more stable housing in relatively safe neighborhoods helps promote the resources and stability of low-income

families (see Sharkey, 2012, for an example). These factors are all related to children's health and well-being as well, so sorting out issues of causality is key for informing policy and practice.

In general, we found connections between profiles with lower quality housing and neighborhood contexts and greater social and economic disadvantage, but we acknowledge the substantial variability in families' profile membership over time. Approximately one-half of families in the sample shifted profile membership between each wave of interviews. Some of this variability was undoubtedly driven by residential mobility; at each wave, nearly one-fourth of the families reported having moved in the previous year. Other shifts were likely the result of changes in families' individual circumstances or in the features of their home and neighborhood. For example, increases in families' housing cost burden (which in turn might drive a shift in their profile membership) could arise from the loss of a job or of TANF payments, from the exit of a spouse or cohabiting partner with income, or from an increase in rent, mortgage, or utility payments. In short, the instability in housing and neighborhood profiles might not only affect, but also reflect, the instability in many other arenas of low-income families' lives, including frequent job transitions, relationship transitions, and income volatility. The instability in housing and neighborhood contexts points to broad opportunities for policy intervention seeking to increase the stability and regularity of children's lives.

Associations Between Housing and Neighborhood Profiles and Children's Development

A major contribution of this article is to document how profiles of housing and neighborhood contexts help to foster or inhibit children's development in core academic and psychosocial domains. In this second goal, we sought to move past previous research that assessed the effects of individual aspects of housing without direct attendance to the embedded and interactive nature of housing and neighborhood contexts. Our results indicated a clear pattern, adjusting for time-varying characteristics of families associated with different housing and neighborhood contexts and, through statistical techniques, controlling for all time-invariant differences among children and families that might influence children's functioning. We primarily found that membership in Profile 2, with the lowest housing problems and neighborhood disorder, highest homeownership, and high prevalence of private rentals but also with exceedingly high housing cost, was associated with the most advantaged child functioning, including better reading skills and fewer emotional and behavioral problems than Profiles 3 and 4. These differences were minimal, averaging about 0.25 SDs. They were notably greater than the effects of maternal employment or marriage, however, suggesting that housing and neighborhood contexts are significant factors for children's healthy development in both academic and psychosocial realms. Only one other significant difference in children's functioning emerged, with membership in Profile 3 predicting greater behavioral problems than membership in Profile 4. These groups shared low housing cost and high government assistance, but Profile 4 showed low housing problems and neighborhood disorder but high residential instability, whereas Profile 3 had high housing problems and neighborhood disorder but low residential instability.

Our results suggest that living in housing with fewer structural deficiencies and maintenance dangers, in neighborhoods with lower perceived crime, social disorder, and distrust, is associated with enhanced child functioning, especially when combined with owned or private-rental housing, even when housing consumes a major portion of family income. By contrast, when high-quality housing

and neighborhood contexts are in government-assisted housing and concomitant with residential instability, such contexts do not consistently benefit children's development, even when housing cost is notably lower. Note that families in Profile 2 shared some distinguishing characteristics, with a higher likelihood of being immigrants and White or Hispanic and a lesser likelihood of being African American than most other groups. Mothers in this profile had the highest levels of education and marriage and the lowest TANF receipt, but they also had low maternal employment and very high poverty rates. The modeling strategy incorporated in this study adjusted for the effects of these time-varying and stable factors, increasing our confidence that the housing and neighborhood profiles, rather than the economic and demographic characteristics, drove associations with child outcomes.

What might explain these patterns of results? Previous research has identified several mechanisms through which substandard housing might impinge children's healthy development: (1) by influencing physical health (that is, through lead poisoning, allergies, asthma, and other respiratory problems; Evans, 2006, 2004), which in turn affects cognitive and socioemotional functioning; (2) by imposing physiological and psychological stress, making concentration and behavioral regulation difficult (Blair, Granger, and Razza, 2005; Shonkoff and Garner, 2012); or less directly, (3) by increasing maternal stress, thereby harming children (Coley et al., 2013). Likewise, research has detailed how neighborhood crime and disorder impinge children's development by similarly creating stress for children and parents and by providing opportunities for children to engage in problem behaviors (Dupéré, Leventhal, and Vitaro, 2012; Roche and Leventhal, 2009). Understanding why homeownership and high housing costs expand the benefits of housing and neighborhood quality, whereas assisted housing and residential instability mask them, is perhaps more complicated. Recent research has been mixed on the benefits of homeownership and high housing costs, with some arguing that higher costs and homeownership help promote children's development because they encourage residential stability and greater social connections, trust, and social capital in communities (Hagan, MacMillan, and Wheaton, 1996; Pettit and McLanahan, 2003). Higher costs and homeownership also are associated with safer and higher quality housing and neighborhood contexts (Kull and Coley, unpublished) and with enhanced access to public resources, such as high-quality schools and community programs that are supportive of children's development (Harkness and Newman, 2002; Holupka and Newman, 2011). Recent rigorous studies nonetheless found limited unique associations between cost or homeownership and children's well-being (Barker and Miller, 2009; Coley et al., 2013; Harkness and Newman, 2005; Harkness, Newman, and Holupka, 2009; Holupka and Newman, 2012; Kull and Coley, unpublished). This article suggests that, rather than acting in isolation, housing cost, housing and neighborhood quality, residential stability, and homeownership might function in a synergistic manner, with constellations of these features providing the most supportive and influential context for promoting children's development.

Limitations

Before concluding, we acknowledge limitations of this work. Most of our housing measures were based solely on maternal report, and we lacked measures of other important characteristics, such as crowding. Moreover, the data focused solely on high-poverty urban neighborhoods, and as such

results might not generalize to other locales, such as smaller cities or rural areas, or to families and neighborhoods with greater economic resources. Finally, we reiterate that the results are descriptive, derived from correlational data, and hence do not necessarily reflect causal relationships.

Conclusions

Beyond these limitations, our results make an important contribution to the extant research, highlighting the importance of assessing families' holistic bundle of housing and neighborhood characteristics rather than attempting to isolate unique effects of characteristics that are inherently interrelated. They provide a much-needed complement to the qualitative literature documenting the various tradeoffs that low-income families make in their housing and neighborhood attributes (Edin and Lein, 1997). Like the qualitative work, our study documented the diversity of low-income families' housing circumstances, but within this diversity we were able to identify and replicate distinct profiles of low-income families' housing and neighborhood characteristics. Thus, our article provides new insights into the complex ways in which low-income families' housing and neighborhood characteristics are configured and the implications for their children's development.

Together, these results have implications for housing research and policy. In terms of research, they suggest that studies—like most extant research—that examine housing features in a piecemeal fashion might misrepresent the connection between certain housing features and children's development. In addition, studies that do not address factors that select families into housing and neighborhood contexts, employ methodological approaches to minimize them, or both, as in the current study, might be likely to lead to unwarranted conclusions. Future research investigating how housing and neighborhood profiles are associated with children's development should explore the mechanisms through which these associations are transmitted, such as parent well-being or neighborhood social processes. In addition, it should consider whether the links between these profiles and children's development vary by child and family characteristics, such child age, gender, or race or ethnicity. Such information is needed to inform policy. Although additional research is clearly needed, the current study has implications for policy. Our findings suggest that housing policies and programs that do not recognize the synergistic nature of low-income families' housing and neighborhood features might fail to have the desired outcome of promoting children's health and well-being.

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Getting to Better Performing Schools: The Role of Residential Mobility in School Attainment in Low-Income Neighborhoods

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Abstract

This article builds on the two largely separate literatures on school and residential mobility by investigating the dynamic interplay of residential mobility, school mobility, and educational opportunity in 10 low-income neighborhoods that were targeted for improvement through Making Connections, a place-based initiative. We analyzed a person-period dataset spanning the years 2002 through 2010, created from representative samples of families, including more than 2,000 children living in the target areas. Most study children attended low-performing schools, and more than one-half attended schools outside the target area. Children moved schools and homes frequently, but these types of moves were often independent. Ordinary least squares models predicting change in school rank showed that, compared with their less educated counterparts, better educated parents were more likely to experience increases in the rank (as measured by aggregate test scores) of their child's school. Compared with White children, African-American and Hispanic children more often experienced a drop in school rank. Housing tenure was not associated with change in the quality of schools children attended, but worsened food security was associated with decline in school rank. The variable most strongly associated with improvement in school rank was moving out of the baseline school district, yet most residential moves were not associated with such gains. We conclude with a discussion of the implications of our findings for place-based initiatives.

Introduction

Place-based initiatives that work to improve school quality, community supports, and parental involvement are gaining increased attention as policy options for improving educational outcomes for children in low-income neighborhoods. High rates of residential and school mobility in such neighborhoods, however, can interfere with the implementation and success of these policies. Although residential moves and school changes each have been studied in isolation, few studies have taken a close look at these changes together within the context of low-income neighborhoods. The study described in this article takes advantage of a panel study of households with children that resided in neighborhoods in 10 cities that were selected to participate in a national place-based initiative. The purpose of the study is to examine the relationship between residential and school mobility in these sites and to determine the circumstances that are associated with children switching to better or worse performing schools as a result.

Understanding the role that mobility plays in children's access to good schools is important, because switching schools may be one way that children in distressed neighborhoods can gain an educational advantage. Changing schools can also set children back, however, especially if they move frequently or experience residential or school changes that are disruptive but do not provide any benefit regarding school quality. In addition, if many children change schools, it can undermine place-based initiatives' work to improve school and neighborhood quality. Although a number of studies of school mobility have been conducted, considerable heterogeneity likely exists in the process and effect of school switching and residential relocation. A deeper understanding of this heterogeneity may help refine studies of school and residential mobility that have heretofore yielded some conflicting results. Furthermore, because the sites in this study operate within the context of a place-based initiative, the study can draw important lessons about how these efforts may be affected when many children move or change schools. Taken together, these analyses are designed to describe the dynamic interplay of residential mobility, school mobility, and educational opportunity as they unfold in the types of neighborhoods that are targeted by place-based initiatives and policies.

Background and Literature Review

Place-based initiatives often include the goal of improving educational success for the low-income children in their midst. The federal government's Promise Neighborhoods program is an example of an approach in which low-income children in a defined geographic area are expected to achieve at similar levels as their more affluent peers as a result of concerted efforts by citizens, parents, agencies, and schools to change the odds of success. Other federal initiatives, such as the U.S. Department of Housing and Urban Development's Choice Neighborhoods, anticipate indirect effects on educational success as a result of physical redevelopment; institutional partnerships; and the creation of vibrant, mixed-income communities. Moreover, for a decade or more, foundation-sponsored community change initiatives have invested in building the social fabric, institutional capacity, and civic engagement in distressed neighborhoods, with the expectation that doing so would lead to improved educational outcomes for children.

Evaluations of place-based improvement efforts often show mixed results regarding individual outcomes such as educational success and community transformation goals (for example, Kubisch

et al., 2010; Popkin et al., 2004). One challenge that was insufficiently anticipated is the high rate of mobility in low-income neighborhoods, which raises questions about whether individuals will experience a sufficient length of exposure to the initiative to benefit from community changes and whether the cadre of experienced residents will suffice to drive transformation forward (Silver et al., 2012). For example, in an earlier study of 10 neighborhoods involved in a national place-based initiative, Coulton, Theodos, and Turner (2012) found that more than one-half of the families with children in the study had relocated within less than 3 years. Approximately one-third of the families who relocated moved up and out, presumably of benefit to them but a potential loss to the community they left behind. Another two-fifths were categorized as churning in place, sometimes making more than one move because of economic and family problems but generally staying in the vicinity. These moves could be construed as disruptive to both the individuals and to the institutions in which they participated. The remainder of movers relocated to an adjacent neighborhood, improving their situation marginally but potentially maintaining some ties with the people and institutions in their previous place.

School mobility is another type of movement that plays an important role in place-based initiatives. Like changing residences, changing schools can have both positive and negative aspects. Switching schools can be disruptive for the child and for the other students in the classroom. Staying put may not always be the best educational option for children living in disadvantaged neighborhoods, however, because the immediate vicinity often suffers from a dearth of high-performing schools. A recent national study found that low-income students, on average, attend schools that perform at the 42nd percentile on state proficiency examinations, whereas middle- and high-income students attend schools that perform at the 61st percentile (Rothwell, 2012). Such disparities are of significant policy concern, because attending schools with students who perform well has been shown to contribute to positive educational outcomes for all students. For example, a study based on a natural experiment of student reassignment in North Carolina estimated that, "adding peers who raise mean achievement by one point raises a student's own achievement by about 0.25 points." (Hoxby and Weingarth, 2006: 19–20). Another study, which also used school reassignment to construct a counterfactual, found that an increase of 0.10 standard deviations in peer average achievement led to a 0.02-standard-deviation increase in individual achievement (Hanushek et al., 2003). Moreover, peer effects may be particularly important for disadvantaged children, who tend to gain more when surrounded by high-performing students. This effect was found in Florida public schools, where the lowest performing students experienced the greatest positive effect from having high-performing peers, whereas high-ability students experienced the weakest peer effects on their own performance (Burke and Sass, 2008).

Although residential and school mobility are an important backdrop for place-based initiatives, little is known about the intersection of these two types of moves and how children may be harmed or benefited (Swanson and Schneider, 1999). Studies of school mobility generally find that children make more school moves than residential moves and that students who change schools frequently fall behind students who stay in place (Hanushek, Kain, and Rivkin, 2004; Mehana and Reynolds, 2004; Reynolds, Chen, and Herbers, 2009). The overall picture of the consequences of student mobility is mixed, however, because many school changes are reflective of parental trade-offs regarding housing and school quality, and some of these moves may be advantageous with respect to school quality (Hango, 2006; Hanushek, Kain, and Rivkin, 2004). It is important also

to recognize that disadvantaged families are often caught up in a cycle of school and residential moves because of unstable social and economic conditions, resulting in distressed moves that produce few benefits and disrupt educational progress (Rumberger and Thomas, 2000; Schafft, 2006; Xu, Hannaway, and D'Souza, 2009).

Household-level decisions to change schools or move homes can add up to high rates of turnover in schools and neighborhoods, a common concern in areas targeted for place-based initiatives. The concentration of frequently mobile children in particular schools has been associated with decreased educational attainment (Gibbons and Telhaj, 2011) and increased risk of dropping out (Rumberger and Thomas, 2000) in the student body as a whole. In addition, extreme rates of residential turnover in neighborhoods are associated with crime and violence (Sampson, Raudenbush, and Earls, 1997), and exposure to violence is thought to be a significant factor in undermining the educational attainment of children and the performance of schools in such places (Burdick-Will et al., 2010). Although both residential and school mobility can be undertaken for positive reasons and with good results, the consequences for disadvantaged children, families, and neighborhoods may often be quite negative.

The evidence that the overall performance of a school's student body influences individual achievement nevertheless raises the question of how children in disadvantaged neighborhoods can improve their access to higher ranked schools. Residential mobility programs that enable families to move out of high-poverty neighborhoods provide some findings related to this question. One of the earliest examples comes from the Gautreaux program, a desegregation mobility program in Chicago that moved many African-American public housing families to White suburbs (Keels et al., 2005). The children who moved to these predominantly White areas attended less heavily minority and higher ranked schools and also improved their educational achievement compared with that of children whose families relocated to neighborhoods in the central city. The Gautreaux findings are in contrast with those of the Moving to Opportunity (MTO) experiment, which supplied vouchers and counseling to help families move from public housing to low-poverty neighborhoods without regard to race or whether the neighborhood was in the central city or suburbs. When educational outcomes for children in the treatment group were compared with those of children in a control group, the anticipated improvements in test scores were not apparent for the MTO movers (Sanbonmatsu et al., 2006). Researchers who subsequently examined school characteristics and test performance rankings for the MTO children found that many families who moved to low-poverty neighborhoods still enrolled their children in relatively low-performing schools that were part of the central-city school system. They noted that access to high-performing schools was limited and that parents may have lacked the capacity to make optimal school choices within their new locations (Briggs et al., 2008; DeLuca and Rosenblatt, 2010). In a reanalysis of the MTO data by site, Burdick-Will et al. (2010) concluded that the lack of an average effect of MTO on educational outcomes obscured some informative differences among sites. They specifically found that, in Chicago and Baltimore (but not in New York, Los Angeles, and Boston), children in the treatment group did experience significantly better educational achievement, and they found that these improvements were not because of school quality but arguably because of moving out of the extremely high-poverty and high-crime areas where they resided before being randomized into the study. These researchers nevertheless reported that, although the experimental-group families moved to much higher income and less dangerous neighborhoods, the children continued to

attend fairly low-performing schools overall and that educational gains were modest (Burdick-Will et al., 2010). In addition, Turner et al. (2012) noted that MTO families who were helped to move to low-poverty areas did not stay put, which may have had important implications. On average, the sample drifted back to areas with higher poverty and fewer educational resources over time, thus mitigating the potentially positive effects of the initial moves on educational outcomes.

The evidence that a school's performance level matters for individual children, along with the fact that residential and school mobility do not necessarily result in sufficiently improved educational settings for low-income children, points to the need to look more deeply into the processes at work. This study attempts to fill this gap by examining school and residential mobility patterns in selected low-income neighborhoods in 10 cities and the circumstances that result in children reaching better or worse performing schools. It differs from the existing literature in several respects. First, it follows representative samples of school-age children residing in the types of neighborhoods that are the focus of place-based initiatives. This sample is a broader population than the public housing families who volunteered for mobility experiments but a narrower population than that in many national or statewide studies of student mobility. Second, it examines performance measures of the schools that the children attend, whether the schools are in or outside the neighborhood, and the co-occurrence of school and residential mobility within the context of these neighborhoods. Finally, it evaluates how residential moves and family and neighborhood factors contribute to the chances that children who change schools succeed in reaching better preforming schools.

Method

Data and Sample

The individuals in this study come from three waves of a household survey that was carried out in distressed neighborhoods as part of the Making Connections (MC) initiative, a program of the Annie E. Casey Foundation. Implementation of the MC initiative took place in selected areas of 10 cities: Denver, Des Moines, Hartford, Indianapolis, Louisville, Milwaukee, Oakland, Providence, San Antonio, and Seattle/White Center. The MC target areas were chosen through a deliberative process involving the foundation and local stakeholders to represent distressed neighborhoods with concentrations of poverty and of immigrants or racial and ethnic minority groups. Although not a national probability sample, these study households and neighborhoods are illustrative of those that are typically selected for place-based initiatives.

The primary data source for this analysis is the MC survey. The National Opinion Research Center (NORC) at the University of Chicago and the Urban Institute jointly designed and collected three waves of household surveys in the MC target areas at 3-year intervals. Of the 10 sites, 7 had three survey waves; in Hartford, Milwaukee, and Oakland, only the first two waves were administered. The interviews were conducted in residents' homes in English, Spanish, and additional languages, as appropriate for the particular site. Wave 1 was completed from 2002 through 2004, wave 2 from 2005 through 2007, and wave 3 from 2008 through 2010.

Samples for the MC survey were designed to give equal probabilities of selection to all households within each target area. In designing and selecting the samples, NORC used the procedures it

developed for list-assisted probability sampling of households using as a basis the United States Postal Service master list of delivery addresses (Iannacchione, Staab, and Redden, 2003; O'Muircheartaigh, Eckman, and Weiss, 2002). Geocoding software was used to map the addresses, and field checks were made to confirm the validity of the lists. The sample design was directed to obtaining a representative sample of households and children in each target area. In households with children, NORC compiled a roster of all children in the household. At wave 1, one focal child was selected at random; information was collected only about this child. At waves 2 and 3, surveyors gathered information about all children in that household. The respondent was the adult most knowledgeable about a randomly selected child.

The sample for this study is restricted to children represented in at least two consecutive waves of data, between the ages of 6 and 17, and for whom we had valid information about the school they attended in each wave. To best take advantage of the available data, we created a person-period dataset, with each observation representing a child from either wave 1 to wave 2 or from wave 2 to wave 3. Therefore, in the text, we refer to children's experiences between "period 1" and "period 2," which represents changes either from wave 1 to wave 2 or from wave 2 to wave 3. The total number of unweighted cases meeting these criteria was 2,387, with 2,137 children contributing one observation to the dataset and 250 children contributing two records. The sample is weighted for the probability of selection and nonresponse at each wave.

To characterize the schools that the children attended, we incorporated data from several additional sources. Using the names of the children's schools that were collected at each wave of the survey, we standardized the names using information from the National Center for Educational Statistics (NCES) Common Core of Data. From this source, we also retrieved information about the geographic location of the school, school district, and the grade levels within the school. We obtained information about each school's statewide standardized test results from one of two sources, depending on the year of the survey. Statewide, school-level standardized test results for the years 2000 through 2005 and for 2007 were retrieved from http://www.schooldata.org, which has data compiled in accessible formats. For the years 2006, 2008, and 2009, we accessed standardized test performance data from the websites of state education agencies for each state in the analysis.

Variables and Measures

Change in School Rank

The principal dependent variable of interest is change in school rank (period 2 to period 1; that is, wave 3 to wave 2 or wave 2 to wave 1), as measured by test-score data for the school that the child attended. Note that test scores are a widely used but imperfect measure of the quality of schooling. The fact that they are highly correlated with social class means that the composition of the student body is an important contributory factor to school rankings based on tests (Caldas and Bankston, 1997; Goldhaber and Brewer, 1997; Lee, Smith, and Croninger, 1997; Rumberger and Palardy, 2005). Many observers view student growth measures as a better indicator of the effectiveness of schools in educating children, in part because they adjust for socioeconomic factors and the student's baseline performance (Schwartz et al., 2011). This study relies on proficiency test scores, however, because value-added measures were not available for the schools in this study.

Because proficiency levels are state defined and, therefore, vary across states and over time, we first ranked reading and math scores for each grade (where tests were administered) for every school in each of the 10 states in this study, based on the percentage of students who tested at or above the state's proficiency level in that subject. This methodology provided a ranking of each school's relative performance on each test administered for each grade at that school in that year. We then averaged the schools' math and reading rankings for all tested grades in a given year to get a yearly composite rank score for each school in our analysis. We then merged the rank data for the schools and years attended by children in the study into the child-level dataset.

Finally, it is possible that a state's lowest ranked schools could have made considerable gains and narrowed the test score gap with high-performing schools and that, as such, these improvements would not have been captured by the relative ranking measure. As a sensitivity test, we also ran models using the average test score for schools, not ranked as a percentile. The study's findings remained substantively unchanged.

School Change Measures

We determined whether each child changed schools between periods. For those children who switched schools, we used NCES information on the grade range of the schools attended to determine whether the child had made a promotional or nonpromotional move. We defined promotional movers as those children who switched schools between survey waves and whose grade at period 2 exceeded the highest grade offered at the schools they attended at period 1. We defined nonpromotional movers as those children who attended a different school at period 2 than at period 1 but who could have stayed at the original school because their period 2 grades did not exceed the maximum offered by their period 1 school.[1] The school addresses were geocoded to calculate the distance between the new and old schools and the distance between the child's home and school at each period.

Residential Mobility

We specified several different definitions of residential mobility. First, cases were classified as having moved homes or stayed at the same address during the two periods (0 = did not move, 1 = moved). Second and third, cases were classified according to whether their residence was in the same census tract (0 = no, 1 = yes) and in the same political jurisdiction (0 = no, 1 = yes). Fourth, cases were classified as to whether their residential address was in the same or a different school district between periods (0 = no, 1 = yes).[2] Fifth, we calculated the distance of residential moves in miles, categorized into a three-level variable (0 = did not move, 1 = moved less than 2 miles, 2 = moved more than 2 miles).

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[1] The MC survey captures only the school attended at the time of the interview. It is possible that some children made additional school changes within periods that are missed in this measure.

[2] To determine the school district of a household, we matched XY coordinates of household location to shapefiles from the School Attendance Boundary Information System, or SABINS, which is a project of The College of William and Mary and the Minnesota Population Center at the University of Minnesota.

Child and Household Characteristics From the MC Survey

Household characteristics included household income (continuous measure, in thousands of dollars), employment status of the respondent or partner (dichotomous; 1 = respondent or partner employed, 0 = neither respondent nor partner employed), educational attainment of the parent or guardian (continuous variable with seven levels), housing tenure (dichotomous; 1 = owner, 0 = renter), race and ethnicity (four categories; non-Hispanic White, non-Hispanic African American, Hispanic, and other), and length of time the household has lived in their neighborhood (dichotomized; greater than or equal to 3 years = 1, less than 3 years = 0). We also calculated a change in financial hardship measure based on whether the respondent reported difficulty paying for food at some point in the past year (indicator variables representing each combination of the dichotomous yes/no measure). This measure complements other insights into the economic neediness of the household; for example, income. Child age is also included in the model (continuous measure). We also include parental satisfaction with the child's school, reported on a 1-to-5 scale, with 1 indicating parents were very dissatisfied and 5 indicating they were very satisfied.

Control Variables

The multivariate model contains control variables for the MC sites and for temporal effects (that is, wave). In addition, we control for the school rank quartile at period 1. Although we relied on a continuous measure of school rank in period 1 to calculate changes in school rank for the descriptive statistics, in the multivariate model we experimented with different specifications for period 1 school rank. Out of concern that period 1 school rank was not linearly associated with rank at period 2, we elected to divide the variable into four quartiles.

We provide a summary of the variables included in the multivariate model in exhibit 1.

Exhibit 1

Key Definitions of Variables Included in Model (1 of 2)

Variable	Definition	Source
Dependent		
Rank score change	Composite test score ranking of school attended by child in period 2 and period 1.	School-level state test scores
Residential mobility		
Change school district	1 if child lived in a different school district in periods 1 and 2; 0 otherwise.	MC survey, SABINS boundary files
Residential move < 2 miles	1 if child moved homes and distance of move was less than 2 miles.	MC survey
Residential move ≥ 2 miles	1 if child moved homes and distance of move was greater than or equal to 2 miles.	MC survey
School and child characteristics		
Promotional school change	Promotional school change between periods 1 and 2.	MC survey, NCES grade information
School stayer	No school change between periods 1 and 2.	MC survey, NCES grade information
Child age	Child's age in period 1.	MC survey
Parent satisfaction with schools	Parent's satisfaction with child's school in period 1 (out of 5).	MC survey

Exhibit 1

Key Definitions of Variables Included in Model (2 of 2)

Variable	Definition	Source
Economic, education, and housing characteristics		
Parental education	Parental education level in period 1.	MC survey
Income	Household income (continuous) in period 1 (in thousands).	MC survey
Employed	Respondent or spouse has job in period 1.	MC survey
Difficulty affording food (n1y2)	"Family couldn't afford to pay for food at some point in the past year." No in period 1; yes in period 2.	MC survey
Difficulty affording food (y1n2)	"Family couldn't afford to pay for food at some point in the past year." Yes in period 1; no in period 2.	MC survey
Difficulty affording food (y1y2)	"Family couldn't afford to pay for food at some point in the past year." Yes in periods 1 and 2.	MC survey
Own home	Respondent owns home in period 1.	MC survey
Years in neighborhood ≥ 3	The number of years respondent had lived in current neighborhood as of period 1.	MC survey
Race/ethnicity		
Non-Hispanic African American	1 if respondent is non-Hispanic African American; 0 otherwise.	MC survey
Hispanic	1 if respondent is Hispanic, any race; 0 otherwise.	MC survey
Other	1 if respondent is not Hispanic, African American, or White; 0 otherwise.	MC survey
Site, wave, and period 1 school performance controls		
Site controls	1 if observation comes from particular site; 0 otherwise.	MC survey
Wave flag	Control, whereby 1 if from wave 2-to-wave 3 period; 0 if from wave 1-to-wave 2 period.	MC survey
Rank score p1 (by quartile)	Composite test score ranking of school attended by child in period 1, divided into quartiles.	School-level state test scores

MC = Making Connections. NCES = National Center for Educational Statistics. SABINS = School Attendance Boundary Information System.

Analytic Approach

Rates of residential and school mobility and the various combinations of both types of mobility were calculated for each site. For school changers, we calculated the mean distance between schools, the proportion that crossed district boundaries, and the amount and direction of change in school composition and performance measures. We compared children on the school change measures, on residential move characteristics, and on child and household variables at both periods.

Change in school rank was modeled as a function of residential and school mobility characteristics between periods 1 and 2 and a set of household and child factors, controlling for site, a temporal control variable that indicates whether period 1 corresponds with the survey data collected in 2002

or 2005 and school rank at period 1, using ordinary least squares regression.[3] Our analyses adjusted the standard errors of the estimates to account for the subset of children being represented twice in the dataset. The regression model incorporates design effects resulting from households (not children) being the unit of selection for the MC survey.[4]

Findings

School Performance in Period 1

Children in the study neighborhoods began, in period 1, in strikingly low-ranked schools. The schools these students attended performed far below their respective state averages. More than one-half of the children (51 percent) attended schools ranked in the worst performing 20th percentile in the state, and more than four in five children (83 percent) attended schools that were ranked below the 50th percentile in the state. These trends held for children at all levels of schooling—elementary, middle school, and senior high—and for children who subsequently remained in their same school or switched schools (exhibit 2).

Across the 10 MC sites in the study, children in every city attended low-ranked schools, although the distribution was not uniform. Variation in school rank across the sites was the product of many factors, including local and state education policies, the level of deprivation of the target

Exhibit 2

Distribution of School Performance for Children in Period 1
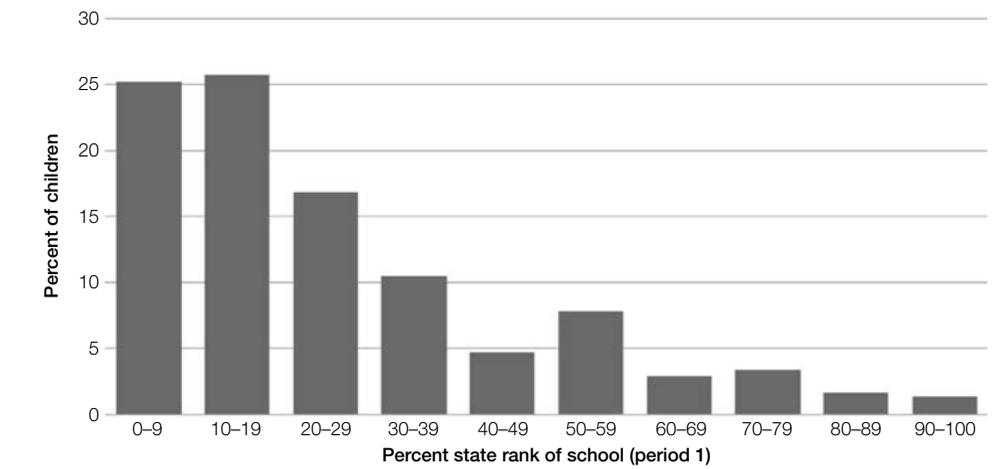
[3] Running the model as a fixed effects (within) estimator is not advisable, because many of the characteristics are time invariant.

[4] Child-level weights were created taking account of the fact that each household might include multiple children. We used a jackknife replication method to estimate design effects, which we used to adjust standard errors of the child-level estimates.

communities, and the degree of their isolation or geographic access to higher ranked schools (often in higher income neighborhoods). Exhibit 3 summarizes the ranks of schools that children in the MC survey attended in periods 1 and 2 for each MC site.

Exhibit 3

Percentile Rank of School Performance, by MC Site and Period

Site	Number of Children	Period 1			Period 2		
		Mean	Median	Std Dev	Mean	Median	Std Dev
Denver	261	21.3	13.1	20.9	25.5	14.8	24.9
Des Moines	323	20.6	14.8	22.7	16.8	6.8	21.3
Hartford	51	25.4	15.8	26.3	22.2	8.3	26.9
Indianapolis	328	29.5	26.8	22.0	29.1	25.2	26.2
Louisville	279	42.8	34.2	30.8	28.1	17.8	28.2
Milwaukee	81	9.9	4.7	14.1	16.0	9.4	20.3
Oakland	73	30.6	24.7	24.3	36.7	35.9	21.2
Providence	309	15.3	11.6	13.5	17.4	11.7	18.0
San Antonio	391	34.9	30.0	19.3	33.6	30.3	18.1
Seattle/White Center	291	22.6	17.8	16.8	27.6	24.2	20.1
Total	**2,387**	**26.6**	**19.7**	**23.3**	**25.7**	**19.8**	**23.4**

MC = Making Connections. Std Dev = standard deviation.

Two examples illustrate variation across the sites. The Milwaukee site was among the most distressed, concentrated in some parts of the city with the lowest incomes. Across all 10 sites, children attended schools ranked in the 27th percentile in period 1 on average (20th percentile at the median), but the average child in the Milwaukee site attended a school ranked in only the 10th percentile in the state of Wisconsin (5th percentile at the median). At the other end of the distribution was the MC site in Louisville, which allows for a high degree of school choice. Although poverty among the families in the Louisville site was no less prevalent than among those in the Milwaukee site, the average child in Louisville attended a school ranked in the 43rd percentile in the state of Kentucky on average (34th percentile at the median).

A striking subtext to this context, especially given the focus of place-based initiatives, is the role of distance traveled to school. Only 49 percent of the children attended schools inside the target area. Those students who traveled great distances to schools in period 1, on average, attended higher ranked institutions. School rank and distance traveled to school were not correlated, however, among children attending schools within shorter distances (for example, 1, 2, or 3 miles from their homes). Only when children attended schools more than 3 miles from their homes were they systematically able to arrive at higher ranked schools.

School and Residential Mobility

Children in the MC survey were very likely to change schools during the 3 years that elapsed between survey waves, with 78 percent of the person periods involving a school change. Of all the children in the study, about 56 percent made promotional changes, 22 percent made nonpromotional changes, and the remaining 22 percent were at the same school in both periods. Thus, although most children changed schools for natural promotional reasons, one-half of those who could have stayed at their original school left for another school. Although no directly comparable

studies exist, Rumberger (2003) found that 34 percent of fourth graders and 21 percent of eighth graders nationally changed schools at least once in a 2-year period. Several state-level studies have provided rates of nonpromotional moves for comparison. For example, between fourth and seventh grades, approximately one-third of Texas public school students made a nonpromotional move (Hanushek, Kain, and Rivkin, 2004). In North Carolina, 37 percent of students who were in third grade in 2000 made at least one nonpromotional move by ninth grade (Xu, Hannaway, and D'Souza, 2009).

Exhibit 4 displays selected characteristics of the children who made different types of school changes. Unless noted otherwise, all differences discussed in the text are statistically significant across the three school change types (no change, promotional change, or nonpromotional change). Statistical significance levels are also displayed in the table for the reader.

A few important distinctions emerge. Given the 3-year followup period, it is no surprise that children in elementary schools, which offer more grades than middle and senior high schools, were more likely to stay in the same school or make nonpromotional school changes than were older children. The average ages for school stayers and nonpromotional changers were 8.5 and 8.2 years, respectively, whereas for promotional school changers it was 11.0 years.

Also, non-Hispanic White children switched schools less than children of other races or ethnicities: they constituted 27 percent of children who stayed at their school but only 19 percent of those who made promotional school changes and 18 percent of those who made nonpromotional school changes. Non-Hispanic African-American children were overrepresented among those changing

Exhibit 4

Characteristics of Study Children, by School Change Type (1 of 2)

	Stayers and Changers	All School Stayers	All School Changers	Promotional Changers	Nonpromotional Changers
Summary					
Count**	2,643	585	2,058	1,481	578
Percent of total	100.0	22.1	77.9	56.0	21.9
Period 1 child characteristics					
Child age (average in years)*	9.8	8.5	10.2	11.0	8.2
	(2.7)	(2.9)	(2.5)	(1.9)	(2.7)
In grades K–5*	68.5	79.6	65.4	59.4	80.5
	(48.9)	(41.8)	(50.3)	(51.4)	(43.0)
In grades 6–8*	25.7	5.0	31.6	40.6	8.6
	(46)	(22.7)	(49.2)	(51.4)	(30.4)
In grades 9–12*	5.8	15.3	3.1	0.0	10.9
	(24.6)	(37.4)	(18.2)	(0.0)	(33.9)
Non-Hispanic White*	20.7	27.2	18.9	19.1	18.3
	(42.7)	(46.1)	(41.4)	(41.2)	(42.0)
Non-Hispanic African American*	30.8	22.9	33.1	34.9	28.5
	(48.6)	(43.6)	(49.8)	(49.9)	(49.1)
Hispanic	41.1	42	40.9	39.2	45.3
	(51.8)	(51.2)	(52)	(51.1)	(54.1)
Other	7.4	8.0	7.2	7.0	7.9
	(27.5)	(28.1)	(27.4)	(26.6)	(29.3)

Exhibit 4

Characteristics of Study Children, by School Change Type (2 of 2)

	Stayers and Changers	All School Stayers	All School Changers	Promotional Changers	Nonpromotional Changers
Period 1 parent and family characteristics					
Used SNAP in past year*	48.9	44.3	50.2	49.6	51.9
	(52.7)	(51.6)	(52.9)	(52.4)	(54.3)
Used TANF in past year	45.0	42.9	45.6	44.3	48.8
	(52.3)	(51.4)	(52.6)	(51.9)	(54.3)
Own home*	34.9	40.0	33.5	35.4	28.6
	(50.2)	(50.8)	(49.9)	(50.0)	(49.2)
In public housing*	14.1	10.9	15.0	14.3	16.6
	(36.6)	(32.3)	(37.7)	(36.7)	(40.5)
Using a voucher	12.7	9.3	13.7	13.4	14.4
	(35.1)	(30.1)	(36.4)	(35.7)	(38.2)
Parental education—no HS degree	37.4	35.8	37.8	36.4	41.6
	(50.9)	(49.8)	(51.2)	(50.3)	(53.6)
Parental education—HS degree	34.8	35.9	34.4	34.8	33.5
	(50.1)	(49.8)	(50.2)	(49.8)	(51.4)
Parental education—some college	27.9	28.3	27.7	28.9	24.9
	(47.2)	(46.8)	(47.3)	(47.4)	(47.1)
Income (average in dollars)	18,799	20,138	18,419	18,917	17,176
	(24,343.5)	(25,199.7)	(24,073.6)	(24,556.0)	(22,714.3)
Parent satisfaction with schools* (average rating)	4.2	4.4	4.2	4.2	4.2
	(1.0)	(0.9)	(1.0)	(1.0)	(1.0)
Residential mobility					
Moved between periods*	54.9	40.7	59.0	55.2	68.7
	(52.4)	(50.9)	(52.0)	(52.1)	(50.4)

HS = high school. K = kindergarten. SNAP = Supplemental Nutrition Assistance Program. TANF = Temporary Assistance to Needy Families.

*Differences between the three school change types (no change, promotional change, or nonpromotional change) are statistically significant at the p > .05 level.

**Weighted counts. Subgroup counts may not add exactly to totals because of weighting and rounding.

Notes: Standard deviations are shown in parentheses. Binary variables are shown as percentages.

schools, constituting 33 percent of school changers but only 23 percent of school stayers. Hispanic children and children of other or mixed races were neither more likely nor less likely to switch schools than the sample average.

Although the residents of these distressed communities generally had quite low incomes, household income did not vary by type of school change (or no change). Children who stayed in the same school, however, were more likely to live in an owner-occupied home than those who changed schools (40 versus 34 percent). Parents of children remaining in the same school were less likely to receive support from safety net programs such as the Supplemental Nutrition Assistance Program, or SNAP, and public housing (exhibit 4). Parents' educational attainment and whether their children switched schools exhibited no statistical association.

It may appear surprising, given the low performance levels of schools attended by MC students, that parents generally reported being satisfied with their children's schools in period 1. On a 5-point satisfaction scale, parents reported an average satisfaction level of 4.2, whereby a rating of 4 represented "satisfied." Statistically significant variation nevertheless exists in the parental satisfaction with schools across school change types, with greater satisfaction among parents of school stayers than of either type of school changers.

Although less prevalent than school switching, residential relocation was also common in the MC sites (see the last row of exhibit 4). Approximately 55 percent of all children moved homes between periods 1 and 2. Note that this mobility rate exceeds the rate of moving nationally, but it is in line with other estimates of residential mobility for low-income families.[5] Although residential mobility rates are higher among school changers (59 percent) than school stayers (41 percent), these two types of mobility also occur independently for many children and households. Non-promotional school changes are more often associated with a residential move than promotional changes, however.

Change in School Performance

For MC students, school ranks in period 2 largely resemble those of period 1 when examining summary statistics. The mean state rank of schools attended by these children was in the 26th percentile in period 2 and in the 27th percentile in period 1. At both points in time, the median student attended a school ranked in the 20th percentile of his or her state. Therefore, a significant share of students in the MC sites was exposed to low-performing schools at some point: 68 percent of children attended a school ranked in the worst one-fifth of the state in either period, and 35 percent of children were persistently in the lowest one-fifth of schools in the state. By contrast, only 5 percent of children attended a school ranked above the 50th percentile in both periods.

These aggregate summary statistics mask some important individual-level changes, however. Exhibit 5 shows where students in each decile of school rank in period 1 fared, in terms of school rank, in period 2. The diagonal set of dashed boxes in the matrix shows what share of all students started in a given decile in period 1, and remained in that same decile in period 2 (for example, starting and ending in the lowest decile).

Approximately 30 percent of children remained in the same decile of state rank in both periods (the sum of the dashed boxes in exhibit 5, also shown in summary exhibit 6). Another 33 percent of students attended schools that were different in state rank by only one decile (17 percent moved up one decile, and 16 percent moved down one decile). The remainder of students, 38 percent, ended up at schools ranked two or more deciles from those where they started, however. Again, these moves were evenly split, with 19 percent of all students arriving at schools two or more

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[5] Data from the March Supplement of the Current Population Survey during the years covered in this study period indicate that 19 percent of people in the lowest income quintile moved in the previous year. Extrapolating this percentage to the 3-year study period indicates an estimated mobility rate of 58 percent, which is comparable with the mobility rate for MC households. A similarly estimated 3-year national average that includes middle-income and upper income people is much less—roughly 39 percent.

Exhibit 5

Change in Rank of School Attended

		Period 2 rank score decile (%)										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total N**	**Total %**
1	13	7	2	1	1	0	0	0	0	0	667	25
2	8	7	5	3	1	1	1	0	0	0	680	26
3	3	3	5	3	2	1	0	0	0	0	445	17
4	2	1	2	2	1	1	1	0	0	0	276	10
5	1	1	1	1	0	0	0	0	0	0	124	5
6	2	1	1	1	1	1	1	0	0	0	207	8
7	0	0	0	0	1	0	0	0	0	0	76	3
8	1	1	0	1	0	0	0	0	0	0	89	3
9	1	0	0	0	0	0	0	0	0	0	44	2
10	0	0	0	0	0	0	0	0	0	0	36	1
Total N	769	567	444	298	203	121	88	52	45	55	2,643	
Total %	29	21	17	11	8	5	3	2	2	2		

(Left axis label: Period 1 rank score decile (%))

Note: Numbers are weighted and may not add to totals because of rounding.

Exhibit 6

Summary of Change in Rank of School Attended, by School Change Type

	Stayers and Changers (%)	All School Stayers (%)	All School Changers (%)
Remained in same decile	30	44	26
Changed one decile	33	37	31
Moved up one decile	17	19	17
Moved down one decile	16	18	15
Changed two or more deciles	38	19	43
Moved up two or more deciles	19	12	21
Moved down two or more deciles	19	7	22

deciles higher or lower ranked than where they began. In short, although school rank in period 1 predicted school rank in period 2, a sizable minority of children in the study moved to both better and worse schools.

As expected, the degree of fluctuation in school rank was higher for children who switched schools than for those who remained in the same school. Whereas 44 percent of school stayers remained in the same decile of state rank in period 2 as in period 1, only 26 percent of school changers did. On the other end of the spectrum, only 19 percent of school stayers saw changes in performance of two or more deciles, whereas 43 percent of school changers did. These figures help underscore the reality that students are more likely to encounter higher or lower performing schools as a result of switching than as a result of changes within schools.

Predicting Change in School Performance

Exhibit 7 presents the multivariate analysis that explores factors related to the change in school rank between the two periods. Most striking are the role and specific nature of residential mobil-ity. The most important variable explaining changes in school performance was *whether a child*

moved out of the school district where he or she had previously been educated. Such a change was associated with an average improvement in percentile state rank of 8.9 points, controlling for other factors.

Exhibit 7

OLS Model of Change in School Performance State Ranks

Variable	Coef	Std Error	T Value	P Value
Residential mobility				
Change school district	8.94	1.93	4.63	0.00
Residential move < 2 miles	– 0.18	1.62	– 0.19	0.91
Residential move ≥ 2 miles	2.25	2.11	1.07	0.30
School and child characteristics				
Promotional school change	– 3.86	2.36	– 1.63	0.12
School stayer	1.53	2.44	0.63	0.54
Child age	0.06	0.33	0.19	0.85
Parent satisfaction with schools (p1)	– 0.85	0.77	– 1.09	0.29
Economic, education, and housing characteristics				
Parental education (p1)	0.81	0.25	3.27	0.04
Income (p1) (in thousands)	0.05	0.03	1.46	0.16
Employed (p1)	0.37	1.80	0.21	0.84
Difficulty affording food (n1y2)	– 2.57	1.13	– 2.28	0.03
Difficulty affording food (y1n2)	– 2.94	1.79	– 1.65	0.12
Difficulty affording food (y1y2)	– 2.49	1.37	– 1.82	0.08
Own home (p1)	0.02	1.52	0.01	0.99
Years in neighborhood ≥ 3 (p1)	0.75	0.97	0.78	0.44
Race/ethnicity				
Non-Hispanic African American	– 4.37	1.83	– 2.38	0.03
Hispanic	– 3.39	1.82	– 1.86	0.08
Other	– 1.72	2.48	– 0.69	0.50
Site, wave, and period 1 school performance controls				
Denver	0.72	2.48	0.29	0.78
Des Moines	– 7.27	2.18	– 3.33	0.00
Hartford	– 1.89	4.10	– 0.46	0.65
Indianapolis	1.51	2.60	0.58	0.57
Louisville	– 3.69	2.05	– 1.80	0.09
Milwaukee	– 1.35	4.03	– 0.34	0.74
Oakland	10.52	3.99	2.63	0.02
Providence	– 4.19	1.71	– 2.46	0.02
San Antonio	5.19	2.01	2.58	0.02
Wave flag	0.75	1.30	0.58	0.57
Rank score p1 first quartile	38.09	2.20	17.30	0.00
Rank score p1 second quartile	31.67	1.75	18.07	0.00
Rank score p1 third quartile	25.54	1.97	12.94	0.00
Constant	**– 22.69**	**4.12**	**– 5.51**	**0.00**

Coef = coefficient. OLS = ordinary least squares. Std = standard.

Note: The omitted category is no move for residential move < 2 miles and residential move ≥ 2 miles; is nonpromotional school change for promotional school change and school stayer; is "no" in both periods for difficulty affording food; is non-Hispanic White for race/ethnicity; is Seattle/White Center for site; and is the fourth quartile for period 1 rank score.

A trichotomous measure of residential mobility (residential move < 2 miles, residential move ≥ 2 miles, no move) did not have a significant effect on change in school quality. Children making residential moves of more than 2 miles were no more likely to reach higher ranked schools than children who moved nearby or did not move at all, controlling for other factors. We also tested other specifications for residential move such as linear distance, moving as a dichotomous measure (0 = did not move, 1 = moved), whether children resided in the same census tract in both periods (0 = no, 1 = yes), and whether they resided in the same political jurisdiction (0 = no, 1 = yes). Note that, after controlling for moves outside the school district, none of these other specifications of residential mobility were associated with reaching higher or lower ranked schools. It is not the case that no children who remained within the same school district saw improvement (or that all children leaving their school district did). These findings, however, do indicate that, on average, residential moves out of the distressed neighborhoods targeted by the MC initiative were not associated with gains in school rank unless those moves were to a new school district.

A child's age did not predict changes in school rank, meaning that older youth did not face greater obstacles in reaching higher performing schools than did younger children. Whether children made a nonpromotional, a promotional, or no school change were also not statistically significant predictors of change in school rank. This finding indicates that children who made the transition from elementary or middle school to middle or high school, respectively, were no better or worse off than other school switchers or school stayers, after controlling for other factors.

Parental dissatisfaction with schools at period 1 is not associated with their children getting to higher ranked schools by period 2, despite the fact that less satisfied parents were more likely to have children who switched schools between periods. It is evident from these results, however, that those school moves do not, ceteris paribus, result in children reaching higher ranked schools, and that children are equally likely to change to lower performing schools.

Increased parental education is associated with positive increases in school performance levels. Each additional level of parental education is associated with an increase in state rank of 0.8 by period 2. Children with an employed parent did no better than children whose parents were not working, however, and household income was not associated with changes in school performance after controlling for other factors. Whether children lived in homes owned by their parents (at either period or calculated as tenure changes between periods) was likewise not linked with improvements in school performance. The length of time the household had spent in the neighborhood in period 1—a possible proxy for previous residential stability—was not statically significant.

A measure of changes in a household's economic insecurity (operationalized as difficulty affording food) is significantly associated with the dependent variable. Households that experienced worsened food security between the two periods or that experienced food insecurity at both periods were associated with declining school performance ranks (-2.7 and -2.5, respectively) relative to households that did not report difficulty affording food at either period. We believe that this food security measure is a sign of financial distress for households, and, apparently, children living in households with this distress are at risk for attending schools with worse performance.

Racial differences emerged in the multivariate analysis, confirming findings from previous research on school performance and mobility. Relative to non-Hispanic White children and controlling for

other factors, non-Hispanic African-American children had more negative school performance change measures. Regression results showed that non-Hispanic African-American children experienced a decline in the percentile of school state rank on the order of 4.4 compared with that of non-Hispanic White children. Hispanic children also fared worse than non-Hispanic White children controlling for other factors, with a decline of 3.4 in the percentile of school state rank relative to non-Hispanic Whites.

The analysis controlled for the ranks of schools that children attended in period 1, because those who start at the extremes face floor or ceiling effects. For example, children in the lowest ranked schools in the state are unable to attend *worse* performing schools, whereas children in higher ranked schools will have difficulty reaching *even better* performing schools. For example, children attending schools in the lowest 10 percent of the state (which equates to the first quartile of children in this study) are not likely to switch to an even worse school: they are almost guaranteed to find a comparable or higher ranked school. We found, as predicted, that children at the lowest end of the state performance distribution were most able to improve in state rank; however, they were still in very low-ranked schools.

We included a temporal control variable indicating whether period 1 corresponded with the survey data collected in 2002 or 2005. This control variable was not statistically significant, however. Site variables were also included as controls, and indeed residence in some sites appears to have been related to changes in the rank of the schools youth attended. These changes may capture citywide improvements or declines in school performance relative to state levels.

Discussion

Summary of Findings

This study finds high rates of residential and school mobility in a representative sample of children living in low-income neighborhoods in 10 U.S. cities. The study sites are illustrative of the kinds of neighborhoods targeted for place-based initiatives. Switching schools in these sites is linked with residential mobility—although not as tightly as might be commonly understood. As expected, residential moves were most frequent among nonpromotional school changers: roughly two-thirds of children making nonpromotional changes moved homes (69 percent). It is then obvious, but worth emphasizing, that one-third of children who made nonpromotional school changes did so without making a residential move. More than one-half (55 percent) of children making promotional changes between periods 1 and 2 also moved homes. A lesser, but still sizable, share of school stayers moved homes (41 percent), further evidence that residential and school moves do not necessarily coincide. These patterns of residential and school mobility collectively add up to neighborhoods that, at any given point in time, have many children attending school outside the target area of a place-based initiative and numerous other children who attend school in the area but live outside it.

Despite the high levels of mobility, children switching schools in the study neighborhoods did not, on average, get into higher ranked schools. Getting to higher performing schools was relatively rare and depended to a considerable extent on making an advantageous residential move. Children

who moved out of the original school district most notably were significantly better off regarding the percentile ranking of their schools. Parents with more education also tended to have children whose school moves were to higher ranked schools. Non-Hispanic White families, a relatively small subgroup in this sample, had somewhat more success in moving their children into higher ranked schools than individuals classified as non-Hispanic African American and Hispanic.

Parental dissatisfaction with their children's schools was linked with the decision to switch schools, but it was not an important factor in the attainment of improved schools. How then do we understand parents' views of their children's education setting? It is possible that, even if they are dissatisfied with their children's original schools, parents are unable to access higher performing ones. This inability might be because they lack information about better schools or because school switching is the result of other factors besides the desire to obtain a place in a higher performing school. In addition, it is possible that factors other than the performance of schools as reflected in test scores are at play in parental choices. As noted in the literature review, test scores do not adequately measure many aspects of school performance, such as student growth or types of learning not covered by the tests. Also, emerging qualitative research has found that parents in low-income communities may value other attributes, such as school safety, more than academic performance (DeLuca and Rosenblatt, 2010). In addition, qualitative studies point out that finding homes that are affordable and of adequate size and quality are factors that can outweigh school quality in families' residential choices.

This study also finds that families who fall into financial hardship are more likely to have children who switch to lower preforming schools. This finding supports the contention that certain kinds of residential mobility hold great promise for families but that not all residential moves are helpful, and some can do damage. In previous research on residential mobility in low-income neighborhoods, Coulton, Theodos, and Turner (2012) identified a cluster of residential movers who are moving in response to family and economic distress. Their moves are not making them better off and, on many measures, they are worse off than households that stay in place and engage more positively with the neighborhood and local schools.

Limitations and Additional Research Needs

This study has several limitations. The neighborhoods in this study are not a representative sample of neighborhoods in the United States. In fact, they were deliberately selected because they were disadvantaged in terms of child and family well-being and neighborhood resources. The schools in these neighborhoods were generally low performing relative to other schools in the state and metropolitan area.

This study was limited by the few measures of school performance that were available for this research. We were able to obtain school-level performance only on math and reading proficiency tests across all sites and were not able to include any other indicators, such as school climate, teacher effectiveness, and so forth. Most educators agree that proficiency test scores are limited in what they measure and tend to reveal as much about who goes to the school as the quality of the education in the classroom. Thus, this study is able to suggest only whether children get to schools with a more favorable mix of students' test performance, and it masks some differences in quality

that are not apparent by these measures. Indeed, we noted that parent satisfaction with the school was not highly correlated with the proficiency test-based performance measures in our study, but parents may have been selecting schools based on qualities not measured here.

Another limitation of this study is that we do not know the exact dates of school changes or residential moves, simply that they occurred between waves of the survey. Although the model treats residential mobility as a predictor of a change in school rank, it is possible that some children changed schools before a residential move took place. For example, children could have made promotional changes to magnet high schools, and then families could have relocated to be closer to the new school. In addition, residential moves may occur to a new school zone or district in anticipation of school promotion, making the two selections jointly determined. Thus, this study is ambiguous about which comes first, both in reality and in family decisionmaking, but the model treats the residential and school moves as correlated but exogenous.

Of final note, although this study represents an important step toward a better understanding of the complicated interplay between residential and school mobility, additional work would be of interest to further examine the heterogeneity of outcomes for children. Other categorization or classification techniques may inform how different residential and school mobility scenarios affect different groups of children differently.

Relevance for Policy and Practice

Despite these limitations, this study reveals the interconnected nature of residential moves and school changes within distressed neighborhoods. The fact that rates of residential mobility are high, but the chances of reaching higher performing schools are low, is an important backdrop that must be acknowledged in place-based initiatives that seek to improve educational outcomes for low-income children. Previous research is mixed on whether school and residential moves have a negative effect on educational outcomes, probably because national samples are heterogeneous, with many moves being neutral or positive in terms of school quality.

This study, however, affirms that many residential and school moves in low-income neighborhoods do not lead children to attend higher ranked schools and, in fact, actually result in children attending schools with lower performance levels. Under these circumstances, changing schools is likely to be disruptive at both the individual and school levels, without commensurate benefits in terms of academic results. These types of moves to schools that are worse or no better performing are frequent among families moving relatively short distances in response to financial distress or household compositional changes. It is only when residential relocation takes families outside the originating school district that we see reliable gains in terms of school rank, but these types of strategic moves are relatively rare among the families living in the low-income neighborhoods studied here.

This study is unique in the school mobility literature because it views the phenomenon from a place-based vantage point of low-income neighborhoods and the schools in that vicinity. Such a purview is consistent with the reality that faces policymakers and practitioners responsible for implementing place-based initiatives that promote educational success for children in the area. These programs often make considerable investments in raising the quality of one or a few schools in the neighborhood and enabling the school to become an anchor point for numerous partnerships that strengthen programs for children and promote parent and community engagement.

The reality, however, is that children in the study neighborhoods attended a variety of schools at varying distances and changed schools fairly often. This condition is likely to be the baseline for place-based initiatives, suggesting that targeted investments in one school, although potentially able to decrease school and residential mobility for some students, may not add up to a measureable effect on the educational outcomes for the neighborhood as a whole. If the schools nearby are not also improved, children will certainly shift among them, diluting the effect, unless a critical mass of students experiences the improved conditions over time. At a minimum, place-based initiatives can do more to help children from disadvantaged families remain at or switch into highly ranked schools and can attempt to minimize student switching to low-performing educational settings.

Residential mobility is another reality with which these place-based initiatives must contend. Moves generated by housing and financial instability tend to be associated with children switching to worse performing schools. If place-based initiatives that focus on education do not have the wherewithal to address these vexing housing and economic problems, the unproductive churning of families and students may overwhelm the investments being made in that place. Attention should be given to methods of reducing the number of residential moves that are the result of distress or that are producing little gain in terms of school performance or neighborhood quality. Policies that enable residentially mobile children to avoid nonpromotional moves that are not to better performing schools may also be needed. In addition, efforts to increase parental and community engagement with schools have to be based on the reality that many families experience multiple schools across a wider geography than those efforts may have heretofore factored into their programming and outreach. Network connections, important ingredients of building community for children, need to be made to function across such barriers of time and space.

This study also has implications for residential mobility policies. Such programs use housing vouchers and other methods to help households move to lower poverty neighborhoods than they could otherwise afford. This research, along with other studies cited in the background section of this article, suggests that only certain types of such moves are likely to result in children enrolling in better performing schools. Children starting out in these 10 low-income communities reliably gained access to highly ranked schools only through moves outside the school district. Residential mobility programs that do not go far enough in supporting relocation to areas with high-quality schools cannot reasonably expect improved educational outcomes for children, given the educational environment in most cities. Educational outcomes are also unlikely to improve if mobility to opportunity neighborhoods is only short lived.

Place-based and residential mobility policies to improve the well-being of children have come about because of the recognition that children's lives are profoundly diminished when they grow up in disadvantaged neighborhoods and do not have access to high-quality schools. Although it makes good sense to focus investments in small, manageable geographic areas to reach a critical mass of improvements, the anticipated effect on child well-being may not occur if mobility is not also addressed. Moreover, programs that promote residential moves to lower poverty areas may falter in terms of educational effect if they do not address the structural barriers to reaching high-quality schools. This study demonstrates that such specificity does not comport with the reality that many children will experience school and residential moves that take them in and out of any target area. If the areas nearby are not experiencing similar improvements, or if the families

lose their connections with the place-based resources, gains as a result of the initiative may be lost. Reducing unproductive school and residential churning may be a key to the success of both in-place investment approaches and mobility strategies, and doing so would be fruitful for future experimentation and policy development.

Acknowledgments

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Coercive Sexual Environments: What MTO Tells Us About Neighborhoods and Sexual Safety

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Abstract

Earlier research on the U.S. Department of Housing and Urban Development's Moving to Opportunity (MTO) for Fair Housing Demonstration identified sexual environments as an important dimension of neighborhood quality for young people. The study presented in this article uses survey data and new indepth interviews with young women in MTO households to present the perspectives of women experiencing harassment in their neighborhoods and to deepen our understanding of how harassment relates to other aspects of their lives. Indepth interview respondents (N = 40) describe what it is like to live with chronic violence and predatory threats and how the violence and threats constrain community life. Women in these communities describe daily life with catcalls, grabbing, sexually suggestive language, and violence toward women and even very young girls. Our nonexperimental analysis of girls in the MTO Final Impacts Evaluation survey data (N = 2,183) supports a link between chronic violence and disadvantage and the existence of a coercive sexual environment (CSE) that further undermines the well-being of women and girls. We use multivariate ordinary least squares regression to identify contextual, social and emotional, and economic and demographic factors that are correlated with reported harassment. We observe a positive, statistically significant relationship between reported harassment and indicators of chronic neighborhood disadvantage. We argue that policy interventions aimed at improving the lives of young women in low-income neighborhoods need to identify and address CSEs.

Introduction

If I went to a neighborhood where men didn't treat females disrespectful, I would be like, "Wow, are you serious?" Like, you know, I would think that that was foreign because I'm so used to, you know, something else. When something greater comes it would just be like real foreign to me. So, I believe growing up in a different situation and environment, it affects who you become.

—Kenesha, youth interview

Young women like Kenesha, growing up in low-income, racially segregated, urban communities, view the world through a lens shaped by decades of poverty and racism. The risks for youth of growing up in concentrated poverty and disadvantage are well documented: developmental and cognitive delays; poor physical and mental health; and the likelihood of dropping out of school, engaging in risky sexual behavior, and becoming involved in delinquent and criminal activities (Brooks-Gunn and Duncan, 1997; Ellen and Turner, 1997; Leventhal and Brooks-Gunn, 2004; Sampson, 2012; Sampson, Morenoff, and Gannon-Rowley, 2002; Sampson, Sharkey, and Raudenbush, 2008; Wodtke, Harding, and Elwert, 2011). In many of these neighborhoods, inadequate or nonexistent local institutions, such as poorly performing schools, inadequate health care, and a weak labor market, compound negative outcomes. Concentrated disadvantage contributes to lowered expectations in many areas (Anderson, 1991; Edin and Kefalas, 2005), including respect. As Kenesha suggests, it is more than the challenges and risks young girls face; it is an environment of concentrated and chronic disadvantage—"it affects who you become."

Neighborhoods mired in chronic disadvantage suffer a range of social ills, including high rates of violent crime, social disorder, and domestic violence (Kawachi, Kennedy, and Wilkinson, 1999; Sampson, Raudenbush, and Earls, 1997). In these disadvantaged communities, chronic violence is pervasive, both within and outside the home (Benson and Fox, 2004; Hannon, 2005), both stemming from and helping to perpetuate low levels of collective efficacy; that is, "social cohesion among neighbors combined with their willingness to intervene on behalf of the common good" (Sampson, Raudenbush, and Earls, 1997: 918). In the Urban Institute's previous work, we have theorized that when disadvantage and violence are great and collective efficacy and social control are minimal, a gender-specific neighborhood mechanism can emerge that has differential effects on male and female youth. To be specific, some communities develop what we have termed a *coercive sexual environment* (CSE), wherein harassment, domestic violence, and sexual exploitation of women and even very young girls become part of everyday life (Popkin, Acs, and Smith, 2010; Popkin, Leventhal, and Weismann, 2010; Popkin and McDaniel, 2013). For girls in the inner city, experience with early and coerced sex can combine with structural deprivations to promote a life trajectory marked by school dropout, early motherhood, little or no connection to the labor market, and unstable family formation (Dunlap, Golub, and Johnson, 2004).

Earlier work addressed the question of why outcomes for inner-city male and female youth were so strikingly different in the U.S. Department of Housing and Urban Development's (HUD's) Moving to Opportunity (MTO) for Fair Housing Demonstration Interim Impacts Evaluation, with girls faring unexpectedly better in terms of mental health and engagement in risky behavior (Briggs, Popkin, and Goering, 2010; Popkin, Leventhal, and Weisman, 2010). That work suggested key

differences in how neighborhood safety matters for male and female adolescents, with girls in high-poverty, high-crime communities also coping with pervasive sexual harassment and constant fear of sexual violence—in essence, a CSE (Briggs, Popkin, and Goering, 2010; Popkin, Leventhal, and Weisman, 2010). This article builds on this earlier research by exploring what a CSE looks and feels like to those experiencing it and by creating a measure that can be used to learn more about the relationship between a girl's environment and her experiences of harassment.

A major goal of this study is to contribute to the understanding of the experiences of girls and women in low-income, racially segregated, urban communities. The first research question is, "How do women and girls in MTO experience sexual pressure and harassment in their neighborhoods?" To address this question, we use new qualitative interview data to explore how sexual harassment and pressures in chronically disadvantaged neighborhoods feel for girls and women. The second research question is, "What are the neighborhood-, family-, and youth-level correlates of sexual harassment?" To address this question, we use data from the MTO Final Impacts Evaluation (Sanbonmatsu et al., 2011) about girls' regular experiences of harassment and about their communities, homes, and individual characteristics that previous literature has suggested is associated with greater risk of exposure to harassment.

We begin by reviewing key findings from earlier work on MTO and other research on harassment to illustrate how the current analysis extends our understanding of a gender-specific neighborhood mechanism. After describing our methods, we present results from our analysis of indepth interviews to illustrate how girls and women perceive their neighborhoods. We then present an analysis of MTO survey data that explores the correlates of harassment. The discussion of our findings raises a number of issues about how sexual harassment feels, how girls navigate it, and how it relates to other socioeconomic and demographic characteristics. We then present the limitations and policy implications of our study, which highlight the importance of addressing coercive behaviors and harassment as a key component of strategies to reduce risk and improve the life chances of low-income women and girls.

Moving to Opportunity

HUD launched the MTO demonstration in 1994 in five sites: Baltimore, Boston, Chicago, Los Angeles, and New York City. MTO was a voluntary relocation program, targeted at very low-income residents of distressed public housing in high-poverty neighborhoods in the five cities (Orr et al., 2003; Sanbonmatsu et al., 2011). About 4,600 families, largely African American and Hispanic, were randomly assigned to one of three treatment groups: (1) a control group, in which families retained their public housing unit and received no new assistance related to MTO; (2) a Section 8 comparison group, in which families received the standard counseling and voucher subsidy for use in the private housing market; and (3) an experimental group, in which families received special relocation counseling, search assistance, and a voucher designed to incentivize relocating to a low-poverty neighborhood for at least 1 year. Slightly less than one-half of families in the experimental group successfully took advantage of the special voucher.

The MTO Interim Impacts Evaluation (Orr et al., 2003) was conducted in 2002, approximately 5 to 7 years after families relocated. Although MTO designers hoped to show that helping families who lived in some of the nation's most disadvantaged neighborhoods (distressed public housing)

move to lower poverty communities would help address some of the toughest problems of deep poverty, the Interim Impacts Evaluation findings were generally disappointing. MTO had no significant effect on employment for adults or educational attainment for youth, and many families did not stay in low-poverty neighborhoods. An exception to the apparently limited effect of the experimental voucher, however, was that adolescent girls whose families had moved were faring better in terms of mental health and risky behavior, whereas adolescent boys in the experimental group were no better off than those who remained in public housing.

The Three-City Study of MTO (Briggs, Popkin, and Goering, 2010) used nonexperimental and qualitative methods to probe some of these puzzling findings from the MTO Interim Impacts Evaluation research.[1] This study, which was the basis for our earlier research, involved interviews with 122 parent-child dyads in Boston, Los Angeles, and New York conducted from 2004 through 2005 and involved ethnographic observations of a subset of these dyadic households. The MTO Final Impacts Evaluation, conducted for HUD by the National Bureau of Economic Research (NBER), interviewed families from 2008 to 2010, approximately 10 to 15 years after the MTO families' initial moves (Sanbonmatsu et al., 2011). This article addresses relevant results from the Three-City Study and MTO Final Impacts Evaluation research.

The Female Fear: How Neighborhoods Affect Girls

The most surprising finding from the MTO Interim Impacts Evaluation research was the gender difference in mental health and behavioral outcomes for boys and girls—especially surprising because preliminary single-site studies seemed to indicate that boys were faring better overall. Instead, the interim findings showed dramatic improvements for adolescent girls in terms of mental health and reduced delinquency but no benefits for boys. Our analysis of data from the Three-City Study suggested that the key mechanism underlying this gender-specific difference was neighborhood safety. Basing our analysis on this work, we argued that the main factor underlying the difference was that MTO girls who moved to safer, lower poverty communities experienced a substantial reduction in "female fear," Gordon and Riger's (1989) term (from their comprehensive study of women and violence) for the fear of sexual harassment, coercion, and rape and the ways in which it impedes women's lives. Although Gordon and Riger suggested that *all* women experience this fear to some degree, women in neighborhoods with high levels of chronic violence and disadvantage are most vulnerable (Popkin, Leventhal, and Weisman, 2010).

The comments of the MTO mothers and daughters we interviewed for the Three-City Study research were striking, clearly documenting that safety has meaning for adolescent girls beyond less exposure to gang violence and drug trafficking. Girls whose families used their vouchers to move from high-poverty public housing communities to lower poverty neighborhoods indeed benefited from a dramatic change in the level of their female fear. Adolescent girls and their mothers who moved to lower poverty neighborhoods were very aware of the dangers they left behind in public housing and cognizant that they felt less stressed and scared. Lower poverty communities

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[1] Another study looking at these puzzles was conducted by Clampet-Lundquist, Kling, Edin, and Duncan and involved interviews with MTO dyads in Baltimore and Chicago (see Clampet-Lundquist et al., 2011).

offered a chance for girls to move about more freely and take advantage of their improved ability to make new social connections (Clampet-Lundquist et al., 2011). By contrast, those who were still living in—or who moved back to—high-poverty communities spoke of their fears, the daily threat of humiliation or violence, the often extreme strategies they used to protect themselves (or their daughters), and the consequences—pregnancy, sexually transmitted disease, intimate partner violence, and sexual assault. Parents in high-poverty communities were concerned about their daughters not only being victimized, but also succumbing to pressures or temptations that might lead them into risky situations, often describing girls as "fast" because of their behavior or dress. We hypothesized that these gender-specific differences in neighborhood safety were the major factor underlying the positive outcomes for MTO girls who moved to low-poverty neighborhoods.

We continued to explore the question of how neighborhood environments might have differential outcomes for girls and boys with a small exploratory study in Washington, D.C. (Smith et al., 2008). We conducted three focus groups with parents and teens living in public housing, asking them targeted questions about dating patterns, sexual relationships, and the way men and boys treat women in their community. The findings from these groups supported our hypothesis that, in these very distressed communities, harassment and oversexualization of even very young girls was both normalized—that is, part of everyday life—and still traumatizing. Participants spoke about the difficulty in distinguishing flirting from harassment, especially with the pressures commonplace in a community fraught with widespread violence. Respondents told stories of older boys and men hanging around outside schools to attract young girls, girls trading sex for favors like cell phones, and the acceptance that boys would have multiple girlfriends. As we found in the Three-City Study research, participants frequently cited girls' own behavior and provocative dress as one source of the problem.

Although intriguing, this work was very exploratory and raised new questions about whether it was possible to demonstrate measurable differences in coercive sexual behaviors across neighborhoods and to more rigorously explore how these differences might affect the life chances and well-being for adolescent girls.

The most recent additions to the body of literature related to MTO are those associated with the MTO Final Impacts Evaluation survey. Like the MTO interim research, the MTO final research found significant differences in mental and physical health and well-being between adult women and girls who moved to lower poverty neighborhoods and those who remained in public housing (Ludwig et al., 2011). The MTO Final Impacts Evaluation survey also included a set of questions intended to measure experiences of gender-based harassment and fear. Analysis of the final survey finds that girls in the experimental group were significantly less likely than those in the control group to report frequent unwanted sexual attention (Sanbonmatsu et al., 2011).

Understanding Coercive Sexual Environments

As outlined previously, our work exploring the gender differences in outcomes for MTO youth led us to define a specific neighborhood mechanism, a CSE, that we believe undermines the life chances of adolescent girls growing up in distressed communities. These neighborhoods are mired in what Sampson (2012) refers to as concentrated disadvantage—places with high poverty, high

crime, and distress that blight the life chances of the families who live there. He argued that, because of their history of disadvantage, these communities suffer from low levels of collective efficacy, which in turn are associated with a range of ills, including violence, poor health, and infant mortality. Other evidence suggests that the risk of sexual violence is greater in disadvantaged communities, even among couples with higher incomes (Fox and Benson, 2006). Distressed, central-city public housing communities like those in which MTO families lived are some of the most racially and economically segregated communities in the nation, where the worst aspects of concentrated disadvantage are plainly evident—physical decay, violent crime, drug trafficking, drug and alcohol addiction among adults, high rates of incarceration, and the absence of even the most basic amenities, such as grocery stores and laundromats. Many adults who live in those communities are disconnected from the labor market and suffer from high rates of physical and mental illness; many of the children and youth are in danger of injury, neglect, and educational failure (Popkin et al., 2000; Popkin, Acs, and Smith, 2010).

Ample evidence suggests that children growing up in such troubled communities experience developmental delays, suffer serious physical and mental health problems, and are at greater risk for delinquency, early sexual initiation, and teen parenthood (Popkin, Leventhal, and Weismann, 2010). In addition, existing research supports the idea that girls and boys experience the effects of chronic disadvantage in very different ways, especially as they enter adolescence. In the 1990s, Anderson argued that young men in inner-city neighborhoods felt pressured to act tough to maintain respect, following the "code of the street," and girls gained status and respect through getting pregnant (Anderson, 1990). In a more recent example, one study of African-American youth growing up in high-crime communities found that young men focus on maintaining respect and avoiding the risk of gun violence, whereas young women focus on the fear of being the object of predatory behavior (Cobbina, Miller, and Brunson, 2008). In her graphic portrayal of life for low-income, urban, African-American girls, Miller (2008: 149) emphasized how neighborhood environments place girls at risk, writing that the "broader patterns of girls' neighborhood mistreatment, visible violence against women, crime and delinquent peer networks, and the prevalence of sexual harassment in schools all coalesced to create social contexts that heightened young women's risks for sexual victimization." As in our research on MTO and with Washington, D.C. public housing residents, Miller noted that teens often believe that the girls are to blame because of the way they behave or dress, explaining that "gendered status hierarchies and the sexualization of young women meant that a number of youths looked to young women's behavior or dress in explaining their neighborhood risks" (Miller, 2008: 39).

Understanding Individual Perceptions of Coercive Sexual Environments

Our own research, combined with our review of the literature, suggests it is not, as some residents suggest, the way girls dress that puts them at risk, but neighborhood characteristics and other environmental factors that put them at risk. Youth living in high-poverty, disadvantaged neighborhoods are exposed to a variety of neighborhood conditions, interactions, and stresses that potentially affect developmental and academic outcomes. The effect of neighborhood environments—often referred to as neighborhood effects—on life outcomes can vary considerably, however (Harding et al., 2010). Girls' perceptions of harassment and unwanted attention are likely shaped by their age, ethnicity, and family background, in addition to their gender. Our previous research highlighted

one of the challenges of measuring individual perceptions—whereas the women and girls in our studies consistently described a threatening environment rife with harassment, oversexualization, and unwanted attention, we also found that these phenomena are viewed as part of everyday life rather than as a problem. It is also difficult to predict which girls might be at greater risk, given that many demographic and social characteristics can potentially be both risk factors for and results of CSEs. The factors discussed in the existing literature as associated with CSEs fall into three broad categories.

1. *Contextual factors.* Family routines and parental involvement can be central to understanding how youth experience their environments and relationships in neighborhoods and schools.

2. *Social and emotional factors.* Adolescents and teenagers experience a great deal of physiological and emotional development. How young people navigate the freedoms and responsibilities of young adulthood and how their peers influence them may protect them or make them more vulnerable to harassment. For example, young people are more likely to engage in risky behaviors such as early sexual initiation, smoking, marijuana use, and truancy if their peers have done so as well (Card and Giuliano, 2011).

3. *Economic and demographic factors.* Economic and demographic characteristics of youth may make them more vulnerable to harassment (or more likely to report it). Young people in single-parent households spend more of their time unsupervised; many come home from school to empty households while their parent works (Flannery, Williams, and Vazsonyi, 2010).

Evidence from the MTO evaluation suggests that neighborhoods influence young girls' lives, and other research suggests that coercive sexual norms and harassment are additional risks that women in areas of concentrated disadvantage face. Critical dimensions missing from this body of work, however, are the perspectives of women experiencing CSEs and a more thorough understanding of how harassment relates to other aspects of the lives of women in distressed areas. What do pervasive fears of sexual violence and regular encounters with harassment look and feel like to those who face it, and which neighborhood-, household-, and individual-level factors are most associated with elevated reports of harassment? Although the young women who cope with CSEs may shed critical insight on both of these questions, the latter demands more systematic analysis. Our study addresses this problem by drawing on the insights and observations of women and girls who face CSEs from indepth interviews and by complementing their perspectives with an analysis of survey data that examine key correlates of harassment.

Methods

This article draws on survey data collected as part of the MTO Final Impacts Evaluation and on new data from a set of indepth interviews with mother-daughter dyads in Los Angeles conducted in the summer of 2011. The University of Michigan's Institute for Social Research collected the MTO Final Impacts Evaluation survey data between June 2008 and April 2010 under its contract with NBER. The database includes 3,273 adult household heads and 5,105 youth who were ages 10 to 20 years at the end of 2007 (Sanbonmatsu et al., 2011). The response rate was approximately 90 percent for adults and youth. Using these data, we identified 2,374 girls ages 13 to 20 whose

families participated in MTO between 1994 and 2008. Some of these girls had missing data for one or more key measures, leaving us with an analytical sample of 2,183 girls.[2] Exhibit 1 presents the characteristics of girls in the national survey sample and the indepth interview sample.[3]

Exhibit 1

Survey and Indepth Interview Samples

Variable Name	Survey Sample	Interview Sample
Sample size	2,183	20 dyads
Girls' reported harassment		
Mean (SD)	3.89 (2.95)	4.15 (3.03)
Girls' age 17–20 (%)	52.3	30.0
Race and ethnicity (%)		
African American, non-Hispanic	60.0	50.0
White, non-Hispanic	1.4	5.0
Other, non-Hispanic	2.3	0.0
Hispanic	31.4	30.0
Missing	4.90	15.0
Household income (%)		
≤ $11,000	28.5	35.0
$11,000–$25,000	28.0	45.0
≥ $25,000	28.5	20.0
Missing	14.9	0.0
Adult has GED or equivalent (%)	53.5	45.0
Missing	6.6	5.0
City (%)		
Baltimore	12.9	0.0
Boston	20.2	0.0
Chicago	21.3	0.0
Los Angeles	23.4	100.0
New York	22.2	0.0
Neighborhood poverty (%)		
Mean (SD)	29 (12)	30 (8)

GED = General Equivalency Diploma. SD = standard deviation.

Sources: MTO Final Impacts Evaluation Survey (2008); U.S. Census Bureau

Analytic Approach

We use the data from our indepth interviews to explore how girls and women perceive and describe the gender dynamics in their neighborhoods. We also take advantage of the neighborhood- and individual-level data from the MTO Final Impacts Evaluation survey to conduct a nonexperimental, exploratory analysis of the factors associated with individual perceptions of sexual harassment.

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[2] To maximize our sample size, we used the sample mean to impute parental education and median household income for less than 10 percent of the girls. We also used the race and ethnicity of a girl's parent to impute a number of cases in which the girl's race and ethnicity were not available.

[3] Four girls in the indepth interview sample were not within the age range (13 to 20) for many of the survey items that we included in our quantitative analysis, and so they are not included in the sample for the regression analysis. They are nonetheless included in the Interview Sample column in exhibit 1, and their interview responses are included in the qualitative analysis portion of the study.

Indepth Interviews

The new interviews conducted for this project sought to better understand how MTO program participants experience sexual pressure and harassment in their neighborhoods and to have them describe accepted neighborhood norms about respect, romantic relationships, commitment, and sexual activity. Interview questions prompted respondents to identify sexual pressures in their neighborhoods, compare their experiences (or expectations) of how men treat women in different communities, and discuss how they navigate potentially unsafe neighborhood situations. Although harassment is often a very personal experience, the interview guide prompted reflection on these issues often through a neighborhood lens. We conducted indepth interviews with 20 mother-daughter dyads[4] (40 separate interviews) from the Los Angeles MTO sample in the summer of 2011. We selected Los Angeles because we hoped to recruit respondents from neighborhoods with different poverty levels, and the Los Angeles MTO site was the most successful in moving families to low-poverty neighborhoods. It was also a potentially promising site to find respondents with experience in different types of neighborhoods, because shifts in the rental market caused a number of families who moved to lower poverty neighborhoods during the demonstration to move back to higher poverty areas. Finally, Los Angeles was one of the Three-City Study sites, enabling us to build on our indepth familiarity with the site. We identified 241 eligible MTO households with a female 13 to 24 years of age in the household who was not the head of household. We sent recruitment letters to all eligible households introducing the project, describing their opportunity to participate, and providing a toll-free number to call to register or ask questions. These introductory letters were followed up with attempts to reach all eligible households by telephone.[5] The first 20 dyads to complete interviews were included in the study.

For this research, we developed semistructured interview guides that cover topics including housing mobility, neighborhood sexual safety and harassment, friends, school, peer pressure, teenage relationships, sexual activity, and pregnancy. Most respondents were very forthcoming on these sensitive topics, with many offering detailed thoughts and opinions.[6] Teams of two experienced researchers with training in qualitative data collection conducted the interviews. Interviewers were matched to respondents on gender (all female) but not on race or ethnicity. Spanish-speaking respondents were given the opportunity to conduct the in-person interview in Spanish.[7] Separate

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[4] In one dyad, the adult portion of the dyad was the grandmother. The mother was not present in the home and the grandmother performed the role of primary caregiver.

[5] We hoped to interview young women in a variety of neighborhood situations (high and low poverty; more and less reported harassment). To that end, initial recruitment strategies divided eligible families into different categories based on neighborhood poverty level and response to the MTO Final Impacts Evaluation survey questions regarding harassment and fear. We conducted recruitment activities in waves, hoping to secure interviews with respondents in different situations. Difficulty in finding willing respondents led us to abandon this tiered recruitment strategy and offer all eligible families the opportunity to participate.

[6] Given that we were interviewing two members of a family, we were able to compare responses to help gauge how forthcoming each respondent was to the interview questions. We also reviewed transcripts for internal consistency. Interviewers made notes in internal family profiles on their impressions of a respondent's cooperation and understanding of the interview.

[7] Four adult female household heads chose to be interviewed in Spanish. The female youth in each of these dyads chose to be interviewed in English.

but concurrent interviews were conducted with the head of household and one eligible female youth. Interviews were held in the homes of respondents and lasted approximately 60 to 90 minutes.[8] Each respondent (adult and youth) was given $40 to compensate them for their time.

The interviews were recorded and transcribed, and the content was coded for analysis using NVIVO.[9] We identified emergent trends and other key responses thematically related to girls' experiences of harassment and exposure to CSEs. We gave special attention to girls' perceptions of harassment and respect in specific settings, such as schools, neighborhoods, and the home.

Survey Analysis

To measure sexual harassment and unwanted sexual attention, we use items added to the MTO Final Impacts Evaluation survey. NBER, which conducted the MTO Final Impacts Evaluation, adapted questions from MADICS, or the Maryland Adolescent Development in Context Study, about how often girls face unwanted or rude comments and unwanted sexual attention from their peers or are afraid to go places because of unwanted attention or pressure (Goldstein et al., 2007). The MTO Final Impacts Evaluation survey asked adolescent girls how often (never, a couple of times each year, a couple of times each month, once or twice a week, or every day) they experienced the following—

1. How often do people make unwanted or rude comments to you?

2. How often do people give you sexual attention that you do not want?

3. How often are you afraid to go places because you worry about unwanted attention or pressure?

We used the responses from these three items to create a harassment index that ranges from 0 (respondent never experienced any of the three types of harassment) to 12 (respondent experienced all three types of harassment daily). Among girls in our study sample, one-fourth have harassment indices of 0 to 1; one-fourth have harassment indices of 2 or 3; one-fourth have harassment indices of 4 to 6; and the remaining one-fourth have harassment indices of 7 to 12. Each point on the harassment index reflects increased frequency or type of harassment and assumes that experiencing harassment more frequently is similar to experiencing multiple types of harassment.

To determine whether reports of harassment, as measured by the harassment index, vary for girls with different characteristics, we calculated bivariate descriptive statistics to examine differences according to contextual factors at home, at school, and in the neighborhood; social and emotional factors; and economic and demographic factors. Then, we assess the extent to which certain factors are more strongly associated with harassment than others, using an ordinary least squares regression model in which the harassment index is regressed on all the factors. Exhibit 2 presents descriptions of the measures used.

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[8] We offered respondents the option of meeting at a public place, but all chose to have the interviews conducted in their homes.

[9] NVIVO is software that enables researchers to organize and report on qualitative data like those from the indepth interviews used in this study.

Exhibit 2

Descriptions of Study Variables (1 of 2)

Variable Name	Item Wording or Description	Scale
Contextual variables		
Presence of gangs	Are there any gangs in your neighborhood or where you go to school?	Dummy variable representing yes/no response.
Perceived neighborhood safety	How safe do you feel on the streets near your home at night?	Four-point scale recoded as a dummy variable.
Neighborhood poverty rate	Derived from tract-level U.S. census data.	Decimal between 0 and 1 representing share of households, weighted by individual's time living in neighborhood.
Neighborhood White population	Derived from tract-level U.S. census data.	Decimal between 0 and 1 representing share of households, weighted by individual's time living in neighborhood.
Positive school climate	Fraction of positive responses to five school quality statements.	Decimal between 0 and 1, average of five items recoded as dummy variables.
Peers dropped out of school	Did your [friend/friends] ever drop out of school?	Dummy variable representing yes/no response.
Peer drug use	[Has your close friend/Have your close friends] ever used marijuana or other drugs?	Dummy variable representing yes/no response.
Peers value studying	Among most of your close friends you hang out with, how important is it to your friends to study?	Four-point scale recoded as a dummy variable.
Peers extracurricularly involved	[Has your close friend/Have your close friends] ever been involved in school activities like school clubs, teams, or projects?	Dummy variable representing yes/no response.
Domestic violence in household	Did you ever witness serious physical fights at home, like a father beating up a mother?	Dummy variable representing yes/no response.
Parent-child involvement	Fraction of positive responses to three items reflective of parent's involvement in the youth's life.	Decimal between 0 and 1, average of three items recoded as dummy variables.
Witnessed drug use/sales	Have you seen people using or selling illegal drugs in your neighborhood during the past 30 days?	Dummy variable representing yes/no response.

Exhibit 2

Descriptions of Study Variables (2 of 2)

Variable Name	Item Wording or Description	Scale
Social and emotional variables		
Educationally on track	Youth is enrolled in age-appropriate grade or has GED equivalent.	Dummy variable for whether youth is on track or not.
In gifted and talented program	Have you ever been enrolled in a program for the gifted and talented?	Dummy variable representing yes/no response.
Ever experienced mood disorder	Child met five conditions established by MTO study as signaling a mood or depression-related disorder.	Dummy variable, equals 1 when youth meets conditions signaling mood disorder.
Ever experienced anxiety disorder	Child met four conditions established by MTO study as signaling generalized anxiety disorder.	Dummy variable, equals 1 when youth meets conditions signaling anxiety disorder.
Index of delinquent behaviors	Fraction of nine delinquent behaviors in which youth reported ever engaging.	Decimal between 0 and 1, representing number of behaviors in which youth has engaged.
Index of risky behaviors	Fraction of four risky behaviors in which youth reported ever engaging.	Decimal between 0 and 1, representing number of behaviors in which youth has engaged.
Regular social activity	During the hours when you are not at school, how often do you either talk on the phone, hang out, or get together with at least one friend?	Dummy variable representing whether youth spends time with at least one friend per week.
Extracurricular involvement	Have you participated this year in school sports, or any other group or club, including honor society?	Dummy variable representing yes/no response.
School suspension/ expulsion	Have you ever been suspended or expelled from school?	Dummy variable representing yes/no response.
Economic and demographic variables		
Youth is age 17–20	Based on date of birth of youth provided by head of household, age at time of final survey.	Dummy variable, equals 1 for older youth in the sample.
African American, non-Hispanic	Based on race and ethnicity of youth provided by head of household.	Dummy variable, equals 1 for African-American, non-Hispanic youth.
White, non-Hispanic	Based on race and ethnicity of youth provided by head of household.	Dummy variable, equals 1 for White, non-Hispanic youth.
Other race, non-Hispanic	Based on race and ethnicity of youth provided by head of household.	Dummy variable, equals 1 for other race, non-Hispanic youth.
Parent educational attainment	From adult survey, has head of household attained a high school diploma or GED?	Dummy variable, equals 1 for those who obtained a GED or equivalent.
Total household income	From adult survey, sum of household income from all sources.	In 2009 U.S. dollars.
Presence of older sister	From MTO family roster, does youth have an older sister?	Dummy variable, equals 1 if the household includes an older sister.

GED = General Equivalency Diploma. MTO = Moving to Opportunity.
Sources: MTO Final Impacts Evaluation Survey (2008); U.S. Census Bureau

Results

This study builds on our earlier research on the gender difference in outcomes for MTO adolescents. The goal of the work is to explore the extent to which girls' perceptions of their neighborhoods, particularly their perceptions of sexual safety, are related to contextual factors such as poverty and crime, individual-level economic and demographic factors, and social and emotional factors. Together, the survey analysis and the indepth interviews present a framework for understanding how girls' experiences of harassment are related to their neighborhood context and individual characteristics. The qualitative interviews lend depth to our understanding of what it means to grow up in an atmosphere rife with sexual harassment and threats. Exhibit 3 presents the key characteristics of survey sample members and levels of reported harassment among subgroups. The average harassment index for the sample was 3.89. Differences in reported harassment are identified among subgroups defined according to contextual, social and emotional, and economic and demographic characteristics.

Exhibit 3

Descriptive Statistics for Survey Sample (1 of 3)

Study Variable	Percent of Sample	Mean Harassment
All	100.0	3.89
Contextual		
School climate		
Very negative	4.3	5.29[†]
Moderate	25.6	4.55*
Very positive	70.1	3.56***
Peers dropped out of school		
Yes	19.7	4.66***
No	80.3	3.70
Peer drug use		
Yes	31.0	4.87***
No	69.0	3.45
Peers value studying		
Yes	46.1	3.67**
No	53.9	4.08
Peers extracurricularly involved		
Yes	79.9	3.86
No	20.1	3.99
Parent-child involvement		
Very little involvement	23.5	4.40[†]
Some involvement	27.2	4.23
Significant involvement	49.3	3.46***
Domestic violence in household		
Yes	16.6	4.85***
No	83.4	3.70
Perceived neighborhood safety		
Streets feel safe	51.0	3.16***
Streets do not feel safe	49.0	4.64
Presence of gangs		
Yes	65.4	4.39***
No	34.6	2.94

Exhibit 3

Descriptive Statistics for Survey Sample (2 of 3)

Study Variable	Percent of Sample	Mean Harassment
Contextual (continued)		
Witnessed drug use/sales		
Yes	36.0	5.01***
No	64.0	3.26
Neighborhood poverty rate		
≤ 10%	1.8	2.88[†]
10–40%	87.3	3.86*
≥ 40%	10.9	4.32**
Neighborhood White population		
≤ 7%	33.3	4.34[†]
7–23%	33.4	3.87**
≥ 23%	33.4	3.46***
Social and emotional		
In gifted and talented program		
Yes	23.3	4.52***
No	76.7	3.70
Extracurricular involvement		
Yes	31.5	3.97
No	68.5	3.85
School suspension/expulsion		
Yes	18.4	4.48***
No	81.6	3.76
Educationally on track		
Yes	86.4	3.86
No	13.6	4.06
Index of delinquent behaviors		
Zero or one	77.2	3.52[†]
Two or three	17.8	4.95***
Four or five	4.2	5.91***
More than five	0.8	5.82***
Index of risky behaviors		
None	27.0	2.75[†]
One or two	41.0	3.86***
Three	18.0	4.66***
Four	14.0	5.19***
Regular social activity		
Yes	49.6	4.16***
No	50.4	3.63
Ever experienced mood disorder		
Yes	20.2	5.40***
No	79.8	3.51
Ever experienced anxiety disorder		
Yes	14.8	5.27***
No	85.2	3.65

Exhibit 3

Descriptive Statistics for Survey Sample (3 of 3)

Study Variable	Percent of Sample	Mean Harassment
Economic and demographic		
Age		
13–16	47.7	3.66
17–20	52.3	4.10***
Race and ethnicity		
African American, non-Hispanic	60.0	4.06***
White, non-Hispanic	1.4	3.77[†]
Other race, non-Hispanic	2.3	3.46
Hispanic	31.4	3.47
Missing	4.9	4.78***
Total household income		
≤ $11,000	28.5	3.92[†]
$11,000–25,000	28.0	3.99
≥ $25,000	28.5	3.75
Missing	14.9	3.90
Presence of older sister		
Yes	69.0	3.83
No	31.0	4.02
Parent educational attainment		
Has GED/HS diploma	53.5	3.96
No GED/HS diploma	40.0	3.75

GED = General Equivalency Diploma. HS = high school.

*$p < .10$. **$p < .01$. ***$p < .001$. [†]indicates reference group for variables with more than two categories.*

Sources: MTO Final Impacts Evaluation Survey (2008); U.S. Census Bureau

Indepth Interviews

The indepth interviews provide personal accounts of harassment and violence in neighborhood life. In the beginning of the interview, we asked respondents more generally about their neighborhoods. Interview respondents confirmed that where you grow up—your neighborhood—matters. When prompted about the differences of living in various neighborhoods, one mother discusses how neighborhoods have fundamentally defined how her daughter developed.

> *[Neighborhoods] define or contribute to the way everything is or how each child is coming along and how they develop, how they think, how they feel. The environment, it has a lot to do with it.*
>
> —Brianna, adult interview

Respondents also suggested that how people are treated and what they see of life directly influence how they view the world. For our respondents living in communities of concentrated disadvantage, violence has been a part of everyday life. Women spoke about the commonality of physical violence in their communities, related to both incessant fighting (with a regular fear of "getting beat") and instances of gun violence.

In worse neighborhoods, girls are trying to jump you because of a color you have on or you look like you from somebody, you somebody I knew or whatever, you can't get a mistake, ask someone, and you'll get hurt, even shot or beat up.

—Dania, adult interview

Expectations for what constitutes a "safe" neighborhood vary. Many respondents openly said they have lived in places of danger, and oftentimes those reporting a move to a "better" area also offered examples of activity reflecting an acceptance of dangerous activities that might not be tolerated in a less vulnerable community. One mother's mention of "only" one homicide on her new street in 6 years and another's boast that her current neighborhood is safe with little violence—"just the shooting that we hear at night" and "a lot of gang activity"—reflect how violence and norms are interpreted by life experiences.

Seemingly random violence is common and particularly troubling for adults and youth. The fear of being in the wrong place at the wrong time or getting caught in the crossfire promotes a sense of helplessness and futility.[10] It is not surprising that when asked about "safety," some respondents responded first with concerns about gangs, shootings, stabbings, and fights.

I keep my surroundings open and watch my back, and, you know, because you never know when someone want to act crazy day or night. If they're going to do it, they're going to do it.

—Keeanna, adult interview

Multiple respondents described a very sexualized neighborhood environment—discussing sexualized elements in their neighborhoods such as active prostitution, men trying to recruit girls to prostitute for them, men regularly on the corner making suggestive comments and gestures to women, and older men "dating" younger girls—but they speak of these situations as "just the way it is."

If I try to walk to the shopping center, it's like I walk and guys would be all, 'hey,' and honking the horn, or they be hanging out like they be, oh man, being perverts sometimes like. So I don't walk places, I try to get rides wherever I go."

—Amanda, youth interview

After one young respondent, Chantal, said it is commonplace for men and boys in her neighborhood to make rude comments about females' bodies, she explained she had heard comments about "my butt or whatever" the day before but "you've got to get used to it." When asked if males grab females, she said, "yeah" but explained that it isn't "uncomfortable" because "I know everybody around here. … I know all these dudes want to talk to[11] me, because they all try to talk to me."

When asked how men treat women in their neighborhood, respondents said everything from "good" to "like dogs." It was not uncommon for respondents to reflect on their neighborhood or other places they lived and share harrowing stories of verbal and physical abuse.

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[10] This assertion is consistent with other studies linking neighborhood processes—chronic violence and fear—to lower levels of self-efficacy for young people (see Dupere, Leventhal, and Vitaro, 2012).

[11] Some respondents used the term "talk to" as a euphemism for a more prolonged connection, such as dating or sexual activity.

They call the girls hoes and B's and, like, some girls I know, like, they have sex with the boys over here and then the boys will go around and tell everybody and then call the girls out … like they just have no respect for women.

—Chantal, youth interview

[Signs of disrespect]. If they hit you. If they call you out by name, and if they bring other females or cheat on you.

—Keeanna, adult interview

Respondents speculated on why these situations happen. A common theme offered by Keeanna is that women might have low self-esteem and feel "that's the only [man] you can get, and so they just put up with it rather than being alone." She feels it could be particularly true for women "in the projects. … Sometime they're not working, you know, all that plays a factor into it, getting welfare, you know, want some money, things like that … it can bring you down." She went on to say that one reason it is worse for women in some neighborhoods (like her old public housing community) is because "seeing a lot of the violence and things that are going on, … being hit and things like that."

Imagining neighborhoods in which such sexualized activities are not present was challenging for youth whose neighborhoods and everyday lives are rife with such pressures. When asked about other neighborhoods and how men might treat women differently in other places, one young woman said she did not know but seemed sure that it would be different from, and better than, her own neighborhood. As Kenesha said when thinking about a neighborhood where men did not treat women disrespectfully, "… it would just be like real foreign to me."

Respondents described strategies of isolation and "not getting involved" as ways to protect themselves (or their children) from potential violence and harassment.

I don't try to make problems with anybody, and I don't want problems with anybody. So I pretty much stay to myself and just deal with me, and my kids, and my grandkids. … It's a lot of people that will stay to theirself or either don't want to get involved. You know, that ain't my child or whatever, or that ain't got nothing to do with me.

—Dania, adult interview

I also taught them you have no friends, [only] associates. If you have a friend, you know, they will just die with you in a hardcore way. … If that associate, you know, does something wrong, then you just cut that associate off and keep on moving. So it's kind of weird teachings, but it, like I always say, it's a dog-eat-dog world out there.

—Imani, adult interview

One teen, Simone, told us how, after seeing men grabbing and disrespecting women "out of my window," she does not "want to call the police in, because that's their business. So I just stay out of it. I just close the window, play music, just ignore it. Stay to myself." She went on to say how she feels about the guys she sees: "You just feel hate towards them, you know."

Mothers shared specific advice on how to avoid sexualized activities and dangers, including how to behave to avoid unwanted attention.

> *I told my kids if they ever was approached like that [harassing, making comments], that just to keep walking and don't pay it no mind. Don't show no smiley faces that you're interested, and don't be walking slow like you're waiting for them to catch up with you.*
>
> —Jasmine, adult interview

> *One rule my mom always told me and my sisters, and I remember this from, man, when we were like babies, … always respect your body so that everybody else can.*
>
> —Michelle, youth interview

Adult and youth interview respondents concurred with the importance of an involved parent to youth success. Many felt strongly that "parents got to take more control what goes on in their kid's life" and suggested that many youth problems are the result of "just a lack of paying attention to your kids." In addition to being plugged in, parents gave examples of house rules to promote safety and protect kids from neighborhood violence.

Correlates of Harassment

Exhibit 4 presents results from the multivariate regression analysis of girls' reported harassment. We review the results according to the three broad categories of factors that we outlined previously: contextual factors, social and emotional factors, and economic and demographic factors.

Contextual Factors

Several contextual variables had statistically significant relationships with reported harassment. Both gang activity and drug use in girls' neighborhoods were positively correlated with harassment, and the presence of either one corresponded to an increase in the harassment index of approximately 0.5 point on a 12-point scale. Perceived neighborhood safety was associated with less reported harassment, by about 0.8 point. Of the peer influences included in the model—whether peers dropped out from school, used drugs, or valued studying—only peer drug use had a statistically significant relationship with harassment, which was positive but modest. Positive school climate had a large, negative, and significant relationship with reported harassment. Greater parental involvement and a greater share of White households in the neighborhood were both associated with slightly lower harassment indices. Neighborhood poverty and household domestic violence did not have statistically significant relationships with reported harassment.

Social and Emotional Factors

Most of the social and emotional variables in the model had a statistically significant and positive relationship with reported harassment. Girls who had ever experienced a mood disorder or anxiety disorder were more likely to have reported harassment, as were girls who engaged in risky and delinquent behaviors or were suspended or expelled from school. Although the parameter estimate is modest in magnitude, a positive and statistically significant relationship emerged between participation in a gifted and talented school program and reported harassment. The relationships between reported harassment and regular social activity, extracurricular involvement, and being on track to graduate on time were not statistically significant.

Exhibit 4

Regression of Reported Harassment on Study Variables

Variable	Parameter Estimate	Standard Error	t Value
Intercept	3.35	0.41	8.22***
Contextual			
Presence of gangs	0.48	0.13	3.71***
Perceived neighborhood safety	– 0.80	0.12	– 6.66***
Neighborhood poverty rate	0.16	0.46	0.36
Neighborhood White population	– 0.61	0.29	– 2.10*
Positive school climate	– 1.31	0.25	– 5.28***
Peers dropped out of school	0.16	0.15	1.05
Peer drug use	0.38	0.14	2.73**
Peers value studying	– 0.14	0.11	– 1.21
Peers extracurricularly involved	0.13	0.15	0.91
Domestic violence in household	0.17	0.16	1.10
Parent-child involvement	– 0.16	0.07	– 2.37*
Witnessed drug use/sales	0.61	0.13	4.77***
Social and emotional			
Educationally on track	0.25	0.17	1.44
In gifted and talented program	0.39	0.14	2.87***
Ever experienced mood disorder	0.92	0.15	6.19***
Ever experienced anxiety disorder	0.44	0.17	2.63**
Index of delinquent behaviors	1.26	0.42	3.00**
Index of risky behaviors	0.97	0.21	4.66***
Regular social activity	0.15	0.11	1.30
Extracurricular involvement	0.11	0.12	0.90
School suspension/expulsion	0.30	0.15	1.93*
Economic and demographic			
Youth is age 17–20	0.19	0.13	1.39
African American, non-Hispanic	0.44	0.12	3.61***
White, non-Hispanic	0.26	0.48	0.55
Other race, non-Hispanic	0.77	0.60	1.28
Parent educational attainment	0.19	0.12	1.61
Total household income	0.00	0.00	– 1.22
Presence of older sister	– 0.04	0.12	– 0.31

*p < .10. **p < .01. ***p < .001

Notes: The N for the model is 2,183, and the adjusted R squared is .24. The reference category for race and ethnicity was Hispanic.
Sources: MTO Final Impacts Evaluation Survey (2008); U.S. Census Bureau

Economic and Demographic Factors

We included five economic and demographic measures in the model as control variables: age group, race and ethnicity,[12] parent's education, total household income, and whether a subject

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[12] The dummy variable for the Hispanic group was omitted as the reference category. As exhibit 1 shows, the final sample is almost exclusively Hispanic and non-Hispanic African American. When we used non-Hispanic White or other non-Hispanic as the reference category for race and ethnicity in our regression analysis, we found that the Hispanic and non-Hispanic African-American dummy variables were collinear, so we selected Hispanic as the reference category for our final model. The dummy variable for the group of younger (ages 13 to 16) girls was also omitted as the reference category.

has an older sister. Of these measures, only the dummy variable for the non-Hispanic African-American group was statistically significant. Compared with the reference group, which was the Hispanic group, non-Hispanic African-American girls reported slightly more harassment.

Discussion

This study sought to illustrate the perspectives of women experiencing CSEs and to deepen our understanding of how harassment relates to other aspects of the lives of women and girls in distressed areas. Interview responses describing neighborhood life tell us how women and girls in the MTO study experienced sexual pressure and harassment in their neighborhoods. They vividly relate stories of rude gestures, sexual comments, and predatory behavior. The matter-of-fact recitation of disrespectful behavior, lewd acts, and low relationship aspirations is poignant. These voices paint a picture of low life expectations, pervasive violence, and acceptance of sexual threats consistent with previous work (Edin and Kefalas, 2005; Gardner, 1995; Miller, 2008; Popkin, Leventhal, and Weismann, 2010).

Although physical attacks can (and do) have an element of sexual threat, when some girls discuss safety, their first concern is the threat of flying fists and bullets. Experience with chronic violence is important to understanding how people perceive and report harassment and sexual violence. The downgrading of sexual threats as a safety concern seems linked to (1) the immediacy of permanent repercussions from gun and physical violence and (2) the acceptance of sexual intimidation, harassment, and degradation as a part of everyday life, both of which were common themes discussed by interview participants. This acceptance of the victimization of women is fed by wider violence and related, socially accepted relationship dynamics (Anderson, 1999, 1990; Cobbina, Miller, and Brunson, 2008; Miller, 2008) and may be part of what Wilson (2011: 20) noted as, "distinct cultural frames in the inner city have not only been shaped by race and poverty but, in turn, often shape responses to poverty including responses that may contribute to the perpetuation of poverty."[13]

Our respondents' stories illustrate what it is like to live with chronic violence and predatory threats and how those conditions constrain community life. The most common strategy for keeping safe is to ignore, isolate, and disassociate—to "keep to yourself." Whereas it may keep individual residents safe, staying indoors and avoiding engagement further undermines community cohesion, collective efficacy, and social control. Good neighborhoods, according to our respondents, have "nice people" who look out for each other—a willingness of neighbors to intervene on behalf of others in the neighborhood. When residents are afraid to intervene, however, social control erodes, creating the ideal conditions for the emergence and growth of a CSE. A violent and chaotic environment can promote sexual harassment and the abuse of women and girls by normalizing violent activities, degrading women and girls, and stifling community response.

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[13] It is instructive to note Wilson's definition of cultural traits (frames) as "shared outlooks, modes of behavior, traditions, belief systems, worldviews, values, skills, preferences, styles of self-presentation, etiquette, and linguistic patterns—that emerge from patterns of intragroup interaction in settings created by discrimination and segregation and that reflect collective experiences within those settings" (Wilson, 2011: 20).

Our nonexperimental analysis of the MTO Final Impacts Evaluation survey data supports a link between chronic violence and disadvantage and the existence of a CSE that further undermines the well-being of women and girls. In this article, reported harassment emerges as one potential individual-level marker of CSE at the neighborhood level. We observe a positive, statistically significant relationship between reported harassment and several indicators of chronic neighborhood disadvantage. Neighborhood characteristics are not the only factors to emerge from our multivariate analysis, but they are among the strongest factors.

Girls living in neighborhoods with disorder and crime report more harassment. As we discussed previously, our earlier work suggests that a CSE is a reflection of chronic violence and disadvantage, and that it is associated with poor collective efficacy and social control. Our analysis, which finds that girls reporting gang activity and recent drug sales or use in their neighborhoods are more likely to report harassment, is consistent with the hypothesis that violence and social disorder play roles in creating communities with pervasive harassment and fear.

Our analysis also reveals a number of nonneighborhood factors that are related to reported harassment. Unsafe or unsupportive school environments may facilitate harassment. Between classes and before and after school, young women and their peers are often loosely supervised or unsupervised, creating opportunities for harassment to occur. Our analysis finds that having a more supportive school environment is associated with less reported harassment. In fact, school climate is the factor that is most strongly correlated with reported harassment for girls in our sample.

The home environment is a central context for young people, and involved parents make a difference. Children benefit from healthy families with parents who provide supportive environments and closely monitor their emotional, social, and academic well-being; they suffer in violent and chaotic home environments. It is not surprising that our analysis indicates that girls with more parental involvement, including parental help with homework, establishment of a curfew, and parental familiarity with friends, report less harassment than girls with less parental involvement. Parents who are involved in their children's lives may also observe neighborhood dynamics and offer advice on how to behave to avoid unwanted attention, including attention with a sexual connotation. This advice may help youth identify and navigate neighborhood influences.

Poor mental health is related to reported harassment. Young women with mood disorders or other mental health concerns may find it particularly challenging to navigate or avoid problematic people or places. They may also be more likely to experience symptoms of mood disorders if they have experienced harassment. This analysis finds that girls who have been diagnosed with a mood or anxiety disorder are more likely to report harassment than girls who have not had such a diagnosis. Differences between girls with and without mood or anxiety disorders emerge in our bivariate analysis and persist in our multivariate analysis. It is unclear, however, whether existing mental health issues make girls more vulnerable to harassment or whether the trauma of experiencing such harassment induces mood disorders (Hailey and Saxena, 2013).

Having friends who use drugs increases girls' risk of harassment. Although peers are typically very influential for teens, girls in this study whose friends have negative influences (for example, dropped out of school) or positive influences (for example, value studying or are involved in school activities) are no more or less likely to report harassment. One exception is that girls who report that their friends use drugs are more likely to report harassment.

Girls' own risky and delinquent behavior is associated with their reports of harassment. The indices summing youths' reported delinquent and risky behaviors are positively associated with reported harassment. Girls who engage in risky behaviors such as smoking, alcohol use, marijuana use, and sex are more likely to report harassment. Likewise, girls who engage in delinquent behaviors such as carrying a gun, belonging to a gang, stealing, or selling drugs are also more likely to report harassment. In fact, our bivariate and multivariate analyses suggest that girls who engage in risky behaviors or delinquent behaviors have a harassment index that is about 1 point higher than those girls who do not report such behaviors. Again, it is difficult to discern whether harassment causes or is caused by risky and delinquent behavior.[14]

Our analysis paints a more complex picture than the stereotype of a disruptive girl with a string of suspensions being more likely to experience sexual harassment than her academically on-track peer. For example, being suspended or expelled in the past 2 years is not associated with reported harassment, and neither is being educationally on track or participating in school clubs or groups. Participation in a gifted and talented program has a moderate positive relationship with reports of harassment, however. These findings highlight the complicated interplay between experiencing harassment, recognizing it as harassment, and letting others know that it has happened.

Limitations

Our study has two important limitations. First, sexual harassment may be more prevalent among our sample than our harassment index suggests, because many incidents of sexual harassment and sexual abuse go underreported, perhaps because victims who report incidents are often stigmatized. One-half of all students nationwide who are harassed do nothing about it, whereas one-third talk about it with a family member and a much smaller proportion report the incident to an authority at school (Hill and Kearl, 2011). Moreover, the pervasiveness and subsequent normalization of sexual violence in some communities can make it difficult for some people to identify and report harassing activity. To address this challenge during the indepth interviews, interview guides included questions asking respondents to describe neighborhood situations and relationships (such as "how men treat women" and "what does respect/disrespect look like") rather than labeling certain activities or experiences as harassment.

Second, the neighborhoods of girls in the MTO sample are almost exclusively moderate- to high-poverty communities. Nearly all (97 percent) of the girls in our study live in neighborhoods with a poverty rate in excess of 10 percent, and the vast majority (80 percent) of the girls live in a neighborhood with a poverty rate of 17 to 40 percent. As a result of this limited variation in neighborhood poverty, our analyses are unable to detect whether girls in low-poverty neighborhoods report less harassment. Therefore, although our regression and bivariate analyses using the MTO Final Impacts Evaluation survey does not suggest significant relationships between poverty and reported harassment, we cannot conclude that poverty is not correlated with girls' experiences of harassment. Racial

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[14] See Lauritsen, Sampson, and Laub (1991) to review the difficulty in understanding victimization risk apart from delinquent lifestyle behaviors.

and ethnic composition, however, emerges as a statistically significant factor; girls living in neighborhoods with greater proportions of White residents report less harassment, equal to approximately 0.6 point on the harassment index. This relationship may have been able to emerge because of more variation in the proportion of White residents in sample members' neighborhoods. Sampson (2012) included racial segregation as one of the core components of what makes a chronically disadvantaged community, so it is perhaps not surprising that race plays a key role here.

Policy Implications

Results from the MTO Interim and Final Impacts Evaluation surveys show that adolescent girls who move from distressed public housing to neighborhoods with lower poverty rates, less crime, more educated and employed adults, and stronger social institutions fare better in terms of their mental health than girls who stay in their distressed neighborhoods (Kling, Liebman, and Katz, 2001; Orr et al., 2003; Sanbonmatsu et al., 2011). Findings from this study and previous indepth ethnographic and qualitative studies of MTO suggest that neighborhood sexual context—specifically, less harassment, violence, and pressure for early sexual initiation—in lower poverty neighborhoods may be a significant part of the explanation for why girls benefited so much from moves to these neighborhoods (Briggs, Popkin, and Goering, 2010; Popkin, Leventhal, and Weismann, 2010). This study used the MTO Final Impacts Evaluation survey to conduct a nonexperimental, exploratory analysis to document the way that girls and women describe how harassment looks and feels in their own words. We used the MTO Final Impacts Evaluation survey data to identify the factors associated with individual perceptions of harassment, one marker of a CSE.

Women in these communities describe daily life with catcalls, grabbing, sexually suggestive language, and violence toward women and even very young girls. This study identifies a number of contextual, social and emotional, and economic and demographic factors associated with reported harassment. In our analysis, we find that girls reporting the presence of gangs and drugs in their neighborhood— which are markers of violence and loss of social control—are more likely to report harassment, an individual marker of a CSE. Conversely, girls who perceive their neighborhood as a safe place or describe their school environment as positive report less harassment. Family and friends also seem to influence reported harassment, with greater parental involvement associated with less reported harassment and friends who use drugs connected to more reported harassment. Young women with mental or behavioral health issues are also more likely to report harassment. Harassment, pressure, and violence are shaming and traumatizing for young women and contribute to poor outcomes, including early pregnancy, early parenthood, and sexually transmitted diseases, associated with youth living in concentrated disadvantage.

We need sustainable solutions to address these realities. Successful interventions will address the violence that starts and perpetuates victimization and will build collective efficacy to strengthen community ties and positive social norms. Influencing social norms includes addressing prevailing attitudes toward masculinity, femininity, and healthy relationships. Increased community discussion of harassment and abuse may uncover existing and previous instances of such activity experienced by individuals and necessitate interventions to deal with trauma in the wider community. We believe effective approaches to combat CSEs will support residents in the development

of community interventions that empower female and male youth and their families to no longer accept "just the way it is" and create a new set of expectations for their neighborhood that directly deal with gender roles, sexual mores, and behaviors.

Acknowledgments

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Promoting Resilience for Children Who Experience Family Homelessness: Opportunities To Encourage Developmental Competence

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Abstract

A developmental perspective on resilience is needed to inform policies and programs that respond to family homelessness. Homelessness and the experiences associated with it can threaten and disrupt healthy development in children, contributing to worse academic achievement, more emotional and behavioral problems, and lower levels of developmental competence in a variety of other domains. Scholarship on resilience and risk provides a framework for understanding how and why this happens, identifying ways to prevent and compensate for the negative impacts of the homeless experience on children. We first explain the fundamental concepts underlying this framework. Through a review of literature on risk and resilience among children in homeless families, we identify two ordinary but powerful adaptive systems that help children avoid or bounce back from the negative effects of homelessness on development—positive parenting and child self-regulation. We argue that policymakers and homeless services providers can enhance, support, and facilitate these systems to achieve better outcomes for children.

Introduction

Families who use shelter services vary widely in their current and past experiences, including differences in the presence of risk factors that increase the likelihood of poor outcomes, of promotive factors that encourage positive outcomes for all children, and of protective factors that shield children from negative outcomes associated with risk. These factors come together in complex ways to influence child development, contributing to an increased likelihood of maladaptation and problems or of positive adaptation and success. Many children in homeless families consequently manifest resilience, showing competence in important developmental outcomes, whereas others do not fare as well. The purpose of this article is to apply a developmental framework on resilience and risk to elucidate the contexts and processes of family homelessness. Our focus is specifically on children who are homeless with their families, with an emphasis on families in shelter that follows from existing research. We briefly present the basic components of a developmental resilience and risk framework, and then we review the literature on children who experience family homelessness. We conclude with a discussion of opportunities for providers and other stakeholders to encourage the ordinary processes of adaptation and promote resilience.

Resilience and Risk in Development

Resilience in development refers to positive adaptation during or after some threat or disturbance (Luthar, 2006; Masten et al., 2009). Resilience describes the functioning of an individual who has encountered some type of risk but continues to function competently nonetheless. *Risk[1] factors* are events, circumstances, or characteristics that have been associated with worse outcomes in studies involving groups of individuals (Rutter, 2012; Zolkoski and Bullock, 2012). Meanwhile, *promotive* and *protective factors* are events, circumstances, or characteristics that predict positive developmental outcomes in general or have even greater positive effects in contexts of risk, respectively (Masten et al., 2009). Risks threaten positive development, whereas promotive and protective factors indicate the presence of broader *adaptive systems* that act to keep positive development on course despite experiences of risk (Masten and Obradović, 2006). Furthermore, the most effective adaptive systems are "ordinary"; that is, conditioned by evolution and society to be present in the lives of most children, such as the presence of a caring parent or other adult and the ability to control one's own emotional arousal with increasing success. Resilience happens because of effective adaptive systems that circumvent or compensate for the ways that risk can interfere with positive development. The day-to-day mechanisms or means by which risks or adaptive systems bring about their effects are called the *processes of risk* or *processes of adaptation*, respectively.

Studies of developmental resilience strive to incorporate risk and promotive and protective factors at all levels of an individual (for example, physiology and psychology) and his or her context (family, school, neighborhood, culture, and so on) to understand the complicated ways that these influences interact and contribute to positive or negative outcomes over time. For example, low income, low

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[1] Risk is sometimes thought about in terms of "adversity," "stressful life events," "trauma," "challenge," or "threat." We acknowledge that multiple sorts of factors are associated with worse child functioning at the group level. Nevertheless, herein we use these terms interchangeably.

parental education, parental incarceration, and exposure to domestic violence are all common risk factors that seem to contribute to lower levels of functioning among groups of children experiencing homelessness, and homelessness itself is an established risk factor for children in low-income families. Furthermore, homeless children fare better if they have important protective factors in their lives, such as better self-regulation of emotions and behavior or parent-child relationships marked by warmth and structure. Risk and protective factors can be internal to individuals (for example, a tendency toward negative emotionality or higher levels of cognitive functioning, respectively), or external, such as those situated in the family (for example, positive parent-child or other relationships) or present in the broader contexts of schools, neighborhoods, cultures, and so on. They can be chronic factors persisting for long periods, such as low parental education (risk) or attending good-quality early education (protective), or they can be acute and relatively brief experiences, such as witnessing one episode of violence or getting a boost from a special outing with mom or dad. These factors come together to increase the likelihood of resilience, shown in good outcomes, or of maladaptation and failure.

Developmental Competence

Resilience and its opposite, maladaptation, are the outcomes or end products of promotive and protective factors and at least one risk factor influencing development (Sroufe, 1997; Yates, Egeland, and Sroufe, 2003). Because adaptive systems are ordinary, humans are rather robust to risk, such that development results in competence for most people growing up in most contexts. Developmental science defines *competence* as being capable of what is generally expected of an individual of a certain age in a given culture at a particular time in history (Masten, Burt, and Coatsworth, 2006). Called *age-salient developmental tasks,* these social expectations define the abilities and characteristics that an individual's context considers to be important preparation for each person to succeed ultimately in life. For example, young children in the contemporary United States (and in many other cultures) are expected to learn to walk, talk, have reciprocal social interactions with caregivers, and follow basic rules put in place by their parents. Showing competence in these developmental tasks prepares children for success in future domains, such as following rules at school and at home, having positive relationships with peers and parents, and developing academic skills in middle childhood. In adolescence, good conduct, success at school, and relationships with family and peers continue to be important, and romantic relationships, work competence, and parenting become salient for some (Masten, Burt, and Coatsworth, 2006). Because of the cumulative nature of development, early and consistent success in these age-salient tasks equips individuals with a more robust set of resources (for example, better cognitive development and self-regulation skills or the ability to engage family and other social supports) that can be used to adapt successfully to the typical challenges of growing up and to less common risk factors that might emerge along the way (Yates, Egeland, and Sroufe, 2003). Conversely, previous failures decrease the likelihood of subsequent adaptation, unless they are addressed.

Patterns of Resilience

Developmental studies of adaptation after risk have primarily uncovered two *patterns of resilience* (Masten et al., 2009). The first is sometimes called *stress resistant*, wherein individuals do not show any detectable negative effects from the risk factor(s) being considered. These children show

competent functioning before, during, and after the experience of risk. They are not invulnerable. Rather, ordinary adaptive systems in their lives either quickly compensate for, or completely circumvent, disruptions caused by risk (Masten, 2001). Adaptive systems, and not some extraordinary individual characteristic, enable these stress-resistant individuals to continue functioning without interruption.

The second pattern of resilience is *bouncing back*, wherein risk disrupts functioning for a brief period as adaptive systems operate, ultimately returning individuals to competent functioning (Masten et al., 2009). This pattern involves short-term impairments after risk, during which individuals do not function competently in one or more areas. Adaptive systems continue to operate, however, and eventually restore individuals' ability to function in a reasonably short amount of time. Despite a temporary perturbation caused by risk, individuals successfully adapt and show resilience.

Childhood Homelessness As a Context of Varied Risks

Family homelessness is a prevalent risk factor for children in the United States. During the 12 months prior to September 30, 2011, nearly one-third of a million children (321,548) stayed in American shelters with their families (HUD, 2011). Most people in families staying in emergency shelter were from ethnic minority groups (72 percent), and adults in these families were much more likely to be women than men (by 4 to 1) and were younger, on average, than adults in nonhomeless families. Most people in homeless families (65 percent) resided in urban areas. The average length of stay for most families in emergency shelter was 1 month or less, with considerably longer stays (by design) for families in transitional housing programs. Most families stayed for 6 months or less.

By far, most research reports involving homeless children have focused on risk, documenting lower levels of functioning among homeless children compared with the functioning of their more stably housed peers and attempting to isolate the unique effects of homelessness by controlling for differences in other risk experiences. For example, groups of children who experience homelessness and residential instability generally show lower levels of academic achievement, even when accounting for differences in other factors such as poverty, establishing homelessness as a general risk factor for worse achievement (Cutuli et al., 2013; Fantuzzo and Perlman, 2007; Herbers et al., 2012; Obradović et al., 2009; Perlman and Fantuzzo, 2010). During the past three decades, studies of risk have investigated a variety of important areas—including academic achievement, emotional and behavioral problems, language development and cognitive functioning, and illness and chronic disease—with increasing methodological rigor (for example, better matched control groups and epidemiological data), recognition that families differ in their experience of other risks, and more detailed investigations of developmental timing and longitudinal change (Buckner, 2008; Samuels, Shinn, and Buckner, 2010). In this way, risk-focused studies of childhood homelessness are moving past simple documentation of lower average levels of functioning. Instead, the field has begun to recognize that understanding *how* the processes of risk unfold, and consequently interfere with healthy development, will lead to innovation in policy and practice.

The effect of risk can vary depending on its timing in the course of development. Children who first experience homelessness in toddlerhood specifically appear to be at even greater risk for poor achievement relative to students who have their first homeless experience later in preschool or

elementary school (Perlman and Fantuzzo, 2010). Furthermore, on average, children who experience homelessness or residential instability already have lower levels of reading skills in the first grade than their low-income peers (Herbers et al., 2012). These findings suggest that the risk for lower academic achievement associated with homelessness may be more salient in young childhood, a particularly important finding because young children are overrepresented among families staying in homeless shelters.

Multiple risk factors tend to co-occur and accumulate in the lives of children and families (Masten, Best, and Garmezy, 1990), and children in homeless families are more likely to experience a wide range of risks besides homelessness (Samuels, Shinn, and Buckner, 2010). One effective way of indexing risk is by creating a *cumulative risk score*, a sum of the number of established risk factors present in a child's life. Higher cumulative risk scores are generally associated with worse outcomes (Luthar, 2006). For example, Masten and Sesma (1999) demonstrated that the cumulative risk scores of children in family shelter predicted children's disruptive behavior problems, positively predicted the number of health problems, and inversely predicted academic achievement. Similar risk-gradient relationships were present in results from a subsequent sample of kindergarten-aged children staying in family shelter: children who experienced higher levels of risk additively had more behavioral problems at school, based on independent reports from teachers (Masten et al., 2008). Cutuli et al. (2010) demonstrated that differences in the number of negative life events involving family functioning among 4- to 7-year-olds staying in family shelter were related to differences in cortisol function.[2]

Acute Risk Overlaid on Chronic Risk

Childhood homelessness appears to represent a period of acute risk experiences in the context of other chronic or persistent risks. Regarding the sequence and timing of risk experiences, Masten et al. (1993) compared negative-life-event and other cumulative risk scores for children and youth in family shelter relative to low-income, housed children and youth ages 8 through 17. They found similar levels of more stable cumulative risk (for example, low parental education, loss of a parent, abuse, or foster care) for both groups. The children in shelter had experienced higher levels of negative life events in the previous year, however, suggesting that homeless episodes tend to occur during periods of varied and acute risks overlaid on chronic risks such as persistent poverty. It is important to note that differences in risk (both chronic and acute) accounted for differences in behavior problems among these children and youth in shelter.

A wealth of other research has documented sources of chronic risk in the lives of homeless children. Chronic risks are more likely to reflect situations that have been ongoing for an extended period of time, most of which are related to chronic poverty, such as low income, a single-parent household, low parental education, an incarcerated parent, substantiated child abuse or neglect, foster care

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[2] *Cortisol*, a hormone, is a normal part of endocrine functioning that plays an important role in regulating multiple physiological systems, including metabolism, immune functioning, neural and cognitive functioning, and the physiological stress response. As such, differences in cortisol have been related to differences in health, mental health, and cognitive functioning. Meanwhile, differences in stress, particularly during childhood and early life, have been linked to lasting differences in cortisol function.

placement, a parent with a substance abuse or mental health problem, past birth risks such as inadequate prenatal care, and premature birth or low birth weight (Cutuli et al., unpublished, 2010; Gewirtz, Hart-Shegos, and Medhanie, 2008; Perlman and Fantuzzo, 2010; Rog and Buckner, 2007; Samuels, Shinn, and Buckner, 2010). Many of these chronic risks threaten development from the very early years and usually in multiple ways. As such, they have the potential to constrain not only competence at a single point in development, but also the individual's ability to successfully adapt to future risks. Within a developmental perspective, success in age-salient developmental tasks at one point in development prepares individuals for success in later tasks, whereas failure predicts subsequent failure (Yates, Egeland, and Sroufe, 2003).

In addition to exhibiting high rates of chronic adversities, families tend to experience homeless episodes in conjunction with other crises. As such, many children in these families also have experienced multiple, recent, and more acute or episodic risks about the time they become homeless. Many acute risks are directly related to the homeless episode, such as the loss of a home, possessions, pets, social supports, and services (for example, school, mental health providers, and primary-care physicians) and other possible precipitating events such as witnessing domestic violence and separation from some family members (Perlman et al., 2012; Samuels, Shinn, and Buckner, 2010). These experiences represent short-term disruptions that threaten well-being in multiple ways. Children and families with functioning adaptive systems (indicated by promotive and protective factors) are better able to respond effectively to these disruptions and demonstrate resilience. In the context of chronic risk, however, many homeless families have fewer resources at their disposal to meet and overcome acute disruptions. The risk associated with childhood homelessness appears to involve varied acute risks overlaid on chronic risks, creating a particularly complex threat to positive development.

Very few studies have followed groups of homeless children over time, with the exception of a handful of efforts that involved academic achievement outcomes. Findings generally support the view of homeless episodes as periods of acute risk for children already in contexts of more chronic risk. Rafferty, Shinn, and Weitzman (2004) compared groups of homeless students with low-income, housed students on math and reading achievement. The homeless group had lower achievement the year after a shelter stay. The differences had disappeared 5 years later, however, after the homeless students had been rehoused, suggesting that the events related to the shelter experience had an additional, time-specific effect on child functioning. In a different study of academic achievement over time, Minneapolis, Minnesota Public School students who had ever been homeless or highly mobile (HHM) persistently underperformed low-income peers longitudinally from third through eighth grades (Cutuli et al., 2013; Obradović et al., 2009). These analyses first considered HHM status as an indicator of chronic risk: if a child was ever identified as HHM in the data, regardless of when, then all their achievement test scores were included in the HHM group, without considering how HHM experiences might have a greater, acute effect on achievement. Additional analyses sought and found acute effects of HHM experiences, however: HHM students had lower achievement scores in math and reading, and slower growth in math achievement, during years in which they were identified as experiencing HHM compared with *their own* achievement and growth during years in which they were not identified as HHM (Cutuli et al., 2013). These patterns of results suggest that homelessness often represents a focused, acute disruption among children who experience poverty and other more chronic, long-term risks. Furthermore, in many

cases, ordinary adaptive systems in the lives of children appear to eventuate in competent functioning and resilience, because sizeable percentages of children appear to bounce back over time. An account of childhood homelessness' effect on development must recognize both chronic and acute sources of risk.

Beyond Studies of Risk: The Promise of Resilience

Despite the complex difficulties of experiencing acute and chronic risk, many homeless children show developmental competence nonetheless (Cutuli et al., 2013; Obradović, 2010; Obradović et al., 2009). A resilience perspective seeks to understand what distinguishes homeless children who succeed from those who struggle. As noted previously, studies of resilience search for promotive or protective factors in the child's life, sometimes called *strengths* or *resources*, that contribute to positive adaptation. As noted previously, promotive factors universally promote competent development regardless of risk, and protective factors have a greater positive effect for children specifically in the context of risk (Masten et al., 2009). These factors are indicators of healthy adaptive systems in children's lives; they are resources and characteristics that enable children and families to avoid the negative implications of risk.

Among the many protective factors identified in scientific studies of resilience during the past 40 years, two have emerged consistently as especially powerful positive influences in the lives of children who experience a range of risks. These factors are better cognitive functioning—such as higher IQ and cognitive or effortful self-regulation of emotions and behavior—and having a close relationship with a competent adult, especially a caregiver (Luthar, 2006). These two factors also appear to be particularly important for children who experience homelessness, indicating the presence of adaptive systems that assist children in competent functioning despite the varied risks that they encounter.

Buckner, Mezzacappa, and Beardslee (2003, 2009) found that better self-regulation predicted better functioning among a group of very low-income 8- to 17-year-olds. Homeless children and youth were overrepresented in this sample. *Self-regulation* was defined as the child or adolescent's level of executive functioning and ability to control his or her emotions and behavior. From the neuroscience literature, *executive functions* refer to the metacognitive processes that help plan, control, and organize thoughts, feelings, and behaviors toward some goal. Relevant to this article are executive functions such as being able to pay attention, inhibiting impulses in the service of controlling behavior (called inhibitory control), keeping rules in mind and following them as appropriate (drawing on working memory and rule-switching), and others. Buckner, Mezzacappa, and Beardslee (2003, 2009) found that interviewer-rated self-regulation skills predicted higher levels of global adaptive functioning, better social relationships, higher academic achievement, lower levels of behavior problems, lower levels of depression and anxiety symptoms, less likelihood of being suspended from school, and less likelihood of police contact or arrest (Buckner, Mezzacappa, and Beardslee, 2009). In addition, this study separated the sample based on whether the child or youth appeared to be demonstrating resilience. *Resilience* was defined, in this case, as showing competence on measures of global functioning across multiple domains and emotional and behavioral symptoms. Self-regulation skills predicted resilience, even when accounting for other factors such as nonverbal IQ, self-esteem, and perceptions of emotional support (Buckner, Mezzacappa, and Beardslee, 2003).

Other work has focused on the role of parenting in promoting child competence. Using the sample described previously, Crossley and Buckner (2012) found links between positive, consistent parenting practices (for example, parents not frequently raising their voices to the child and praising the child), parental monitoring (knowing where and with whom the child is), and child self-regulation skills. In a separate effort, Miliotis, Sesma, and Masten (1999) followed a group of 6- to 11-year-old African-American children after they left shelter and moved into homes. Ratings of close parent-child relationships and parent involvement in children's education predicted fewer behavior problems and better academic outcomes, based on school records. These findings affirm that positive parenting and child self-regulation represent important adaptive systems that help children in homeless families show resilience.

Integrative Accounts of Adaptation in Children Experiencing Family Homelessness

A recent program of research with kindergarten-aged children in family shelter integrates and elaborates on past research focused on parenting and self-regulation as important adaptive systems that encourage resilience. These efforts target the developmental period that coincides with the transition to school, given findings suggesting that children who experience homelessness are less likely to succeed in the early school years (Cutuli et al., 2013; Fantuzzo and Perlman, 2007; Herbers et al., 2012). Obradović (2010) examined resilience among 4- to 6-year-old children staying in an urban emergency shelter with their families during the summer of 2006. While in shelter, children completed assessments of general cognitive functioning and completed standard tasks indexing child effortful control. Effortful control refers to the volitional control of behavior, a psychological construct that is closely related to cognitive control, executive functions, and self-regulation. After the children entered kindergarten or first grade the following fall, teachers completed validated questionnaires of child competence in multiple areas, including academics, getting along with peers, emotional problems, and behavioral problems. Children who did better on the effortful control assessments in shelter had higher levels of competence in each of these areas. Additional analyses compared children who showed competent functioning in each measured domain (suggesting resilience across multiple domains) with those who did not. Forty-one percent of children demonstrated resilience in this way. Furthermore, effortful control was an important factor that distinguished children who showed resilience from those who did not.

A more nuanced analysis revealed that parenting quality and child cognitive functioning come together in a more complex way to support positive child development. Herbers et al. (2011) analyzed data from the same study, including information on ratings of parenting quality and cumulative risk scores from caregiver interviews completed in shelter. Results suggested that, when considered separately, both cognitive functioning (IQ and executive function skills based on effortful control tasks) and parenting quality predicted subsequent child academic competence. Children with better cognitive functioning did better academically in kindergarten or first grade, as did those who experienced higher quality parenting. Looking closer, better parenting quality had its positive effect on academic competence indirectly through its positive relation with child cognitive development: children who experienced higher quality parenting also had better cognitive functioning, and children with better cognitive functioning did better academically in school. In effect, higher quality parenting supported good cognitive development that the child, in turn, took to school as a resource to succeed in that context.

These findings were replicated using additional data collected in 2008 and 2009, replacing interview-based assessments of parenting quality with observer ratings of standardized caregiver-child interaction tasks. Child executive function skills again predicted higher levels of success later in the classroom across important domains of functioning, beyond the effects of general intellectual functioning (Masten et al., 2012). In addition, caregiver and child behavior were coded second by second from video-recorded, parent-child interaction task sessions that lasted about 40 to 60 minutes. Codes reflected the proportion of time that caregivers engaged in positive parenting, indicated by warmth, structure, and guidance as appropriate to the child's behavior. As before, parenting had an indirect effect, through child cognitive functioning, on academic competence and on competence regarding teacher-child relationships, behavior, and being engaged with school and learning (Herbers, 2011; Herbers, Cutuli, Supkoff, et al., unpublished).

Parenting also emerged as an important protective factor for these young children in shelter. Children differed in their experiences of stressful, potentially traumatic, life events such as witnessing violence (for example, against a parent, in the neighborhood, or as a victim), the loss of a parent (to incarceration, divorce, separation, or death), or some other serious threat to the integrity of the child or family. Children who had experienced more of these lifetime events also had higher scores on parent-reported measures of emotional and behavioral problems and, more specifically, symptoms of posttraumatic stress disorder (PTSD). It is important to note that, among children who experienced more such life events, those children who experienced higher quality parenting had lower levels of emotional and behavior problems and fewer PTSD symptoms (Herbers et al., forthcoming). Positive parenting in shelter appears to protect children from the negative effects of higher levels of risk, at least regarding common psychiatric symptoms.

Opportunities To Promote Developmental Resilience Through Practice and Policy

Understanding resilience and risk in development promises to unveil more effective approaches for promoting the positive adaptation of children. Indeed, a developmental perspective on resilience and risk suggests that positive adaptation in the context of homelessness is because of ordinary but powerful adaptive systems in the lives of children, and not only because of differences in past experiences of risk. Many adaptive systems are external, such as experiencing consistent, supportive parenting, especially early in life. Other adaptive systems are internal, such as children's developing cognitive skills and self-regulation abilities. These systems interface with each other to promote good outcomes in children exposed to homelessness and its associated risks. Understanding how risk can interfere with development, and how adaptive systems work to address that risk and produce resilience, provides a blueprint for providers and policymakers interested in the success of children in homeless families.

The remainder of this article applies the lessons of developmental resilience and risk, revealing three simultaneous opportunities for those interested in the well-being of children in homeless families. First, we discuss evidenced-based programs that can directly boost important adaptive systems such as positive parenting and better child cognitive functioning and self-regulation, highlighting findings with families in shelter when available. Second, we note the need to be vigilant for well-intentioned

practices that inadvertently interfere with optimal functioning of adaptive systems already present in the lives of children, such as positive parenting, and removing them where they occur. Third, we recognize that services can address some risks directly while also minimizing the introduction of new barriers and risks.

Programs That Promote Adaptive Systems

Unlike other approaches that highlight only risk in the lives of children and families, a developmental perspective on resilience and risk reveals the importance of considering adaptive systems that protect and promote positive development. As reviewed in previous sections, positive parenting and child cognitive skills related to self-regulation are key adaptive systems that distinguish resilient from nonresilient children in the context of family homelessness. It is important to note that these systems are malleable and can be improved and reinforced through evidence-supported,[3] psycho-social interventions that can be provided to homeless and low-income families.

Programs To Boost Cognitive Development and Self-Regulation

Several programs have emerged with the potential to improve children's related skills of effortful self-regulation and executive functioning. These programs range from highly involved and focused on the child's ecology (for example, comprehensive approaches to early childhood education) to less intensive and narrowly focused on specific neurocognitive skills (computer-based skill training). Although none have been evaluated specifically in shelter contexts (to our knowledge), several have been shown effective in populations of low-income children. The general view of these approaches in applied developmental science is that ecological or psychosocial interventions are more efficacious, especially for children with multiple problems or greater deficits, whereas narrowly focused skill training shows limited benefits for other skills or real-world functioning (Blair and Raver, 2012; Bryck and Fisher, 2012; Diamond and Lee, 2011).

Curricula and training of teachers and staff. Perhaps the most convincing interventions for improving cognitive functioning and self-regulation take the form of good-quality early childhood education programs, followed by good-quality education through middle childhood (Anderson et al., 2003). For example, Montessori curricula expressly construct classroom experiences to encourage *normalization*, meaning a shift to self-discipline, independence, orderliness, and peacefulness. Activities such as walking meditation encourage self-regulation and cognitive development, whereas situations that require executive functions, such as needing to work with other children or waiting for other children to finish with desired classroom materials, are specifically created (Diamond and Lee, 2011).

Designed specifically for preschool children, Tools of the Mind (Diamond et al., 2007; Diamond and Lee, 2011) is a complete curriculum that explicitly scaffolds developing executive function skills. Teachers engage children in normative developmental activities designed to encourage

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[3] Many evidence-supported or evidence-based interventions exist for the general population and for some specific subgroups, such as low-income families. A recent review, however, found that essentially no evidence-based interventions exist specifically for families experiencing homelessness because of a lack of quality evidence in the literature (Herbers and Cutuli, 2014).

concentration and controlling one's own behavior, for example, in moderated pretend play during which children are required to stay in character for set periods of time. This program also engages children in quiet, turn-taking activities, using concrete aids (for example, reminder cards) to support children in applying self-control in the classroom in a way that is appropriate for their developmental level. In a randomized trial involving primarily children from low-income families, those who received Tools of the Mind had better executive function skills at the end of the program (Diamond et al., 2007).

Good-quality, comprehensive preschool curricula boost self-regulation skills and related cognitive functioning, a key adaptive system for children in homeless families. Mobility, availability, and other risks might make it less likely for children to benefit from these programs, however. A different approach is to train teachers and others who interact with these children, such as shelter providers and afterschool program leaders, in strategies that encourage better self-regulation skills. For example, The Chicago School Readiness Project trained Head Start teachers in extensive behavior-management skills and provided regular stress-reduction workshops for teachers. Children in Head Start classrooms showed greater gains in executive function skills during the course of the school year compared with the gains of their peers in classrooms of teachers who did not receive the training (Diamond and Lee, 2011; Lillard and Else-Quest, 2006).

Another example for older children is the Promoting Alternative Thinking Strategies (PATHS) program. PATHS is not a school curriculum but a set of strategies for teachers to encourage emotion regulation. For example, adults learn how to help children in a variety of contexts avoid impulsive expressions of strong emotions by stopping, taking a deep breath, verbalizing the problem and their feeling, and constructing a plan of action. PATHS has been shown to help children avoid several negative outcomes and encourage better executive functions and self-control (Diamond and Lee, 2011; Riggs et al., 2006).

Families in shelter could potentially benefit from extensive and targeted curricula that have shown effects on child executive functioning and self-regulation, where such programs are available and feasible. More practically, training adults (for example, provider staff) in emotion regulation and behavior management techniques shows positive effects on child functioning, as well. Although it is not known if training shelter program staff and other adults will have a similar effect on children's developing skills, attempting such an approach seems warranted given the importance of these skills for children in family shelters.

Specialized computer training. Several efforts have attempted to improve executive function skills by training children on specially designed computer games. For example, the CogMed program allows for children to play progressively harder games that require working memory or other executive function skills. After training, children have shown improvements in working memory skills but not in executive function skills that were not targeted. The CogMed program does not seem to support executive functioning more generally, with effects limited to working memory skills. Also, gains did not consistently transfer to cognitive functioning more generally (Diamond and Lee, 2011).

Mezzacappa and Buckner (2010) used a portion of the CogMed program to train working-memory skills in a pilot study of nine low-income students, ages 8 through 11, in an urban public school.

Although the conclusions drawn were very limited, these children showed significant improvements in working-memory skills and in teachers' ratings of ADHD, or attention deficit hyperactivity disorder, symptoms. This finding underscores the need for more rigorous research with low-income children.

Another group evaluated a 5- to 10-session training program with 4- to 7-year-olds. This program also targeted executive functions, with an emphasis on attention. Early evaluations were promising for gains in attention and transfer of these gains to general intelligence (Rueda et al., 2005). More recent work suggests that behavioral gains from training are modest, if present at all, however (Rueda, Checa, and Combita, 2012).

Skill-training approaches using computers are tempting for the shelter context because they generally are short term (for example, 5 to 10 sessions during as many weeks), can be appealing to children, and do not require a high level of expertise or guidance from staff. These computer-training programs tend to produce improvements for children in the specific executive skills that are trained, however, without generalization to other executive function skills (Bryck and Fisher, 2012; Diamond and Lee, 2011). It also remains unclear if or how much this type of training translates into better self-regulation and functioning in real-world situations, for children either in shelter or in general samples. Increasing evidence suggests that the training of specific neurocognitive skills (as is done through these computerized programs) has only limited value for children, whereas ecological and psychosocial approaches to boosting child executive function skills are preferred (Blair and Raver, 2012; Bryck and Fisher, 2012; Diamond and Lee, 2011).

Parenting Programs

Parenting behavior and the parent-child relationship are the primary context for children, tied closely to positive adaptation and the development of abilities that further support healthy development (Herbers, 2011; Herbers et al., 2011; Lengua, Honorado, and Bush, 2007). Although the importance of parenting in shelter has been recognized for many years (for example, Miliotis, Sesma, and Masten, 1999), very few parenting interventions have been rigorously evaluated in the context of family shelter. Most evidence comes from feasibility studies or from preliminary or pilot studies with few participants, rare use of established measures, or both. Nevertheless, it is worth reviewing the programs and studies that have been used in shelter while programs continue to evolve and an evidence base is constructed. We specifically focus on two programs with an evidence base involving non-shelter groups that were subsequently adapted and implemented with families in shelter. Comprehensive reviews of these and other programs have been recently summarized in the literature (Gewirtz, Burkhart, Leoehman, and Haukebo, 2014; Perlman et al., 2012).

The Triple P—Positive Parenting Program is a parenting program with a well-established evidence base involving evaluations with more general samples of families (Sanders, 2008). The program contains parent education and skills training (for example, behavioral strategies for teaching children). Triple P was piloted with 10 families staying in a Belgian center for integrated family guidance, an institutional residential setting that provides multiple services for families with a history of violence and who are at very high levels of risk (Glazemakers and Deboutte, 2013). The intervention involved both group and individual family sessions, with the latter occurring in each family's

living space. Program delivery appeared feasible in the setting, with families showing high rates of engagement, attendance, and completion of activities and assignments. Additional evaluation is needed to determine efficacy with families in shelter.

The Parenting Through Change intervention (PTC) is an intervention based on the well-established Parent Management Training—Oregon model. PTC has been adapted for families in domestic violence shelter and for families in supportive housing. The adapted PTC is delivered in a group format in 14 weekly sessions, targeting positive parenting skills including skill encouragement, problem solving, limit setting, monitoring, and positive involvement. Program authors trained two staff members in a domestic violence shelter to implement the intervention with 10 mothers, who showed high rates of attendance and engagement with the program, suggesting feasibility (Gewirtz and Taylor, 2009). PTC was also implemented as part of a randomized clinical trial with families in supportive housing programs. Preliminary analyses again suggest high rates of attendance and engagement, affirming feasibility. Forthcoming analyses will evaluate program efficacy with regard to increasing positive parenting and better child outcomes (Gewirtz, 2007; Perlman et al., 2012).

Recognizing Challenges to Positive Parenting and Reducing Practices That Interfere

In addition to having opportunities to implement programs to encourage positive parenting skills, shelter providers and policymakers have opportunities to recognize and remove those practices and policies that make it more difficult for some parents to support their children through difficult circumstances. The best approach would minimize any interference with important family processes and be sensitive to other aspects of caregivers' lives that affect their ability to use positive parenting.

As noted previously, parents experiencing homelessness with their children face a variety of risks that can threaten their capacity for optimal caregiving. Many of these risks are indirectly related to homelessness; they are characteristics or circumstances that are common among parents experiencing homelessness and that have been linked to negative parenting in the broader developmental literature. Other risks are inherent in and unique to the experience of homelessness, particularly among parents who reside temporarily with their children in emergency shelters or transitional housing (Lindsey, 1998; Perlman et al., 2012).

Most parents experiencing homelessness are young, single mothers living in extreme poverty (Bassuk, 2010). These young mothers tend to have limited educational backgrounds and little experience or training related to employment opportunities (Bassuk et al., 1997; Burt et al., 1997). Parents who are homeless tend to have more medical problems than housed adults (Weinreb et al., 2006). In addition, parents who are homeless with their children often have experienced significant risk and adversity in their own developmental histories, including abuse and neglect, foster care placements, or homelessness as children (Gorzka, 1999; Swick and Williams, 2010). After their difficult experiences, many of these parents have untreated emotional, chemical, or behavioral problems, such as substance abuse, depression, or ongoing symptoms of post-traumatic stress (Arangua, Andersen, and Gelberg, 2005; Lee et al., 2010; Samuels, Shinn, and Buckner, 2010). Furthermore, parents who are homeless often arrive at shelter after acute traumatic experiences, such as domestic violence, neighborhood violence, house fires, or other disasters (Anooshian, 2005; Buckner, Bassuk, and Zima, 1993). These risk factors tend to accumulate among parents experiencing homelessness and

threaten their capacity for warm, nurturing parenting (Perlman et al., 2012). Parents in homeless families often have limited economic resources, limited knowledge of typical child development, lack of experience with positive parent role models, and limited access to social support (Gorzka, 1999; Howard, Cartwright, and Barajas, 2009; Swick and Williams, 2010; Vostanis et al., 2001). The chronic stress of these hardships also can be exacerbated by heightened needs of their children, as children experiencing homelessness have higher rates of developmental, educational, and behavioral problems (Bassuk et al., 1997; Buckner et al., 1999; Haber and Toro, 2004), and by their own reactions to the stressful and potentially traumatic experiences confronting the parent and family (Buckner, Bassuk, and Zima, 1993; Hicks-Coolick, Burnside-Eaton, and Peters, 2003; Lindsey, 1998; Perlman and Fantuzzo, 2010).

The context of shelter presents additional risks for parents experiencing homelessness with their children. Often, families encounter regulations that prevent certain individuals, most often men and adolescents, from entering and residing in shelters (Perlman et al., 2012). To use emergency housing for themselves and their younger children, mothers may be forced to separate from their adult partners and their teens, particularly teen boys. Such separations are inherently stressful and disruptive for everyone in the family. The adult men and older teens may have nowhere to go, and the mothers and younger children lose opportunities for contact, support, and assistance with those members of their families (Barrow, 2004; Cowal et al., 2002). The rationale for these restrictions includes not only practical reasons such as room size, availability of space, and lack of multiple single-sex bathrooms but also concerns about safety. Such regulations should be balanced against the potential harm of forcing families to decide between using emergency housing or remaining intact.

The routines established by shelters based on meal times and availability of programs also can interfere with family routines and rituals, which may detract from parents' perceived and actual control (Friedman, 2000; Schultz-Krohn, 2004; Torquati, 2002). Spaces within the shelters may not be conducive to family life in other ways. Families often are crowded, such that everyone must sleep in the same room, and bathrooms may be shared with other residents. Often, children have few spaces to play, and the spaces available may not be developmentally appropriate or well equipped for a range of child ages, interests, and learning opportunities (Perlman et al., 2012).

When families are residing in shelter, much of the parenting and parent-child interactions occur in public rather than private family spaces (Friedman, 2000; Lindsey, 1998; Swick and Williams, 2010). When parenting in public spaces, parents are observed and often scrutinized by other shelter residents and shelter staff. Parents may feel pressured to adapt their parenting styles based on shelter rules and may have to restrict certain child behaviors, such as noisy and active play, that are developmentally appropriate and would be acceptable in more typical family circumstances (Lindsey, 1998; Schultz-Krohn, 2004). In some cases, shelter staff may correct child behavior or critique parents' discipline techniques in front of the parents, children, and other families, undermining the authority of parents and sometimes even advocating or encouraging inappropriate or insensitive practices (Perlman et al., 2012; Swick and Williams, 2010). These experiences can be demoralizing to parents, contributing to a lack of confidence in their parenting, increased feelings of failure or inadequacy, and doubts regarding their ability to support their family through a highly stressful and challenging period (Lee et al., 2010).

Thus, shelters and shelter staff may inadvertently interfere with some of the ordinary adaptive systems through which parents and children adjust to the risks and adversities associated with homelessness, despite good intentions and the provision of safe housing and basic necessities such as food. Although some homeless parents may lack knowledge of child development and skills related to positive parenting, many parents experiencing homelessness provide adequate or even exemplary caregiving for their children despite the risks present in their circumstances (Herbers, 2011; Miliotis, Sesma, and Masten, 1999). Positive aspects of the parent-child relationship system lead the child to resilience. These aspects would benefit most from external reinforcement and support from shelter resources, regulations, and staff interactions, or, at very least, noninterference. Homeless parents struggling with their caregiving roles similarly would likely benefit from a strengths-based, supportive approach to the provision of services and care that empowers them in their roles as parents and encourages competent functioning. Such efforts should not be limited to specific programs or services available to families residing in shelter but should pervade the shelter ecologies with developmentally appropriate resources, staff training, and policies (Kilmer et al., 2012; Perlman et al., 2012). For example, these efforts would include providing developmental education and information about the varied but positive ways children and families respond to potentially traumatic events to all staff who might have any contact with families. The entire shelter context must attend to the developmental context of children and families, not only to specific individuals or specific times or programs (for example, family movie nights) that the families might choose to participate in.

Shelter providers can enact programs and policies that address the risks to parenting that tend to be associated with homelessness as well as the risks that can arise in shelter settings. Case management services in shelters often aim to identify the individual needs of families and make appropriate referrals for internal or community-based programs that can provide opportunities for educational and job training, childcare, mental health and substance abuse treatment for parents, and developmental or behavioral health services for children. Programs designed specifically to enhance parenting and parent-child relationships may be provided in shelter, as well. In addition to these services that address associated risks, shelter providers can enact policies and programs to reduce negative effects on families related to the shelter environment. Such efforts could include providing child- and family-friendly spaces for developmentally appropriate play, including parents in decisions related to meal times and meal options, and training all shelter staff in appropriate expectations for child development and discipline techniques that emphasize positive, sensitive, nurturing parenting.

Minimize and Remove Risk: Developmentally Informed Policies and Coordinated Service Provision

In addition to promoting ordinary adaptive systems, as discussed previously, agencies and policymakers have clear opportunities to encourage positive outcomes by removing sources of risk from children's lives. Providers and other social service agencies typically have specific mandates or missions that target circumscribed basic needs, such as providing shelter, food, education, mental health care, physical health care, or protection against defined instances of abuse and neglect. Because many families who experience homelessness also experience accumulating, longstanding, or repeated risks associated with chronic disadvantage and poverty, it is not uncommon to require

services from more than one agency (Bassuk, Volk, and Olivet, 2010). Interagency collaboration will likely remove more risk from families' lives than siloed approaches, as specialized agencies combine their respective expertise and resources to address the complex ways that risks affect homeless families. Budgetary constraints and defined operating boundaries can make it difficult for agencies to extend beyond their mandates, however. Even so, increased federal attention to the value of interagency collaboration is encouraging more coordination with the goal of ending family homelessness (United States Interagency Council on Homelessness, 2012).

The need to engage multiple, noncoordinated agencies represents a barrier to families, especially during periods of crisis like an episode of homelessness involving relocation to new addresses with limited resources. Maintaining connections to both routine services (for example, schools and primary-care physicians) and specialized ones (special education programs, mental health providers, and so on) can be especially challenging. This kind of disconnection also can occur when families move out of shelter into housing in different areas. Concerted collaboration between school districts and shelter providers appears to hold value for educational well-being (United States Interagency Council on Homelessness, 2012), and children who change schools less frequently have better academic careers (Fantuzzo et al., 2012; Fantuzzo and Perlman, 2007; Herbers, Reynolds, and Chen, 2013).

Regarding other services, downward extensions of adult programs that involve intensive case management services have shown some promise but require additional evaluation. The Family Critical Time Intervention, for example, provides comprehensive care management to families during the critical transition out of shelter, when many families fail to maintain housing. This case management begins before families leave shelter and aims to identify needed services, ultimately connecting families with existing, mainstream providers in their new communities (Samuels, Shinn, and Fischer, 2006). This approach simultaneously acknowledges that families who experience homelessness have varied needs and that multiple siloed services can be better coordinated to meet those needs. Additional, rigorous evaluation is needed to test the efficacy of Family Critical Time Intervention and other interventions that specifically target families experiencing homelessness (Bassuk, Volk, and Olivet, 2010; Herbers and Cutuli, 2014; United States Interagency Council on Homelessness, 2012).

What Works Best for Whom? Some Open Questions

The literature on risk and resilience underscores that different families have different needs. As reviewed above, other risks and adversities, such as low parental education, mental and chemical health issues, and unemployment, tend to accompany homelessness. At the individual level, families vary on their past experience of risk. As such, many children and parents require different types of assistance. Some, but certainly not most, may require long-term intensive programming in the context of an emergency housing intervention. Some may simply need housing in the short term as their ordinary adaptive systems enable positive adaptation and resilience. One-size-fits-all approaches seem ill advised. More likely, most families by far would benefit most from tailored, but not necessarily intensive or pervasive, programs that target the removal of specific risks or the promotion of key adaptive systems considered individually for each family (Bassuk, Volk, and Olivet, 2010).

Further complicating assessment and case management planning is the realization that family functioning might be disrupted in the weeks after the events surrounding a move to shelter. These disruptions may be temporary for many families who ultimately bounce back, or they may represent longer term problems for others. This uncertainty makes predicting which families will need which services difficult at intake, when functioning is most likely to be temporarily disrupted. More rigorous evidence is needed regarding assessing the needs of families entering shelter and accounting for ordinary adaptation that occurs over time. Future research can attend to promotive factors, protective factors, and risks in determining what level of services ultimately will be most helpful to individual families.

High-quality evidence should inform which housing programs work best for which types of families. It is not uncommon for localities to offer a mix of different housing interventions for families experiencing homelessness but without evidence-based practices as to which families can participate in which programs. At a minimum, most localities offer some emergency shelter that provides for the most basic needs of families (for example, shelter and, frequently, meals and basic case management) for relatively short periods of time. Emergency shelter for families commonly can include accommodations in institutions that exist for this purpose (often managed by private nonprofit organizations), in charitable organizations that provide temporarily converted space for time-limited periods, or in other shelter-like, multitenant (single-room occupancy) hotels. In some urban and more rural settings, emergency shelter might also include vouchers for stays in hotels or motels. *Transitional housing* programs differ from emergency housing in that they typically involve longer stays (6 to 24 months) in an apartment or other shared housing while the family receives a package of supportive services designed to encourage independent living. These services tend to be more comprehensive than those available in emergency housing programs, including referrals for services related to obtaining employment or job training, enrolling in entitlement programs, transportation, childcare, medical care, mental health care, and an array of other programs to meet the needs of families in the program. Finally, *rapid rehousing* programs focus on transitioning families into permanent housing as soon as possible. Rapid rehousing usually involves temporary rental subsidies for 2 to 18 months in private-market housing, and it sometimes includes intensive case management and other services to help families connect to community-based, mainstream providers in their new neighborhoods to meet whatever needs the family might have.

To date, evaluations of housing interventions have neglected most considerations important to a developmental framework on resilience and risk. We propose preliminary criteria to begin to understand if and how different housing programs support developing children and families. We intend the following criteria to be a starting point.

1. Does the program recognize that different families have different strengths and different needs as determined by evidence-based assessment? Such assessment would evaluate chronic and acute sources of risk and protective factors in the family and in individuals.

2. Does the program take measures to support existing protective factors and help families develop new ones (for example, by supporting positive parenting)?

3. Does the program help reduce risk in children's lives by removing existing risk factors and preventing exposure to new ones?

4. Does the program help connect families to services that promote positive development and address any special needs (for example, by facilitating enrollment in early childhood education)?

5. Finally and perhaps most importantly, does the program result in better outcomes in age-salient developmental tasks for children (for example, cognitive development, academics, positive family and peer relationships, and emotional and behavioral health)?

We offer a critical application of these criteria to the scant but emerging evidence on rapid rehousing programs for families as an example. Good-quality evaluation is especially salient for decisions about rapid rehousing programs, given their potential for cost savings, their apparent popular appeal, and the fact that many of these programs were funded temporarily by the American Recovery and Reinvestment Act and now municipalities must decide if they should be maintained with local funds (Briggs et al., 2013; da Costa Nunez, Anderson, and Bazerjian, 2013a, 2013b; United States Interagency Council on Homelessness, 2012). Although we choose to focus on rapid rehousing programs as an example, we note that high-quality evidence is also scant for other types of housing interventions, and much work needs to be done.

Rapid rehousing appears to prevent some forms of risk related to institutional living in homeless shelters. Because rapid rehousing approaches focus on transitioning families into permanent housing as soon as possible, they minimize some negative aspects of shelter stays, such as time separated from fathers or older siblings because of shelter rules, well-intentioned interference in parenting by shelter staff, and other aspects of institutional living in shelter that disrupt the powerful effects of ordinary adaptive systems. The explicit purpose of these programs is to enable the family to resume living in a private, permanent residence without the disruptions that accompany living in a shelter setting. Services that promote protective factors like positive parenting may not be offered, but in exchange they do not interfere in how the family functions.

Furthermore, if rapid rehousing results in lasting residential stability, then families might have an opportunity to connect with, and stay connected to, positive resources in neighborhoods and communities. Additional school moves might be less likely; for example, allowing for children to avoid additional risk and increasing the likelihood of academic resilience (Fantuzzo et al., 2012; Herbers, Reynolds, and Chen, 2013). Families might connect to community providers for universal (for example, primary medical care) or targeted (for example, mental health care) services. A context of stability is expected to increase the likelihood that families stay connected to needed resources and services, resulting in increased continuity and quality of care. Stability is a context that affords more opportunities for resilience.

Any housing intervention should be subjected to rigorous evaluation that informs not only *if* it helps promote resilience among children and families, but also *how* and *for whom* these effects come to be. Although the reasoning for rapid rehousing approaches with families appears sound on many levels, the research base is so sparse that any strong conclusions about its benefits to developing children are premature. To date, exceptionally few publications (peer reviewed or otherwise) consider developmental competence as a child outcome when studying the effects of rapid rehousing compared with those of other housing interventions. It is similarly unclear whether rapid rehousing actually supports promotive or protective factors, such as positive parenting or connectedness with teachers. In addition, it is unclear if any quality assessment of family needs

occurs in most implementations, and if families have better access to community services while staying in housing subsidized through a rapid rehousing program compared with their access to similar services in other housing interventions. To our knowledge, it is also unclear if meaningful differences exist in the quality or comprehensiveness of services received.

Finally and perhaps most importantly, whether rapid rehousing results in residential stability and fewer future episodes of homelessness for families also remains an open question. For example, widespread implementation of rapid rehousing in New York City appears to coincide with *increased* numbers of families presenting to homeless shelters and increased homelessness recidivism in the long term (da Costa Nunez et al., 2013b). Meanwhile, a shorter term case study of a rapid rehousing program and intensive case management for families in Mercer County, New Jersey, reported that most families remained in permanent housing after the temporary rental assistance ended, suggesting that rapid rehousing provided stability (da Costa Nunez et al., 2013a). Similarly cursory reports from some other localities have suggested that rapid rehousing benefits a subset of families (National Alliance to End Homelessness, 2012), at least in the short term. All known reports to date have lacked designs and the rigor required for high-quality evidence regarding families, however. Little to no literature (at the time of writing) adequately informs decisions on the utility of rapid rehousing for families with children, whereas a robust literature suggests that providing services to families, especially services tailored to specific need, has benefit (Bassuk and Geller, 2006; Bassuk, Volk, and Olivet, 2010). Given the lessons of resilience and risk in development, it is probably the case that rapid rehousing approaches will fall short for a subset of families for whom risk overwhelms their ability to successfully adapt, but rapid rehousing will work best for others as ordinary adaptive systems produce resilience. If, how, and for whom this approach promotes resilience remain open questions, however.

Conclusion

Many children who experience family homelessness show resilience by doing well in important developmental outcomes, but others do not. Investigations that have considered resilience in development discovered that children and families use ordinary but powerful adaptive systems to lessen or avoid the negative effect of risk. Individual homeless families differ in the levels and types of risk that they experience, but as a group they tend to experience high rates of chronic risks, such as poverty and low parental education, in addition to recent acute or episodic risks, such as the loss of housing, possessions, and connections to others, or other potentially traumatic events that may have led to homelessness, such as domestic violence. Two powerful and ordinary adaptive systems for children in homeless families are good self-regulation skills, especially executive functions, and positive parenting. For many, the presence of these adaptive systems enables children and families to avoid the negative effects of chronic and acute risks associated with homelessness, resulting in competent functioning in key developmental outcomes.

The lessons of developmental resilience and risk reveal notable opportunities to promote good outcomes for children who experience family homelessness. First, providers and policymakers can target the most influential adaptive systems with effective programs, such as curricula and staff training, to promote child self-regulation and executive functions or with programs to encourage

positive parenting. Evidence-based programs to improve these systems are supported by studies with low-income and general populations, and several groups are in the process of adapting and evaluating these programs specifically with families in shelter. Providers also can evaluate their policies and practices to reduce interference in the ordinary processes of adaptation, especially when it comes to parenting in crisis and in the "public" context of shelter. Finally, many agencies exist to remove or prevent risk in the lives of children. Given the multiple, complex, and varied risks that accompany family homelessness, interagency collaboration and a tailored approach to service provision, including housing interventions, will help ensure that families' specific needs are met efficiently and effectively. In these ways, risks can be minimized and addressed for homeless families, and adaptive systems can be bolstered and maximized to encourage resilience.

Acknowledgments

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Healthy Start in Housing: A Case Study of a Public Health and Housing Partnership To Improve Birth Outcomes

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Abstract

This article describes the collaboration that supported the development and implementation of the nation's first contemporary program to use housing as a strategy to promote healthy birth outcomes. Using case study methodology, we examine how two agencies with distinctly different missions, the Boston Housing Authority (BHA) and the Boston Public Health Commission (BPHC), were able to successfully collaborate and develop the program Healthy Start in Housing (HSiH) in 2011. HSiH provides priority access to housing in the city's traditional family housing developments to homeless and housing-insecure pregnant women who have existing medical risks associated with poor birth outcomes. Data were collected from eight key stakeholder interviews, two focus groups with HSiH staff, program documents, and archival records. The contextual factors, chronology of the development of HSiH, and lessons learned were identified from an analysis of the case. We found that recognizing the need for interdependence, having a history of previous interagency collaboration, and clear and mutually shared goals facilitated the development of the HSiH collaboration. The challenges to cross-agency collaboration between the BHA and BPHC were minor but did exist, including difficulty in assessing BHA eligibility at program entry. This case study provides insights to the key components of a unique collaboration that aims to promote healthy birth outcomes and sets the stage for future research to assess the health effects of program participation.

Introduction

When public health officials measure the health status of a population, the two primary health indicators of interest are life expectancy and infant mortality. Infant mortality is considered a highly sensitive indicator of the health of a population. It reflects the direct causes of infant death and other factors that are likely to influence the health status of whole populations, such as their economic status, general living conditions, social well-being, rates of illness, and the quality of the environment (Reidpath and Allotey, 2003). Prematurity, defined as the birth of infants at less than 37 weeks gestation, and low birth weight (LBW), defined as the birth of infants weighing less than 2,500 grams, are associated with most infant deaths and are a major public health concern. The effects of prematurity and LBW can persist across the life course, placing children at elevated risk for cognitive and behavioral concerns (D'Agio et al., 2002; Hack et al., 2005; Klebanov, Brooks-Gunn, and McCormick, 1994; O'Shea et al., 1997). In the United States, societal costs of premature, LBW births exceed $26 billion a year (Institute of Medicine, 2006).

Despite an overall improvement in infant survival, Black infants in the United States continue to die at a rate twice that of White infants, a pattern that has persisted since the 1950s (Hogan et al., 2012).[1] The disparity in infant mortality is attributable to racial differences in LBW and premature births and explains approximately 80 percent of the observed Black-White gap in infant mortality (Bryant et al., 2010; MacDorman and Mathews, 2011).

To date, existing approaches, such as expanding access to prenatal care and case management, have not been successful in eradicating these disparities, even in communities such as Boston, the setting for this case study. Boston has a strong infrastructure of primary and specialty services, near universal access to health insurance, and comprehensive federally and locally funded perinatal support services, yet the rate of premature births among Black infants in Boston is 1.5 times that of White infants (BPHC, 2011b) and the rate of LBW for Black women is 59 percent higher than the rate for White women (BPHC, 2011b).[2] Research supporting the link between early experiences with social inequality and adverse health outcomes (Barker, 1995; Felitti et al., 1998; Geronimus, 1996; Stein, Lu, and Gelberg, 2000) have forced public health leaders to reevaluate previous strategies and develop new program models that support women's health before conception and throughout their reproductive years. As a result of this greater appreciation of the importance of social determinants of health, stable housing has emerged as a critical factor in the lives of women at risk for poor birth outcomes.

The Affordable Care Act and the newly adopted National Prevention Strategy (ASTHO, 2013; NACCHO, 2013) have created opportunities to strengthen housing and health collaborations. The emergence of a new approach to policymaking and program development, Health in All Policies (HiAP), provides a framework for such collaborations. The HiAP approach integrates considerations of health, well-being, and equity during the development, implementation, and evaluation of

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[1] The national infant mortality rate is now 6.6 per 1,000 live births, a 4-percent decrease since 2000 (Mathews and MacDorman, 2012) and a 28-percent decrease since 1990 (CDC, 1993). For Black infants, the rate in 2008 was 12.67 per 1,000 live births compared with 5.52 per 1,000 live births for White infants.

[2] Numbers are based on 2009 data.

programs and policies. This approach is being promoted by major public health organizations, including the National Association of County and City Health Officials (NACCHO) and the Association of State and Territorial Health Officials (ASTHO). The U.S. Department of Housing and Urban Development (HUD) has integrated the HiAP framework into its 2010–2015 strategic plan. Its goal to "utilize housing as a platform for improving the quality of life" by "utilizing HUD assistance to improve health outcomes" is an example of this approach (Bostic et al., 2012: 2133). Despite a strong tradition of partnerships between housing authorities and public health agencies, to our knowledge none have focused specifically on pregnant women who have existing medical risks associated with poor birth outcomes and none have had the explicit goal of improving birth outcomes (Krieger and Higgins, 2002). Understanding how collaborations work is key to understanding the implementation and dissemination of HiAP.

Using case study methodology we examine how two agencies with distinctly different missions, the Boston Housing Authority (BHA) and the Boston Public Health Commission (BPHC), were able to successfully collaborate and develop the program Healthy Start in Housing (HSiH). Initiated in 2011, HSiH was designed to provide intensive case management and priority access to housing in the city's traditional family housing developments to homeless and housing-insecure pregnant women with existing medical risk for, or a previous history of, poor birth outcomes. We found that the development of the HSiH collaboration was facilitated by recognizing the need for interdependence, having a history of previous interagency collaboration, and clear and mutually shared goals. Although this case study does not provide data on the efficacy of the program, it nevertheless provides important insights from a unique collaboration that supported the development and implementation of the nation's first program to use housing as a strategy to promote healthy birth outcomes.

Conceptual Framework—Life Course Theory

Life course theory (LCT) provides the conceptual framework to understand the effects of housing on birth outcomes and the trajectory of a child's early development (exhibit 1). LCT has emerged nationally during the past decade as an explanation for health disparities. LCT is based on the principles of health trajectories, early programming, critical or sensitive periods of development, cumulative effect, and risk and protective factors. Stated more simply, LCT examines how the places where people are born, grow, live, work, and age contribute to their health outcomes, and it searches for critical or sensitive periods of risk and for the effects of cumulative exposures (Berkman, 2009; Hogan et al., 2012). LCT emphasizes the importance of social determinants of health and, in doing so, offers a new way of understanding and, therefore, addressing the persistence of disparities in birth outcomes. One such social determinant is housing, which is a major challenge for low-income women who are pregnant and have young children. To be specific, LCT provides the theoretical framework to describe an explanatory pathway connecting housing security to adverse birth outcomes. This hypothesized pathway links housing insecurity to psychological stress, psychological stress to physiological stress, and physiological stress to adverse birth outcomes. The fact that the effect of housing stress can affect at least two and possibly more generations (Collins et al., 2006) provides a rationale to provide priority access to housing to pregnant, at-risk women. LCT has become the leading framework underlying national- and state-level maternal and child health programs (Kotelchuck and Fine, 2010). Its application to housing policy and understanding how housing effects birth outcomes and child development is novel, however.

Exhibit 1

The Effect of Homelessness and Housing Insecurity on Maternal, Infant, and Child Health: A Life Course Perspective
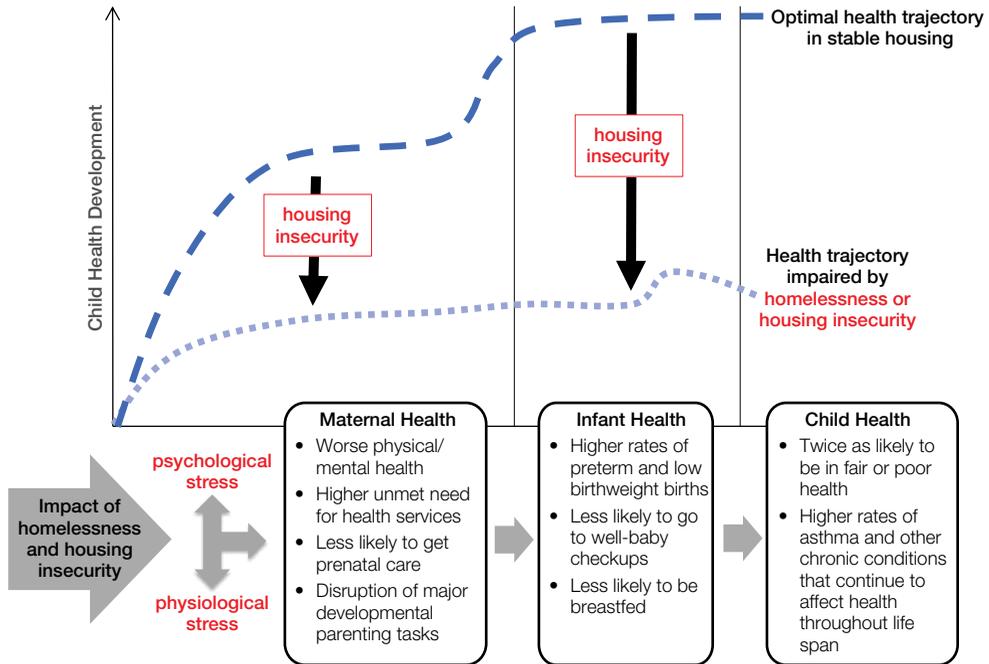
Source: Adapted from Halfon, Inkelas, and Hochstein (2000)

Literature Review

We have organized the review of relevant literature thematically, presenting first the research examining the effects of homelessness on birth outcomes and early child development. Next, we describe the literature that explores how pregnancy increases the risk of homelessness. We conclude with a review of the literature that examines housing partnerships that aimed to promote healthy child development.

The Effect of Homelessness on Birth Outcomes and Early Child Development

The link between a woman's health during pregnancy, birth outcomes, and future child development is well established. Homelessness is associated with a cascade of health outcomes that affect early child development. Beginning with pregnancy, homelessness is associated with poor maternal physical and mental health (Crawford et al., 2011; Institute for Children, Poverty, and Homelessness, 2012; Weinreb et al., 2006) and with heightened unmet need for health services (Lewis, Andersen, and Gelberg, 2003). Analysis of data from the U.S. Centers for Disease Control and Prevention's Pregnancy Risk Factors Surveillance System (PRAMS) suggests that homeless pregnant women were less likely to have adequate prenatal care, take prenatal vitamins, and breastfeed, and they were more likely to smoke than housed mothers (Richards, Merrill, and Baksh, 2011).

Relative to birth outcomes, homelessness is associated with premature birth and LBW, a major factor influencing a child's physical and cognitive development. In a 1997 retrospective study of homeless women who had given birth in the previous 3 years, Stein, Lu, and Gelberg (2000) found that controlling for use of prenatal care, greater homelessness severity (measured in terms of homelessness during the first trimester and longer duration or repeated instances of homelessness) was a more accurate predictor of premature birth and LBW than any other factor studied, including smoking, substance abuse, and previous mental health hospitalization. The effect of homelessness on birth outcomes was greater for Black women than for White women (Stein, Lu, and Gelberg, 2000). A recent study substantiated these findings; Merrill, Richards, and Sloan (2011) used national data from PRAMS to examine the relationship between birth outcomes and psychosocial and pregnancy-related risk factors. Compared with housed women, homeless women were more likely to experience stressful life events and to give birth to infants who were, on average, 17.4 grams lighter in birth weight after adjusting for maternal age, race, ethnicity, region, education, and marital status. The study found that housing status modified the effect of risk factors on birth outcomes. The negative influence of stressful events, such as late entry into prenatal care, family illness, and relationship conflicts, on infant birth weight was significantly greater for homeless women than for housed women. In both the Merrill (Merrill, Richards, and Sloan, 2011) and Stein (Stein, Lu, and Gelberg, 2000) studies, the unique effects of homelessness on birth outcomes matched or outweighed those of any other adverse circumstance.

The effects of homelessness on child outcomes continue well after birth (Weinreb et al., 1998). The instability that comes with parenting when a family is homeless exacerbates risks for adverse child health outcomes (Perlman et al., 2012). Women who are homeless are less likely to attend well-baby checkups and initiate or continue breastfeeding (Richards, Merrill, and Baksh, 2011). Breastfeeding provides infants with long-term protective effects in the risk of allergies, obesity, eczema, and type 1 and type 2 diabetes (Ip et al., 2007). Children who are homeless are twice as likely to be in fair or poor health, and they have higher rates of asthma and other chronic conditions (David, Gelberg, and Suchman, 2012; Shinn et al., 2008). Overall, compromised health status and unmet health needs exert a negative effect on child development (Richards, Merrill, and Baksh, 2011). Little empirical evidence exists that explores the effect of homelessness on a parent-child relationship. Using developmental attachment theory, however, David, Gelberg, and Suchman (2012) present a compelling argument about how homelessness disrupts the major developmental parenting tasks in early childhood. Secure attachment, the foundation of children's healthy social-emotional development, is predicated upon a safe, secure, and predictable environment that enables a parent to respond in a consistent manner to a child's needs. The circumstances of homelessness work against parents providing both the physical and emotional environment to support secure attachment.

The effects of housing insecurity on maternal and child health are more difficult to study than the effects of homelessness. A study by Park, Fertig, and Allison (2011) compared maternal reports of health outcomes for children who were homeless, children in doubled-up settings, and children of low-income but housed families, using data from the Fragile Families Study. Elevated prevalence of physical disability among homeless children was the sole difference that emerged across the three housing groups in that study. Lack of other health differences may, however, reflect that the study controlled for LBW of children in the sample. Because homeless children were significantly

more likely to have been born at LBWs than housed children and LBW was predictive of later health deficits, this analytic approach may have obscured actual differences (Park, Fertig, and Allison, 2011). In contrast to the findings of Park, Fertig, and Allison (2011), a study by Children's Health-Watch (2011), "Behind Closed Doors: The Hidden Health Impacts of Being Behind on Rent," found a higher prevalence of poor physical health and developmental delay among children whose families were behind on rent compared with children who had stable housing. In addition, mothers who experienced being behind on rent were almost as likely to have experienced poor health or depression and were more likely to have foregone healthcare or food expenditures to pay rent compared with mothers in sheltered homeless families. These findings support the hypothesis that the psychological stress of poor housing has an effect across generations, affecting both maternal and child health.

Pregnancy As a Factor That Increases the Risk of Homelessness

The importance of developing housing programs to promote healthy birth outcomes and targeting such programs to pregnant women is motivated by the changing demographic composition of homelessness. In 2012, 38 percent of the total homeless population in the United States consisted of homeless people in families (Emergency Shelter Commission, 2012). In Boston, largely as a result of the high cost of housing and the tight rental housing market, the proportion is higher. In 2011, 49 percent of Boston's homeless population was family members rather than individual adults (Emergency Shelter Commission, 2012). Although homelessness has decreased during the past 5 years, the decline has been relatively less among people in families, 3.7 percent, compared with the decline of 6.8 percent among homeless individuals. Overall, the number of families in shelter has increased by approximately 29.0 percent during the 3-year period from 2007 to 2010.

Descriptions of homeless women currently do not ascertain pregnancy status. The demographic characteristics and pattern of housing instability of homeless families suggest that pregnancy is a factor that moves women and their families from precarious housing situations to homelessness, however. A typical homeless family is a young mother with children less than 6 years old and an income below the federal poverty level (Bassuk, 2010; Buckner, 2008; Perlman et al., 2012). For these families, and for pregnant women without children, homelessness is usually preceded by periods of housing instability characterized by frequent moves and "doubling up" with friends and relatives. Based on data from the 2010 Annual Homeless Assessment Report to Congress, 43 percent of families in shelters became homeless after their living arrangements with family and friends were no longer tenable (Cortes et al., 2011; Samuels, 2010). The increased need for space and the disruption of normal routines that accompany the birth of an infant may be the critical factors that make a previously unstable living situation untenable (Weitzman, 1989).

Housing Partnerships To Promote Healthy Child Development

Partnerships between local housing authorities and other governmental and private organizations have been used to support housing stability among high-risk populations. Most of such partnerships historically have been targeted at single chronically homeless individuals and, more recently, special populations, such as individuals with substance abuse, HIV infection, and mental illness, whose care needs are more expensive when not stably housed (Rickards et al., 2010). Partnerships

that affect children fall into two categories: those focused on improving environmental conditions, such as HUD's Healthy Homes Initiative to reduce indoor toxins and allergens that trigger childhood asthma (Krieger, 2010; Krieger and Higgins, 2002; Saegert et al., 2003) and those that address family homelessness (Cortes et al., 2012). The partnerships targeted to homelessness among families are most relevant to this case study. The common characteristic of these partnerships is linkage of housing and human services. A 2012 report that Abt Associates prepared for U.S. Department of Health and Human Services describes 14 innovative programs that integrated housing and human services to better serve homeless and housing-insecure families (Cortes et al., 2012). All the programs described in the report integrated intensive case management with housing support, but they differed in respect to the subpopulations they served and the extent to which they focused on outcomes other than housing stability (Cortes et al., 2012). No programs targeted medically at-risk pregnant women or reported partnerships with a local public agency. Extant literature indicates that HSiH is unique in its focus on medical risk for poor birth outcomes and its explicit long-term goal to positively influence birth outcomes. It represents a new type of partnership to support housing stability and the health of women and infants. Understanding the development and implementation of this partnership will contribute to the dialogue around using the HiAP framework to promote the health of vulnerable women and children.

Methods

We present a descriptive case study of an interagency collaboration that used the HiAP framework. To be specific, we describe the collaboration between a city's public health department and its housing authority to implement a program to improve birth outcomes. A case study approach is well suited to the aims of this study. It seeks to answer "how" and "why" questions; to be specific, it can be used to describe an intervention or phenomenon and the context in which it occurred (MacDorman and Mathews, 2011; Yin, 2009). Its strengths lie in its ability to incorporate a variety of types of evidence and present complex phenomena in a way that is easily understood by a broad audience. This approach is particularly important given the novelty of the HSiH program. The ability to analyze documents and to conduct in-person interviews allowed for an in-depth review of the evidence and enabled us to elucidate some of the details of the collaboration that led to the development of the HSiH program.

Data Sources

We used three of the six main sources of evidence highlighted in case study literature: program documents, archival records, and stakeholder interviews. Yin (2009) emphasizes the importance of program documents for corroborating and augmenting other sources of evidence. In this case study, program documents included the memorandum of agreements (MOA), which documented the specifics of the interagency collaboration; press releases; newspaper articles; meeting agendas; and forms that program staff and participants used. Archival records included service records showing the number and characteristics of women participating in the program during the first year of implementation. The stakeholder interviews included eight in-depth interviews with key informants from the BPHC, BHA, the Emergency Shelter Commission, and two focus groups with HSiH frontline staff. We conducted the stakeholder interviews and focus groups in February 2013, more than

a year from the program's start date. We selected key informants from all the participating agencies and included individuals involved in both management decisions and day-to-day implementation. The key informants included four members from the BPHC, three members from the BHA, and the Director of the Emergency Shelter Commission. From BPHC, we interviewed the Director of the Bureau of Child, Adolescent and Family Health, who is responsible for management decisions and program oversight of the city's broad array of maternal and child health programs addressing birth outcomes, early childhood well-being, youth health and development, women's health, and violence prevention. We also interviewed three program managers of the Healthy Baby/Healthy Child and the Father Friendly Initiative program, who were responsible for daily operations and supervision of case managers, one of whom also served as the primary liaison with BHA staff. From the BHA, we interviewed the Director of Operations of Property Management at BHA, who oversees the functioning of all of physical BHA housing developments; the Director of Occupancy, who oversees all the leased housing programs; and the Assistant Director of Occupancy, who provides supervisory support to BHA staff processing housing applications. We also interviewed the Director of the Emergency Shelter Commission, who is responsible for management and strategic planning of the city's programs for homeless families and adults in crisis. Interviews of HSiH participants were not included in this examination of the big picture collaborative efforts of BHA and the BPHC, but they are currently being conducted for separate program evaluation analyses.

Analytic Approach

Analysis of data covers the period beginning in the spring of 2011—when the idea of addressing disparities in birth outcomes through a supported housing program was first discussed—through the fall of 2012, which marked the first year of enrollment of participants into HSiH. We include significant background factors mentioned by interviewees and activities related to the planning and implementation of the partnership during the program's first year.

Program documents and archival records were obtained and catalogued chronologically. The interviews and focus groups were audiotaped and transcribed. Common themes were identified. Transcript review began after two interviews, which enabled us to continuously refine the probe questions, develop themes, and monitor for thematic saturation (Guest, Bunce, and Johnson, 2006). To assess data validity, we triangulated results, comparing interviews with members of different organizations and interviews with members who held different positions within the same organization (MacQueen et al., 2008; Patton, 1999). The accuracy of the sequence of events was cross-checked with people known to hold different roles in the program's development. Major themes were identified from analysis of the case with the aim of capturing the complexity of interagency collaborations that led to the successful development and implementation of the HSiH.

Results

The results are presented in three sections. The first section describes the contextual factors leading to the development of HSiH, including the key players and influential historical factors. The second section outlines the chronology of the partnership between BPHC and BHA that led to the creation of HSiH. The last section analyzes major processes and factors that influenced the actualization of HSiH, including facilitating factors for program success and ongoing challenges.

Contextual Factors

The key players (BHA and BPHC) and the historical influences that provided the setting for HSiH are described in the next section.

Key Player: BHA

The BHA is the largest landlord in Boston and the largest public housing authority in New England. As such, the BHA houses approximately 10 percent of the city's residents through its programs. Public housing was established to provide decent and safe rental housing for eligible low-income families, elderly people, and people with disabilities. BHA's 64 developments offer different sizes and types of public housing, including 27 traditional family developments that range from town-homes to highrise apartments. BHA has housing locations in all major neighborhoods of the city. In addition to providing conventional public housing, the BHA also provides more affordable housing through the administration of several rental assistance programs.

The BHA currently owns approximately 11,300 units of housing in Boston and houses about 27,000 people under the public housing program. Residents pay approximately 30 to 32 percent of their gross income toward rent. The BHA also helps provide housing to approximately 25,000 people under their rental assistance program. This program administers approximately 13,000 rental assistance vouchers that enable families to rent houses or apartments in the private market and apply a rental subsidy to their rent. With this assistance, residents are able to pay approximately 30 to 40 percent of their income toward rent, with the BHA paying the remainder (Meneses, 2013).

Key Player: BPHC

The mission of the BPHC, the city's health department, is to protect, preserve, and promote the health and well-being of Boston residents, particularly those who are most vulnerable. BPHC works with academic medical centers, community health centers, and government and community agencies and leaders to plan health policy, conduct research, and provide residents with access to health promotion and disease prevention. Core activities include communicable disease surveillance and control, maternal and child health monitoring, substance abuse counseling, homeless services, environmental health monitoring, and emergency medical services. With an operating budget of slightly less than $70 million, BPHC operates many public and community health programs, employs 1,200 staff, and receives more than $20 million in annual federal, state, and private grant funding. Within BPHC, the Bureau of Child, Adolescent and Family Health, Division of Early Childhood and Family Health is home to the perinatal programs (Boston Healthy Start Initiative and Healthy Baby/Healthy Child) that work directly with women to support healthy pregnancy and birth outcomes (Allen, 2013).

Historical Factor: Focus on Pregnancy, Birth Outcomes, and Disparities at BPHC

Persistent health inequities are a primary target for BPHC activities. Disparities specifically in perinatal[3] health have been an ongoing focus of BPHC programs and initiatives. Despite concerted

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[3] The perinatal period commences at 22 completed weeks (154 days) of gestation and ends at 7 completed days after birth (WHO, n.d.).

efforts to increase access to and engagement in high-quality, culturally appropriate prenatal care, premature births, the major contributor to infant mortality and developmental disability, remained highest in Boston's Black community (BPHC, 2009, 2011b). The BPHC health equity plan developed during 2010 and 2011 placed a new emphasis on decreasing disparities in birth outcomes. The first of the new health equity goals was to reduce the LBW rate among Boston infants by reducing the gap between the White and Black LBW rate by 25 percent. Public health leadership believed that achievement of these goals could make a significant difference in improving the health and well-being of the city's most vulnerable children and families.

BPHC had in place two major programs designed to combat birth outcome disparities before HSiH: the federally funded Boston's Healthy Start Initiative (BPHC, 2012) and its Healthy Baby/Healthy Child home-visiting program (BPHC, 2011a). The federally funded Boston Healthy Start Initiative seeks to address disparities in perinatal health by ensuring that pregnant and postpartum[4] Black women and their infants receive high-quality care. It provides case management, health education and interconceptional care at neighborhood health centers and community-based agencies. The program recruits women during pregnancy and follows the family for up to 2 years postpartum. Healthy Baby/Healthy Child is a home-visiting program designed to promote positive birth outcomes and family unity to pregnant and parenting families with a child less than 5 years old. Public health nurses, advocates, and social workers help prepare parents for healthy deliveries and successful parenting within the scope of their own culture and language. Frontline staff from these programs consistently identified housing instability as one of the biggest issues facing their clients and one that their programs were unable to affect.

Historical Factor: Boston's Housing Market

Rental vacancy rates have continued to fall in Boston since the spring of 2010. In 2011, only 4.4 percent of rental stock was vacant, a 9-year low (Bluestone and Billingham, 2011). This limited rental market created an upsurge of rental prices. Between 2011 and 2012, the average monthly rent in Boston jumped more than 7 percent to nearly $1,900, making the city's rental housing market the fifth most expensive in the country and the third most expensive for a metropolitan city (Adams, 2012; Bluestone and Billingham, 2011). For many, especially low-income families, these increasing rents present an untenable living situation and threaten housing stability.

Historical Factor: Homelessness Policy and the Organization of Homeless Services

In Boston, two agencies play key roles in addressing homelessness: BHA, with its provision of housing units, and the Emergency Shelter Commission, which is responsible for coordinating interagency strategic planning, public policy advocacy, and services for constituents who may be at risk of, or experiencing, homelessness. Two recent changes in the city's housing environment created the conditions that supported the development of HSiH. First is the shift in homelessness policy from a "housing first" approach that focused on the specific problems of adult chronic homelessness (Greene, 2013) to a supported housing approach that provides more comprehensive services and addresses specific housing needs of special populations (for example, veterans and people with HIV/AIDS, substance abuse issues, and mental illness). This new approach, which

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[4] The postpartum period refers to the period immediately after delivery (WHO, 2010).

was implemented in 2008, aims not only to create more stable living environments for vulnerable populations, but also to reduce use of high-cost medical care. Pregnant women who have existing medical risks associated with poor birth outcomes were not initially identified as a special population. Providing priority access to housing to this vulnerable group is consistent with the approach, however. Second, changes in the organizational structure of homeless services played an important role in the creation of HSiH. In 2010, the city's Emergency Shelter Commission was reorganized to fall administratively under the responsibility of BPHC, recognizing the close connection between housing and health. It had previously resided in the Mayor's Human Services Cabinet. As important, its offices moved to a new physical location on the same city block as the BPHC in 2011. This restructuring increased the interactions between the city's public health leadership team and Emergency Shelter Commission staff. It enabled them to play an important bridging role in promoting BHA awareness of an interest in the issue of homelessness among pregnant women.

Chronology of Events

The following section describes the chronology of events, beginning in the spring of 2011 and ending in the fall of 2012, which supported the collaboration between the BHA and BPHC and led to the implementation of HSiH. This information is summarized in exhibit 2.

Establishing the BHA-BPHC Partnership: Spring of 2011

The first concrete steps toward developing HSiH occurred in the spring of 2011. In a meeting with the Executive Director of BPHC, the Director of the Emergency Shelter Commission raised the idea of a program to address housing instability and birth outcome disparities based on experience with supported housing interventions. Provision of supported housing and case management was being used to improve health outcomes among other vulnerable populations, but it was a novel strategy to achieve the BPHC's goal of reducing birth outcome disparities. The Executive Director of BPHC requested a meeting with senior BHA leadership to discuss the topic. Less than a month later, the directors of BPHC and the Emergency Shelter Commission met with senior leadership at BHA to propose the idea of an interagency program to address housing instability among women with high-risk pregnancies. The BHA warmly received the proposal and offered to give prioritized placement to 75 eligible women in their traditional family housing developments, effectively bypassing multiyear waitlists for subsidized housing and moving women to the top of the list for the type of housing unit for which they qualified. In turn, BPHC would provide staff to deliver intensive case management services to program participants. These staff would not only link women to services such as food stamps and health insurance but also provide the needed support to maintain stable tenancy, thereby supporting one of BHA's objectives.

HSiH Program Planning: Summer of 2011

During the summer of 2011, BPHC program staff met with BHA to solidify program details and administrative protocols. The BHA began drafting an official MOA; the BPHC established program parameters and eligibility criteria. Planning for HSiH progressed quickly, largely because of the ability of the agencies to draw from existing resources and avoid the need for new funding. BPHC turned to its existing perinatal programs and created a dedicated unit within Healthy Baby/Healthy Child home-visiting program to implement HSiH. The Healthy Baby/Healthy Child program has a

Exhibit 2

Chronology of Events

Historical factors	Persistent health inequities are a primary target for BPHC activities. Birth outcome disparities persist despite BPHC programs aimed to improve prenatal care.
	2008: Integrated housing and support services become focus of homelessness initiatives in Boston.
	2010: Emergency Shelter Commission reorganized under BPHC.
	2010: Bureau of Child, Adolescent and Family Health at BPHC incorporated Life Course Theory into its mission statement.
	2010–2011: New BPHC strategic plan developed. Identified improving birth outcomes and reducing racial disparities in low birth weight as the first of three key public health priorities.
	Director of Emergency Shelter Commission proposed the idea of a program to address dual goals of homelessness and birth outcome disparities to the Executive Director of BPHC.
Spring of 2011	Executive Director of BPHC requested a meeting with senior BHA leadership.
	Directors of BPHC and Emergency Shelter Commission met with senior leadership at BHA to propose idea of interagency program to address housing instability issues for women with high-risk pregnancies.
	Proposal was immediately accepted and planning for HSiH began.
	Executive Director of BPHC met with Director of Child, Adolescent and Family Health at BPHC, who met with other BPHC perinatal program staff to discuss possible parameters and eligibility criteria.
Summer of 2011	MOA developed by BHA legal department with input from BHA leadership and program staff for the new collaborative program.
	BPHC program staff met with BHA periodically throughout summer to solidify program details and administrative protocols.
	Additional collaborators brought in. City of Boston's Department of Neighborhood Development contacted to provide housing application training for HSiH case managers.
	Boston University School of Public Health provided additional training for case managers and evaluation services for HSiH.
October 2011	First group of HSiH participants enrolled.
November 2011	Mayor officially announced HSiH program at press conference.
December 2011	MOA between BHA and BPHC finalized.
October 2012	Year 1 of HSiH completed. 38 HSiH participants successfully placed in BHA housing.

BHA = Boston Housing Authority. BPHC = Boston Public Health Commission. HSiH = Healthy Start in Housing.
MOA = memorandum of agreement.

full-time staff of about 46 and serves 1,000 clients at any one time with a yearly budget of approximately $3.9 million. The new HSiH unit oversees eligibility screening and enrollment and is responsible for delivering a newly designed model of services tailored to homeless and housing-insecure pregnant women. HSiH eligibility criteria were designed to meet BHA housing requirements and identify women at risk for a poor birth outcome. To be eligible, women need to be pregnant at the time of referral, have a Boston address as their last known residence, be homeless or at risk for homelessness based on HUD definitions, and have an established medical risk for, or a previous history of, a poor birth outcome. Unlike other perinatal case management programs in

which participation is optional, to be eligible for priority access to housing, women were required to sign a contract affirming their intent to comply with all HSiH requirements, including ongoing participation in intensive case management for 12 months. HSiH case managers also received special training to work with HSiH clients. The city's Department of Neighborhood Development provided educational sessions that focused on the specific barriers that homeless populations face and the unique challenges that can arise when working with them, BHA staff provided training on how to complete the lengthy and detailed housing application, and collaborators from the Boston University School of Public Health provided training to implement a case management approach that integrated motivational strategies within a standardized curriculum designed to build participants' problem-solving skills.

HSiH Implementation: Fall of 2011–Fall of 2012

The fall of 2011 brought HSiH to fruition. Although the MOA was not officially completed until December, by October the first potential HSiH candidates enrolled in the program and began the processes of applying for BHA housing with their HSiH case managers. In November 2011, the Mayor of Boston, Thomas Menino, held a press conference to officially announce HSiH along with the new Boston Task Force on Improved Perinatal Clinical Care (City of Boston Mayor's Office, 2011). The press conference and project launch received front-page coverage in the *Boston Globe*, the city's largest daily newspaper (Lazar, 2011). During this period, program staff from BPHC and BHA continued to communicate regularly to improve procedures related to completing and processing housing applications. At the 1-year evaluation point in October 2012, HSiH had successfully placed 38 HSiH participants in BHA housing. The program is ongoing and continues to enroll new participants. Detailed results of the first year implementation, including the number of women referred, the number who were eligible, the number who completed the BHA application process, and the number placed in housing, are described elsewhere (Allen, Feinberg, and Mitchell, 2013).

Major Processes and Factors That Influenced the Actualization of HSiH

From the analysis of case study data, we identified three factors that were instrumental in developing and maintaining the collaboration between BHA and BPHC, and we identified three factors that presented challenges to the effective implementation of HSiH.

Mutual Benefit and Well-Aligned Objectives

First and foremost, HSiH offered a mutual benefit to the BHA and BPHC and was designed to achieve pre-existing objectives of the respective organizations.

> The proposal was matchmaking that aligned the strengths of the MCH (maternal and child health) work of the [BPHC] with the housing stock and the need for some supported housing of the BHA.
> —Emergency Shelter Commission, key informant

BPHC and their clients benefited from the access to reserved BHA housing units. Unmet housing need of low-income minority mothers and the detrimental effect of unstable housing on maternal and child health outcomes was a key concern for the BPHC. Thus, the HSiH collaboration enabled the BPHC to better serve its clientele and work toward their public health objective of reducing racial birth outcome disparities and supporting women's health across the lifespan.

For the mother it becomes an interconceptional[5] intervention, looking forward to the next pregnancy. For the child, it means starting life not homeless or in very unreliable housing … you can consider this asthma prevention, obesity prevention. So it's really this global goal of improved long-term health.

—BPHC, key informant

The BHA also benefited from the supports provided to HSiH participants. On the average, more than 20 percent of BHA's residents have a balance due at the end of each month, highlighting the challenge of stable tenancy. HSiH case managers meet with participants to complete and implement a family development plan that includes goals related to personal development. In addition, case managers deliver a problem-solving intervention weekly specifically guided to increase self-efficacy regarding issues around housing and economic self-sufficiency. Because HSiH case managers continue to meet with their clients after they have been housed, the HSiH case managers serve as an additional point of contact that BHA can access if difficulties arise about the course of a tenancy.

About 75% of all the new admissions are homeless families with no support … and their tenancies are difficult to maintain because people are housed but that's just one piece and the support system is not there … it's the same parents we are going to be helping anyway but they will have some support system and help them continue their tenancy and continue improving other personal needs.

—BHA, key informant

BHA considered this added support from HSiH case management as a significant contribution to their goal of providing stable housing for low-income Boston residents and to "serve as catalysts for the transformation from dependency to economic self-sufficiency" (BHA, 2013a).

Excellent Working Relationship Built on Years of Previous Collaboration

The second key factor that contributed to the successful development of HSiH was the excellent working relationship between the BPHC and BHA. All key informants spoke highly of their collaborators from other agencies.

The folks at BHA, they have been very committed to the process.

—BPHC, key informant

They [BPHC] are great, they are keeping up with everything and they do their follow up and it's awesome compared to other programs. With them we don't have to worry because they are on top of their game.

—BHA, key informant

This positive relationship was built on years of previous collaboration between BHA and BPHC and a shared commitment to serving vulnerable Boston residents. An example of a previous collaboration is Breathe Easy at Home, a multiagency collaboration that strives to improve communication about asthma management through the efforts of local health providers, public health agencies, housing agencies, and nonprofit organizations (City of Boston, 2013).

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[5] The interconceptional period is the time between the conception of one child and the conception of a subsequent child. More simply, it is the time between pregnancies.

The housing authority and the public health commission have really a long history of partnering on a lot of different kinds of programs and initiatives. Since we've worked together on so many projects over a decade or more, we think about them as partners and they think about us as partners … these kinds of collaborations are natural outgrowth of the stuff we have done in the past.

—BHA, key informant

Dual Role of LCT: Motivation and Shared Framework for Program Success

LCT was not only a motivating factor but also a common framework that was vital to the development of HSiH, and it strengthened the agency's commitment to HSiH goals. For the BPHC, LCT is recognized as an integral part of their approach to public health work outlined in their mission statement, including "the critical impact of social factors and conditions on health," and, "the cumulative impact of life experience on the health of individuals, families, and communities" (BPHC, 2013). The potential for a social determinant, such as housing, to affect multiple health outcomes, and perhaps multiple generations, provides the rationale for reserving precious BHA housing resources for this specific population. Indeed, LCT was explicitly part of the HSiH program model. HSiH thus adheres to BPHC's approach and serves as an excellent example of LCT in practice.

[HSiH] was presented as an explicit part of Life Course Theory. The rationale for it was that there are lots of deserving groups that could be sent to the top of the list for housing but the view of putting mothers to the top of the list is that you have the potential to have impact on two generations maybe even three… the ability to make the case that this bears this special fruit that you don't get with any other people with whom you might intervene was very important.

—BPHC, key informant

LCT has not been an explicit conceptual framework for BHA's work in the past. Early in the development of this project, however, BPHC invited BHA staff to participate in the Partnership to Eliminate Disparities in Infant Mortality—Action Learning Collaborative. Boston serves as one site for this national learning collaborative. The Partnership to Eliminate Disparities in Infant Mortality—Action Learning Collaborative workshop introduced BHA staff to LCT concepts and broader discussions about the effect of racism, discrimination, and poverty within that framework.

That really cemented the relationship because it grounded it in a kind of mutual, a shared vocabulary about stress and why we wanted to do this so much why this was so important.

—BPHC, key informant

Need for Accurate Dissemination of Program Information and Rationale

The greatest challenges to implementing HSiH were not issues related to collaboration, but with effectively integrating the program and explaining its specific purpose to the greater landscape of homeless services in Boston. Although BHA has set a precedent for providing housing or other preferential treatment to specific subpopulations—for example, people displaced because of a disaster and people who are experiencing domestic violence (BHA, 2013b)—preferential treatment has never been extended to pregnant women, as a specific subpopulation. An initial challenge came from within the larger network of homelessness advocates in Boston. For these organizations,

the rationale for including women who were not currently homeless but were at high risk for homelessness was not clear. Some believed that scarce resources should be devoted to those in the direst housing situations. The Emergency Shelter Commission, which had a long history of working with homeless advocates, played a key role in explaining the rationale for including high-risk pregnant women who were at risk for homelessness in the eligible pool of HSiH participants. As the Director of the Emergency Shelter Commission explained, "Hopefully housing stability [can be seen] as a clinical consideration in the birth outcomes and health outcomes for MCH [Maternal and Child Health populations]."

Difficulty in Assessing BHA Eligibility at Program Entry

Another challenge was related to the extremely high value that permanent, stable housing has in the lives of low-income, pregnant women. A number of women who were in very stressful housing situations chose to go through the screening and application process despite not meeting BHA's eligibility requirements such as Boston residency and criminal background checks. These women were initially thought to be eligible but later were found to be ineligible upon final BHA review. BHA denial was difficult for HSiH case managers who devoted considerable time to assisting clients with housing applications; they understood the effect of housing stress on their clients' lives. The effect of their application denial was magnified because of the absence of other housing options. To address this problem, training sessions that explicitly lay out BHA regulations were developed to train BPHC staff. Yet, women's motivation to secure a safe and stable environment for themselves and their children makes this a recurrent issue and demonstrates the importance of the program and the need to develop creative solutions to support at-risk women who may not be eligible for traditional public housing programs.

Need for Increased Efficiency in Housing Placement

Other challenges have centered on increasing program efficiency in housing placements. The time from program referral to housing placement needs to be shortened to have maximal effect on birth outcomes. Because the average time to housing placement was 5 months, some women were not established in permanent, stable housing until after their child was born. Collaborative performance-improvement strategies that leverage the strength of the partnership may help the agencies further streamline the housing application and review process.

Lessons Learned

The implementation of HSiH and its explicit focus on healthy birth outcomes is an example of putting HiAP into action. It can serve as a model for other cities and states that wish to pursue similar strategies. The HiAP framework has grown out of the recognition that to achieve real gains in population health, health considerations must be integrated into policymaking and program development across sectors. The BPHC, in collaboration with the BHA, used this framework to promote healthy birth outcomes within the context of housing policy, potentially improving child health outcomes and generating cost savings by decreasing premature and LBW births.

Successful collaborations are essential to the implementation of HiAP. As such, the literature on interorganizational relationships (IORs) provides a structure to elevate the specific lessons learned

from the implementation of HSiH to more generalizable principles that could guide other agencies that want to adopt the HiAP framework. IOR theory supports the idea that collaboration leads to a more comprehensive coordinated approach to persistent complex issues (Glanz, Rimer, and Viswanath, 2008). Several factors promote IOR formation, including three constructs that were integral to HSiH's implementation and would be applicable to other similar endeavors: recognition of the need for interdependence, proven success in previous collaborations, and clear and mutually shared goals (Glanz, Rimer, and Viswanath, 2008; Oliver, 1990).

Recognition of the Need for Interdependence and Presence of Available Resources

For cross-sectorial collaborations to be successful, agencies need to believe that they will accrue direct benefits through collaboration (Rigby, 2011). In HSiH, both agencies believed that they could advance program goals that they had not been successful in achieving alone. For the BHA, maintaining stable tenancy among families with young children has been a persistent issue; for the BPHC, improving birth outcomes has been a long standing but difficult to obtain goal. After a clear benefit from the collaboration has been established, at least one member of the IOR must agree to divert some of their resources to the effort. The collaboration between the BHA and BPHC was supported by the agencies' ability to draw from each other's existing resources and avoid the need for new funding, a common challenge in cross-agency collaborative policy (Rigby, 2011).

Proven Success in Previous Collaborations

The role of previous collaboration in successful IOR formation is important because it is often through these well-established networks that agencies judge the trustworthiness and value of potential partners (Bryson, Crosby, and Stone, 2006; Glanz, Rimer, and Viswanath, 2008). BHA and BPHC's collaboration on programs such as Breathe Easy at Home made the HSiH collaboration a relatively smooth process and contributed to its success. For agencies without such a history of previous collaboration, developing the relationships and procedures needed to build consensus may prove challenging (Glanz, Rimer, and Viswanath, 2008). In this setting, partnerships are more likely to emerge incrementally with informal arrangement that do not require higher levels of trust (Bryson, Crosby, and Stone, 2006).

Clear and Mutually Shared Goals

The HiAP framework requires that agencies that have missions unrelated to health understand how their activities affect the health of their constituents. Providing agencies in nonhealth sectors the opportunity to recognize the health effect of their work is an important and replicable strategy that can be used to build mutually shared goals (Rigby, 2011). By inviting the BHA to participate in the Partnership to Eliminate Disparities in Infant Mortality—Action Learning Collaborative, the BPHC did exactly that. Learning about LCT helped BHA staff understand the relationship between housing stress and birth outcomes and strengthened their commitment to the HSiH collaboration. Establishing mutually agreed-upon goals was not difficult for the BHA and BPHC. Rather, the challenge has come from the processes required to reach those goals. BHA housing regulations, most often the 3-year residency requirement and the precise definition of homelessness, prohibited pregnant women with medical risk and high levels of housing stress from obtaining housing through the program. This type of challenge—arising from differing eligibility standards across organizations—

has been particularly difficult in collaboration involving governmental agencies that have little flexibility to change program rules (GAO, 2000). An understanding of potential tensions and an agreement from the start regarding program eligibility rules can help mitigate this issue.

Conclusion

This case study of the Healthy Start in Housing program illustrates a successful collaboration between a local public health agency and a public housing authority. It provides insight into how two diverse stakeholders united around an innovative policy to address a longstanding public health problem and improved their ability to meet agency-specific objectives. This successful collaboration was predicated upon recognizing the need for interdependence, having clear and mutually shared goals, and having a history of working together on other projects. We hope that this case study will encourage replication of programs similar to HSiH. Evaluation of the outcomes of women participating in HSiH is planned and will provide valuable information about program effects.

Acknowledgments

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Moving Beyond Neighborhood: Activity Spaces and Ecological Networks As Contexts for Youth Development

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Abstract

Many scholars, policy analysts, and practitioners agree that neighborhoods are important contexts for urban youth. Yet, despite decades of research, our knowledge of why and how neighborhoods influence the day-to-day lives of youth is still emerging. Theories about neighborhood effects largely assume that neighborhoods operate to influence youth through exposure-based mechanisms. Extant theoretical approaches, however, have neglected the processes by which neighborhood socioeconomic contexts influence the routine spatial exposures—or activity spaces—of urban residents. In this article, we argue that exposure to organizations, institutions, and other settings that characterize individual activity spaces is a key mechanism through which neighborhoods influence youth outcomes. Moreover, we hypothesize that aggregate patterns of shared local exposure—captured by the concept of ecological networks—are influenced by neighborhood socioeconomic characteristics and are independently consequential for neighborhood youth. Neighborhoods in which residents intersect in space more extensively as a result of routine conventional activities will exhibit higher levels of social capital relevant to youth well-being, including (1) familiarity, (2) beneficial (weak) social ties, (3) trust, (4) shared expectations for pro-social youth behavior (collective efficacy), and (5) the capacity for consistent monitoring of public space. We then consider the implications of ecological networks for understanding the complexities of contextual exposure. We specifically discuss the role of embeddedness in ecological communities—that is, clusters of actors and locations that intersect at higher rates—for understanding contextual influences that are inadequately captured by geographically defined neighborhoods. We conclude with an overview of new approaches to data collection that incorporate insights from an activity-space and ecological-network perspective on neighborhood and contextual influences on youth. Our approach offers (1) a new theoretical

Abstract (continued)

approach to understanding the links between neighborhood socioeconomic characteristics and youth-relevant dimensions of neighborhood social capital; (2) a basis for conceptualizing contextual influences that vary within, or extend beyond, traditionally understood geographic neighborhoods; and (3) a suite of methodological tools and resources to address the mechanisms of contextual influence more precisely. Research into the causes and consequences of urban neighborhood routine activity structures will illuminate the social processes accounting for compromised youth outcomes in disadvantaged neighborhoods and enhance the capacity for effective youth-oriented interventions.

Introduction

The image of urban children growing up in economically deprived neighborhoods has spurred more than two centuries of reform and intervention aimed at ameliorating conditions thought to be harmful to youth. Alongside these initiatives, social scientists, policymakers, and health researchers have been engaged in a longstanding project to illuminate the mechanisms through which residential environments shape developmental outcomes (Elliott et al., 1996; Leventhal and Brooks-Gunn, 2000). These efforts have yielded important advances in uncovering the processes that account for variation across urban contexts in the experiences of youth (Sampson, Morenoff, and Gannon-Rowley, 2002).

Despite the substantial promise of neighborhood research, the field has been hampered by a lack of theoretical and empirical attention to the fundamental mechanism implied in most neighborhood theory—exposure. Theories of neighborhood effects predominantly posit that the causal influence of environments operates through exposure to neighborhood processes relevant to development. Yet, with few exceptions, conventional approaches to neighborhood effects do not theorize the individual-level spatial-exposure process or the collective implications of exposure patterns for neighborhood outcomes. Instead, residential location in a geographically defined neighborhood is assumed to lead to equivalent exposures across residents. The neglect of exposures has deflected attention away from the person-environment dynamics that actually channel contextual influences (Wikström et al., 2012).

In this article, we first describe a theoretical approach to neighborhood-based spatial exposures that elucidates the link between features of neighborhood disadvantage and social processes thought to influence the health and well-being of youth. We specifically argue that residence in a socioeconomically disadvantaged neighborhood shapes characteristics of individual-level *activity spaces*—that is, the set of locations and settings to which residents are regularly exposed. Individuals who reside in disadvantaged neighborhoods are less likely to have access to high-quality local institutions, organizations, and amenities, with direct implications for residents, in general, including youth. These deficits are compounded by the implications of neighborhood influences on activity spaces for the likelihood that residents share routine exposures. We hypothesize that the collective

structure of shared activity-space exposures—captured by the concept of an *ecological* (or *eco-*) *network*—helps explain the link between key aspects of neighborhood disadvantage—particularly concentrated poverty and racial segregation—and a variety of dimensions of neighborhood social capital relevant to youth development.

Eco-network structures characterized by extensive overlap in conventional routines are expected to increase neighborhood-level (1) familiarity, (2) beneficial ("weak") social ties, (3) trust, (4) shared expectations for pro-social youth behavior (collective efficacy), and (5) the capacity for consistent monitoring of public space. These dimensions of social organization, particularly the proximate effects of trust and informal social control (collective efficacy), have been identified as significant neighborhood influences on youth development (Sampson, 2012). In turn, increasingly interconnected eco-network structures are expected to confer benefits to entire neighborhoods as norms and expectations for the socialization and supervision of youth are spread and reinforced through repeated interactions of actors and neighborhood-based settings. To date, however, extant neighborhood theory has neglected the spatial-exposure mechanisms that collectively account for neighborhood socioeconomic influences on critical social processes.

Our second objective is to draw out the logic of the eco-network concept for understanding contextual influences that extend beyond the boundaries of conventionally defined geographic neighborhoods. Individual activity spaces often encompass locations that are not contained within neighborhoods of residence. Individuals may cluster in non-residential activity spaces in potentially important ways. For instance, a magnet school or employment location may draw actors from different neighborhoods together, independently influencing contextual exposures. We term clusters of activity locations and actors that intersect at higher rates *ecological communities* and argue that they are relevant sociospatial-exposure contexts in their own right that have been virtually ignored in contextual research. The extent to which ecological communities overlap with neighborhood boundaries is unknown, yet most neighborhood research implicitly assumes such sociospatial correspondence.

We conclude with an overview of new approaches to data collection and analysis, facilitating research on urban activity spaces and ecological networks. New techniques for relatively unobtrusive collection of Global Positioning System (GPS) data on daily travel paths and for ecological momentary assessment (EMA) of a variety of youth-relevant measures, such as activities, social interactions, mood, and behavior, in real time will afford new opportunities for research on neighborhood and contextual influences on youth.

Conventional Approaches to Neighborhood-Effects Research

We begin with an overview of neighborhood research, emphasizing the development of theory and empirical findings on the role that neighborhood socioeconomic characteristics play in influencing youth development and the evolving understanding of the mechanisms thought to channel these influences. Emerging from the work of early 20th century urban researchers, pioneering studies of "neighborhood effects" demonstrated the potentially significant role of social and economic characteristics of youths' residential contexts in influencing a range of outcomes, including crime and health (Faris and Dunham, 1939; Shaw and McKay, 1942). The seminal work of Shaw and

McKay (1942) articulated the "social disorganization" model of crime, emphasizing the role of neighborhood-level poverty, instability in residential tenure, and ethnic/racial heterogeneity in limiting the capacity of neighborhoods to realize common goals. Mid-century critiques of this model focused on the tendency to equate social disorganization with crime itself, leaving the actual neighborhood social processes that capture disorganization incompletely conceptualized (Bursik and Grasmick, 1993).

Beginning in the mid-to-late 1970s, theoretical innovations (Kasarda and Janowitz, 1974; Kornhauser, 1978) attempted to articulate the mechanisms linking the neighborhood structural factors Shaw and McKay (1942) identified with youth outcomes. These works emphasized the consequences of neighborhood socioeconomic disadvantage for the development of viable (dense, frequently interacting) informal social networks and participation in voluntary organizations (for example, neighborhood watch, civic groups) that could operate as conduits and reinforcements of norms and expectations directed at local youth. Kornhauser (1978) argued that poor neighborhoods concentrated individuals with limited interest in maintaining long-term residence and brought financially constrained minority and immigrant groups into proximity. In turn, residential instability and ethnic/racial heterogeneity were seen as the proximate causes of attenuated social ties as short residential tenure limited community engagement and race/ethnic distrust fragmented local networks. In this view, neighborhood poverty influenced social networks *through* instability and heterogeneity, indirectly affecting neighborhood social capacity to achieve shared goals, such as crime reduction (Bursik and Grasmick, 1993).

The reformulated social disorganization model led to a significant resurgence in research on neighborhood effects, including outcomes beyond crime and delinquency (Sampson, Morenoff, and Gannon-Rowley, 2002). Yet, concerns emerged regarding the revised model as well. First, concentrated poverty remains the single most powerful predictor of a range of negative outcomes for youth, including adolescent delinquency, dropping out of high school, and teenage childbearing (Brooks-Gunn, Duncan, and Aber, 1997a, 1997b), even after accounting for the influence of residential instability and ethnic/racial heterogeneity, indicating the need to understand the additional explanatory mechanisms linking poverty with youth well-being. Second, studies examining the effect of dense neighborhood social networks have not offered consistent evidence that strong informal social network ties exert regulatory effects on local crime rates (Bellair, 1997; Bellair and Browning, 2010; Browning, Feinberg, and Dietz, 2004; Merry, 1981; Simcha-Fagan and Schwartz, 1986; Warner and Rountree, 1997; Wilson, 1996). Moreover, evidence that informal networks explain the link between neighborhood socioeconomic disadvantage and crime and other negative outcomes has been limited (Kubrin and Weitzer, 2003; Warner and Rountree, 1997).

Equivocal findings on the role of social networks have led some researchers to shift attention away from the mediating effects of dense, frequently interacting network ties to the informal social-control processes that more directly influence youth outcomes. Sampson's *collective efficacy* theory is the most prominent disorganization-influenced model to take this tack. Indeed, collective efficacy—defined as the willingness of neighborhood residents to act on behalf of pro-social goals—has been shown to influence a wide variety of outcomes related to youth well-being, including violence (Maimon and Browning, 2010; Sampson, Raudenbush, and Earls, 1997), risky sexual behavior (Browning, Leventhal, and Brooks-Gunn, 2005, 2004), and mental health (Browning

et al. 2013; Xue et al., 2005). In Sampson's approach, informal social networks are seen as contributing to collective efficacy (Morenoff, Sampson, and Raudenbush, 2001) as is the density of civic and nonprofit organizations (for example, schools, social services, libraries) (Sampson, 2012). Sampson acknowledges, however, that social networks may not always operate beneficially and may even present obstacles to the informal social control of neighborhood youth (Browning, Feinberg, and Deitz, 2004; Pattillo-McCoy, 1999; Sampson, 2012). In addition, the simple presence of organizations does not neatly translate into neighborhood norms and expectations supporting youth, particularly if organizational constituencies are predominantly extralocal (McRoberts, 2003). Thus, the mechanisms that link basic structural deficits to the capacity of neighborhoods to collectively influence youth outcomes remain incompletely understood.

Neighborhood research needs a richer understanding of the spatial and social mechanisms that translate neighborhood-level socioeconomic deficits, such as poverty rates and racial segregation, into the collective capacity to promote youth outcomes. What types of networks are beneficial for neighborhoods? Under what conditions do local organizations contribute to collective efficacy? How does the day-to-day spatial organization of routine activities reflect variation in neighborhood socioeconomic status and, in turn, shape the collective capacity to socialize and supervise local youth?

We present a novel approach to understanding how contexts affect youth development and health-related outcomes. Our "eco-network" approach to neighborhood influences on youth development emphasizes the consequences of the activity-space setting characteristics to which youth are directly exposed as well as the embeddedness of activity spaces in larger interconnected structures that consist of co-residents and their ties to activity locations. Understanding the origins of eco-network structures in socioeconomic characteristics of urban neighborhoods addresses key gaps in the current understanding of the consequences of deprivations rooted in poverty and racial segregation. Moreover, as we demonstrate in the following section, structural properties of eco-networks illuminate the critical links between neighborhood socioeconomic characteristics and proximate social processes relevant to youth, such as collective efficacy.

A Sociospatial Approach to Understanding Contextual Influence

Our theoretical approach integrates concepts from geography, social network analysis, and neighborhood theory to articulate a model of the social and spatial processes by which urban contexts influence child outcomes. We begin by tracing the recent history of the activity space concept and then describe eco-networks as applied to neighborhood research.

Conceptualizing Activity Spaces and Ecological Networks

Although theoretical developments in geography have resulted in the rapid diffusion of the concept of activity space into allied disciplines, the concept remains relatively new to neighborhood-effects research (Matthews and Yang, 2013). The time-geographic approach emerging in the 1970s was among the first systematic efforts to understand the organization of human activities in space and time (Hägerstrand, 1970). Early work in this area focused on documenting space-time patterns of human activity in unprecedented detail and understanding the implications of these patterns within

the context of rapid social change (Mårtensson, 1977). Despite an ensuing period of energetic conceptual and empirical work on the role of activity spaces, for the most part, the concept did not enter into the discourse of neighborhood research.[1]

Individual activity spaces comprise all the locations that individuals come into contact with as a result of their routine activities (Inagami, Cohen, and Finch, 2007; Newsome, Walcott, and Smith, 1998; Schönfelder and Axhausen, 2003, 2002). A given activity space—generated by a typical daily travel path over a period of time—may be usefully characterized by a series of spatially bounded *settings* that serve as stages for action and interaction. Settings vary in the level of structure they exhibit (whether the setting is characterized by predictable, conventional activities, behavioral expectations, and monitoring) and the extent to which their boundaries are fixed (for example, schools versus hang-out locations). *Situations* refer to the immediate social and physical environment (objects, people, events) of a setting at a particular point in time (Tseng and Seidman, 2007). We use the term "contexts" more generically when referring to any analytically delimited aspect of surrounding conditions. In this sense, settings and situations are instances of contexts that are delimited by space and space-time, respectively.

At the aggregate level, the macrostructure of interconnection between actors and settings can be usefully conceived as an eco-network that links people and activity-space settings.[2] Neighborhood residents who share an activity setting may be understood as "tied" within the ecological network. Shared routine activity locations do not necessarily imply—and in most cases will not lead to— intimate social interaction (for example, close friendship). On the other hand, eco-networks capture the structural conditions necessary for social interactions to occur (Gehl, 2011). Neighborhood residents who do not share routine activity locations are unlikely to become familiar with one another or develop neighborhood-based social ties, trust, and a sense of shared expectations for public space use within the neighborhood (see Activity-Space and Ecological-Network Effects on Youth Development later in the article for a more detailed discussion of the implications of ecological-network characteristics).

Exhibits 1 and 2 present visual representations of two eco-networks based on data from youth ages 11 to 17 residing in a low-income (exhibit 1) and high-income (exhibit 2) census tract in a large urban metropolitan area. Key activity settings are represented by squares with labels affixed to more central locations (for example, school, shopping mall). Youth are represented in the exhibit by either circles (in the high-income tract) or triangles (in the low-income tract). The shapes representing the individuals are weighted by levels of "network centrality," or the extent to which they are attached to settings that are frequented by other adolescents (Faust, 1997). (Settings are weighted by the extent to which their participating members frequent other settings.) In both exhibits, actors and settings are not geographically situated (to protect privacy).

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[1] See Wikström et al.'s (2012) concept of "activity field" for a recent exception and Matthews and Yang (2013) for a review of efforts to incorporate the activity-space concept into place and health research.

[2] In network terminology, eco-networks are a specific form of "affiliation," or two-mode network (see Borgatti and Everett, 1997; Breiger, 1974). We use the term "structure" to describe both the organization of specific settings at the micro level and the structure of interconnection between actors and locations at the neighborhood eco-network level.

Exhibit 1

Actor-Setting Affiliation Network, Low-Income Census Tract
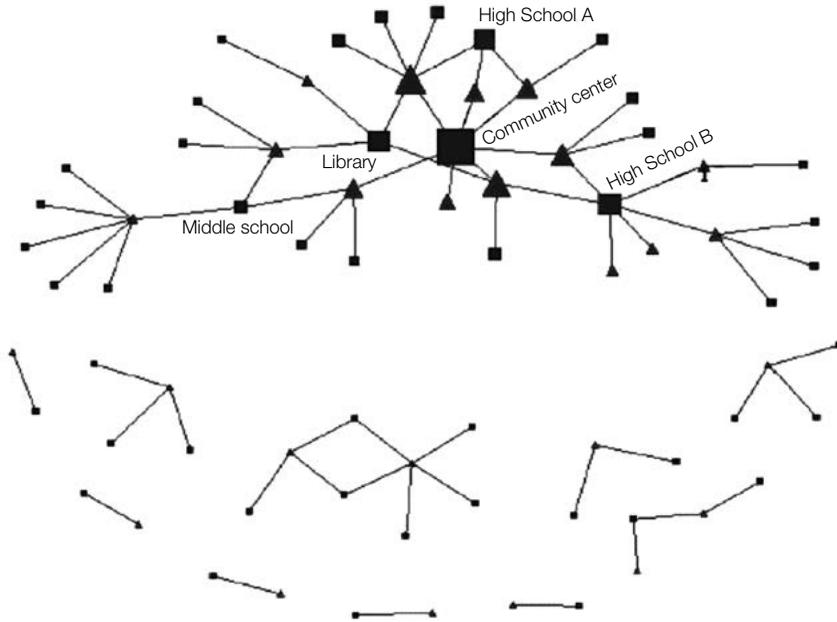
Notes: Squares represent activity settings. Triangles represent youth. Shapes are weighted by network centrality.

Exhibit 2

Actor-Setting Affiliation Network, High-Income Census Tract
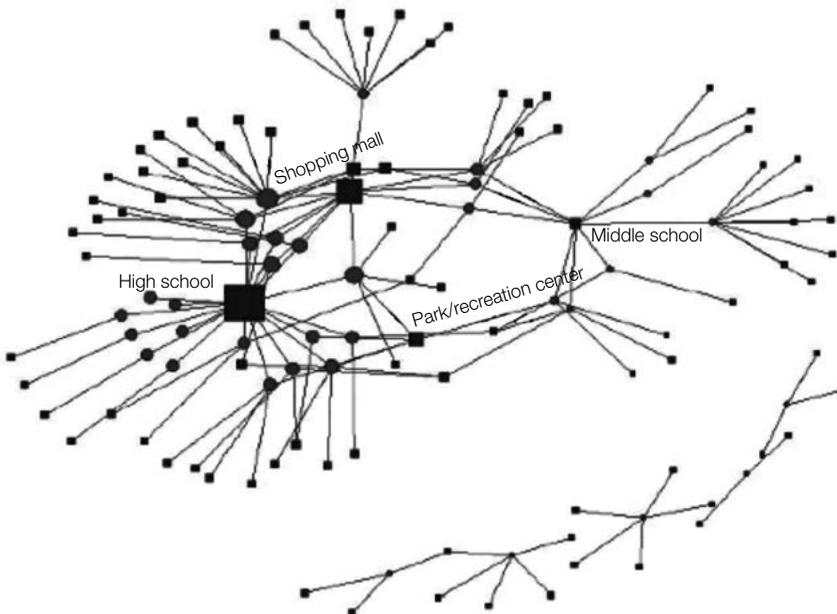
Notes: Squares represent activity settings. Circles represent youth. Shapes are weighted by network centrality.

A cursory visual inspection indicates that youth in the low-income tract report fewer activity locations than those in the high-income tract. The exhibits also reveal potentially interesting differences in the structure of routine activity intersection across tracts, however. It is not surprising that schools are relatively central locations for both tracts, although the community center is most central for the low-income tract in contrast to a high school for the high-income neighborhood. Indeed, youth in the low-income tract reported attending eleven different schools versus five for the high-income tract (with a larger sample of youth in the latter). Schools in the high-income tract thus play a more significant role in linking resident youth in the ecological network. In addition, a higher proportion of youth in the low-income tract are socially segregated within the larger neighborhood eco-network, as they are not linked to co-residents through shared activity locations. Although these data are presented for illustrative purposes only, they show that constructing eco-networks—even those based on relatively few reported activity locations—offers rich data on the structure of routine activity intersection characterizing urban neighborhoods, with potentially important implications for other aspects of social organization relevant to youth well-being. The differences across tract income level also suggest the importance of neighborhood socioeconomic characteristics in shaping key features of individual activity spaces and resulting eco-network structures.[3]

In the next section we elaborate theoretical relationships among neighborhood socioeconomic characteristics, individual-level activity spaces, resulting eco-network structural characteristics, and youth-relevant neighborhood social processes. We begin by examining the effects of neighborhood socioeconomic characteristics (for example, poverty, racial segregation) on the types of settings likely to characterize youth activity spaces (for example, organizations, institutions) and the level of structure (organized, predictable activities and behavioral expectations) activity-space settings will exhibit. We then consider the implications of neighborhood socioeconomic influences on activity spaces for the formation and macrostructural features of eco-networks such as density, centralization, clustering, and structural embeddedness and the consequences they bear for social processes that are relevant to youth developmental outcomes. We then describe the implications of activity-space and eco-network structural characteristics for child and adolescent developmental outcomes.

Determinants of Activity-Space and Ecological-Network Characteristics

Neighborhood theory has not effectively theorized the consequences of variation in socioeconomic disadvantage for the actual sociospatial exposures experienced by urban residents. We argue that spatial exposure processes are central to understanding the mechanisms through which neighborhoods influence youth wellbeing.

Neighborhood Influences on Activity-Space Characteristics

A host of factors clearly shape the activity spaces of urban residents. Individuals—particularly adults—exhibit agency in their choice of activity locations. Nevertheless, activity-space options are

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[3] Like Bronfenbrenner's (1979) Ecological Systems Theory, the ecological-network approach views individuals as embedded in multiple, potentially relevant developmental contexts. A key innovation of the eco-network model, however, is an emphasis on the network of ties between actors and settings characterizing a collectivity as a whole (for example, a neighborhood or ecological community, as described in the following section) and the influence of these larger structures of interconnection for youth outcomes.

also subject to constraints based on location of home residence (dependent on, for example, financial resources, market conditions, and political decisions regarding housing), work (dependent on, for example, human capital, available opportunities for employment, and employer bias), family obligations, and the ability to access desired locations, both spatially (Hägerstrand, 1970; Miller, 1991) and socially (Lewis, Emerson, and Klineberg, 2011; Pager and Shepherd, 2008).

Residential neighborhoods—which comprise the geographic area in which a home residence is located—are critically important determinants of activity-space characteristics. Residence in an economically disadvantaged area,[4] for instance, is associated with more limited access to high-quality organizations and amenities. For instance, Wilson (1996, 1987) argued that high-poverty contexts tend to be characterized by population decline and "deinstitutionalization"—that is, the flight of businesses, institutions, and other organizations typically present in urban neighborhoods. Small more recently argued that this process characterizes racially segregated African-American neighborhoods specifically (Small and McDermott, 2006), suggesting these neighborhoods are likely to experience particularly acute organizational deficits. Even low-income neighborhoods that exhibit relatively high levels of organizational density, however, may be characterized by compromised organizational quality and limited diversity, potentially contributing to low levels of organizational participation among neighborhood residents (Gardner and Brooks-Gunn, 2009). Indeed, extant research on businesses (for example, grocery stores), schools, social service organizations, and other organizations in low-income and racially segregated neighborhoods strongly supports the claim that high-quality and diverse local organizational options are limited in these neighborhoods (Babey, Hastert, and Brown, 2007; Connell and Halpern-Felsher, 1997; Furstenberg et al., 1999; Rankin and Quane, 2002; Zenk et al., 2005). Associated lack of employment opportunities may also send residents outside their neighborhoods to find work—often substantial distances away (Allard and Danziger, 2002; Ihlanfeldt, 1999).

Consistent with research on organizations, empirical evidence on the conditions and distribution of amenities, such as high-quality parks and recreational facilities, in low-income and racially segregated neighborhoods is equally disconcerting (Babey, Hastert, and Brown, 2007; Wolch, Wilson, and Fehrenbach, 2005). Satisfaction with the quality and maintenance of such spaces (parks in particular) is consistent in the literature (Scarborough et al., 2010; Wyant, 2008), suggesting that the availability of appealing informal amenities in low-income neighborhoods is quite limited.

These conditions have significant implications for the activity spaces of residents of economically disadvantaged and segregated neighborhoods. We expect these spaces to be characterized by fewer nonhome (or nonprivate residence) settings overall and fewer structured settings. As noted previously, by structured settings, we mean those characterized by routine participation in purposive, conventional activities, such as schools, youth-oriented organizations, places of worship, and businesses. Structured settings typically organize activities by providing explicit ends for action, norms

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[4] Our focus on the neighborhood-level socioeconomic determinants of activity-space characteristics emphasizes economic disadvantage and racial segregation as major influences on urban activity spaces. Other conditions, however, including those highlighted in classic disorganization models (Shaw and McKay, 1942) may also be relevant. Ethnic and racial heterogeneity, for instance, may lead residents to avoid particular spaces, organizations, and institutions associated with outgroups (Putnam, 2007), resulting in racially and ethnically circumscribed activity spaces (Merry, 1981). Residentially unstable neighborhoods may find it harder to support businesses and institutions when faced with highly transient populations.

for participating in activities, supervision, and resources to achieve setting goals. Unstructured settings, by contrast, offer no defined, predictable, or normatively regulated course of action (Osgood, Anderson, and Shaffer, 2005). Evidence about the prevalence of structured settings within the activity spaces of disadvantaged neighborhood residences is quite limited. Most research has focused on time-use and supervision patterns by household socioeconomic status, with some research finding that children from lower income families spend more time in unstructured activities—without systematic reference to the location of settings (for example, Lareau, 2011). Others have found that some residents of low-income neighborhoods respond to challenges in neighborhood environments by relying on in-home supervision and limiting exposure to neighborhood-based settings (Furstenberg et al., 1999). Both findings are consistent with the notion that structured settings beyond the home are more limited in disadvantaged environments, but systematic efforts to simultaneously track youth spatial exposures and the level of structure characterizing their activity settings remain rare (Wikström et al., 2012).

We would also expect that a lack of locally available, high-quality organizations and institutions would lead to larger average distances between home locations and activity-space settings. Some studies found support for these expectations. For instance, Sastry, Pebley, and Zonta (2002) found that, by comparison with Whites, racial and ethnic minority residents of Los Angeles (who were far more likely to reside in a socioeconomically disadvantaged neighborhood) traveled significantly farther to shop for groceries. African-American residents traveled farther to church, and Latinos reported longer distances between home and healthcare locations (although distance to work locations did not favor Whites).

In short, organizational deficits in disadvantaged neighborhoods limit access to high-quality local destinations, with important implications for the activity spaces of urban residents.

Neighborhood Sources of Eco-Network Structure

We expect that the socioeconomic characteristics of neighborhoods will have implications for the structure of eco-networks. For instance, to the extent that residents of economically disadvantaged or racially segregated neighborhoods report fewer activity locations overall, we might expect that eco-networks within these areas would be marked by lower levels of *density*—that is, a lower likelihood of two randomly selected residents sharing a given activity location. In addition, disadvantaged neighborhoods characterized by poor-quality schools may lead residents with children to opt out of their neighborhood school to seek better educational opportunities elsewhere (Cullen, Jacob, and Levitt, 2005). In turn, local neighborhood schools are less likely to serve as an institutional hub or social anchor for the neighborhood as a whole. Judgments about other local institutions may also lead residents to seek alternatives outside their residential neighborhood (Furstenberg et al., 1999). Thus, lower levels of *centralization* around highly popular locations may also characterize disadvantaged communities. We might also expect that subsets of residents within the neighborhood who are spatially proximate or share a need or affinity for certain types of amenities or locations might exhibit *clustering*—or a tendency to form multiple, densely connected subgroups. Such clustering, however, may be less likely to occur when amenities and commerce are not distributed across the space of a neighborhood or the diversity of available options is limited (Jacobs, 1961). Finally, two randomly selected residents of disadvantaged, organizationally compromised neighborhoods

are less likely to be linked through multiple locations—or to exhibit *structural embeddedness* (for example, encountering each other not only at the grocery store but also at the school and the local gym). Extensive overlap of activity locations among residents across a wider variety of settings is likely to decrease the level of fragmentation within eco-networks.

Residence in socioeconomically disadvantaged neighborhoods may have implications for structural properties of eco-networks beyond those considered here. Moreover, the structure of eco-networks may be generated out of colocation at less structured settings, such as street corners, public spaces on the periphery of schools, or poorly supervised parks, particularly in locales where organizational density is low. To the extent that segregated, low-income neighborhoods are characterized by fewer high-quality organizations, mutual ties to locations within such neighborhoods are more likely to involve less structured settings, with implications for the consequences of eco-network structure—a point to which we return later in the article.

In summary, we argue that neighborhood socioeconomic variation—particularly concentrated poverty and racial/ethnic segregation—influences the extent to which residents' routine, conventional activities intersect and that these patterns of intersection (structural properties of eco-networks) are linked with dimensions of neighborhood social organization that are important for youth development. Using the tools of network analysis, we can characterize relevant eco-network structures formally—for example, levels of density, centralization, clustering, and structural embeddedness—allowing for a high degree of analytic precision in linking eco-network features with neighborhood social processes and outcomes relevant to the well-being of youth.

Activity-Space and Ecological-Network Effects on Youth Development

Drawing on insights from sociological approaches to neighborhood effects, we describe expectations for the effect of activity-space exposures and eco-networks on youth developmental outcomes. We move from the implications of direct setting exposures to a discussion of the ways in which qualities of eco-networks contribute to neighborhood social processes relevant to youth development, including familiarity and trust, social ties, collective efficacy, and patterns of public space use. Identifying properties of eco-networks that are consequential for key neighborhood social processes advances the understanding of the mechanisms through which residents' activity patterns collectively influence adolescents' health and developmental outcomes.

Activity Space-Setting Characteristics and Youth Development

Attending to the characteristics of adolescents' routine activity spaces becomes ever more important for understanding developmental outcomes as the frequency and intensity of interactions within and beyond the home neighborhood context increase during this life-course stage. As we noted earlier, settings vary in the level of structure they exhibit. Settings marked by routine, organized, purposive activities; enforceable norms; supervision; and the resources to support these social processes provide potentially significant socialization contexts for youth (Tseng and Seidman, 2007). Some settings are explicitly directed toward advancing youth developmental needs, such as schools and youth services organizations. Although they vary (potentially dramatically) in quality (Bryk et al., 2010), the benefits of school participation over nonparticipation are substantial (Downey, Von Hippel, and Hughes, 2008).

Extant research on the effects of youth participation in after-school organized activities suggests they have important positive implications for development. Youth organizations (for example, Boys and Girls Clubs, YMCA, YWCA) protect youth from social hazards and stressors (for example, disorder) rooted in local environments, and they promote positive outcomes through direct participation in structured extracurricular activities. Highlighting the efficacy of organizational participation in promoting youth well-being, involvement in after-school programs or extracurricular activities is negatively associated with depressive symptomology and weak self-concept and positively associated with educational expectations and commitment among youth (Gardner, Browning, and Brooks-Gunn, 2012; Rankin and Quane, 2002). Several other studies attest to the positive effects of individual participation in after-school and extracurricular activities on a variety of adolescent developmental outcomes (for reviews, see Bohnert, Kane, and Garber, 2008; Durlak, Weissberg, and Pachan, 2010).

By contrast, unstructured, unsupervised socializing with peers is a major situational predictor of problem behavior (Maimon and Browning, 2010; Osgood et al., 1996). Osgood et al.'s (1996) formulation of routine activities theory proposes that spending large amounts of time in unstructured activities with peers in the absence of adults in supervisory roles places adolescents at an increased risk of engaging in delinquency and other problem behaviors. Indeed, unstructured socializing has been found to explain significant proportions of basic demographic disparities in delinquency based on age, sex, and race (Osgood, Anderson, and Shaffer, 2005).

Eco-Networks and Social Organizational Outcomes

Although structured and supervised activities likely promote healthy development among their participants, widespread participation in such activities confers benefits to whole neighborhoods. For instance, residence in neighborhoods with higher concentrations of organizations that serve young people and adults is negatively associated with youths' aggressive behavior (Molnar et al., 2008). Wider variety of youth-oriented services in neighborhoods has been found to be negatively associated with individual exposure to violence among adolescents (Gardner and Brooks-Gunn, 2009). Strong institutional presence and adult participation in community-based organizations in neighborhoods may also promote the well-being of youthful nonparticipants. For instance, Mason, Schmidt, and Mennis (2012) found residential proximity to religious institutions is negatively associated with substance use among a sample of urban youth, after controlling for individual religiosity. These studies suggest that strong institutional presence within neighborhoods has "spillover" effects that promote youth development, even for nonparticipants.

We argue that the collective benefits of participation in organized activities and strong organizational presence in neighborhoods are in large part because of their effect on structuring neighborhood-based eco-networks. Varieties of structured activities and organizations within neighborhoods may lead to neighborhood-based eco-networks with beneficial structural characteristics, such as high density levels, centralization, clustering, and structural embeddedness. In turn, residents' overlap in activity settings within eco-networks will lead to repeated encounters (among youth and adults), promoting public familiarity and trust (Curley, 2010) and, potentially, beneficial organizationally based social ties. Based on his analysis of parents' interactions in childcare centers, Small (2009) argued that even quite weak organizationally based ties (acquaintances or more fleeting interactions) may yield important benefits and engender a sense of trust. In turn, although discrete settings may

provide a number of direct benefits for individual youth, we argue that interconnections between residents and such settings within larger eco-networks is the principal mechanism that generates trust and shared expectations for action on behalf of the collective socialization of neighborhood youth as a whole.

We expect the process of shared, routine exposure to structured settings as captured by properties of eco-networks to promote public familiarity and trust and, in turn, to cumulatively produce and reinforce generalized, pro-social norms that become effective beyond the confines of any given setting. Using data from the Los Angeles Family and Neighborhood Survey (L.A.FANS), Browning, Soller, and Jackson (2012) found associations between the extent of overlap in routine activity locations within eco-networks—as measured by clustering and centralization—and levels of trust, network exchange, intergenerational closure (ties between adults and children in the neighborhood), and collective efficacy. Thus, consistent with expectations, structural features of neighborhood-based eco-networks independently predict neighborhood social processes that are linked to youth development.

Eco-networks have consequences for the use of public space, including streets and other outdoor areas as well. Overlapping conventional routine activities require travel to and from shared locations. As Jacobs (1961) forcefully argued, dense patterns of shared connection to locations made possible through diverse and spatially distributed activity-setting opportunities result in active urban streets. Residents who occupy neighborhood streets in the process of engaging in conventional routine activities (for example, errand running) over the course of the day offer a consistent source of street monitoring or "eyes on the street." In Jacobs' view, however, streets that are dominated by "strangers" will be less effectively monitored. By contrast, street activity generated by those engaged in routine activities—who have established a basic sense of familiarity and a "web of public trust" based on consistent exposure—will provide more robust street monitoring (Browning and Jackson, 2013) and spread norms and expectations for public behavior through larger swaths of neighborhood public space. Eco-networks in which households share many routine activity locations (for example, high structural embeddedness)—are likely to be particularly important in setting the conditions for active public spaces that are accompanied by monitoring rooted in familiarity and public trust. The prevalence of dyads linked routinely through conventional activities at multiple neighborhood-based locations generates consistent (and familiar) street activity to and from these locations.[5] At the aggregate level, then, structural embeddedness is likely to be associated with the on-the-ground informal social-control capacity that Jacobs' (1961) seminal account persuasively emphasized.

The "Content" of Ecological Networks

We highlight the benefits of eco-network ties rooted in structured settings that organize activities and interactions. In their absence, eco-networks connected through settings characterized by unstructured activity may emerge—particularly for youth. As noted earlier, exposure to unstructured

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[5] Jacobs (1961) emphasized the spatial distribution of conventional routine activity locations, such as businesses and other amenities, highlighting the importance of dispersing these destinations throughout neighborhood environments. Concentration of locations (for example, strip malls) leads to larger interstitial "gray area" spaces lacking commercial and other destinations to generate sufficient numbers of eyes on the street. The temporal distribution of activity patterns generated by local destinations is also important for the consistency of street monitoring.

socializing is one of the strongest predictors of delinquent and other risk behavior among adolescents (Osgood, Anderson, and Shaffer, 2005). When the settings in which unstructured socializing occurs are linked into larger eco-networks characterized by settings with similarly low levels of structure, neighborhoods may experience substantially increased opportunities for participation in problem behavior among youth. Similarly, adult ties through unstructured settings are less likely to generate positive social organization benefits. For instance, residents tied primarily through shared, informal street settings associated with residential proximity may produce highly localized familiarity and trust, but these benefits may not extend beyond the immediate microneighborhood. The concatenation of highly local patterns of social organization or "territoriality" (Taylor, 1988) may result in "patchier," more spatially insular social organization, producing fewer benefits for youth. Suttles (1968) argued that, in highly disadvantaged urban contexts, residentially localized patterns of interaction may be employed strategically to generate direct social ties and information about potential threats and resources in the immediate environment; however, the familiarity generated by these patterns is less easily translated into collective trust and shared normative orientations at the larger neighborhood level (see also Granovetter, 1973).

In summary, our theoretical model emphasizes the mediating role of ecological-network factors in the link between neighborhood socioeconomic characteristics and social organizational dimensions of neighborhoods relevant to youth. In neighborhoods characterized by dense, clustered, centralized, and structurally embedded eco-networks, with actors who are linked predominantly through structured settings, we anticipate higher levels of familiarity; beneficial, organizationally based social ties that extend beyond the immediate residential environment (for example, block); trust; and collective efficacy with respect to the socialization and supervision of youth. We also expect these eco-network structures to generate more extensive street activity, contributing to "eyes on the street" and more effective informal social control—particularly when activity locations are neighborhood based and dispersed.

Finally, social network tools allow for characterization of both overall network structures and the network positions of specific actors and settings in the case of eco-networks. As noted earlier, unstructured settings linked to other such settings through the activity patterns of local youth are likely to be more problematic as exposures contexts. By contrast, unstructured settings in eco-networks characterized by a predominance of structured settings are likely to be less problematic for youth because of the positive influence or "spillover" effects of the structured settings to which they are tied. Maimon and Browning (2010), for instance, found that neighborhood advantage significantly attenuates the positive effect of unstructured socializing on violence among youth. Unstructured settings in more affluent and socially organized neighborhoods are likely to be embedded in larger structures of constraint, reducing their potentially harmful effects. In the language of social network analysis, setting effects may differ, depending not only on the features of the focal setting but also on the level of structure characterizing the settings to which they are tied; that is, their "centrality" within larger eco-networks of structured or unstructured settings.

Thus far, we have considered pathways through which neighborhood socioeconomic characteristics influence activity spaces and the associated formation of neighborhood eco-networks. In turn, we linked characteristics of eco-networks to the operation of neighborhood social processes that are relevant to youth development. Although we note the importance of eco-networks to a variety

of neighborhood social processes, the ecological-network approach may be extended to address the role of contextual exposures that extend beyond, or are inadequately captured by, the boundaries of residential neighborhoods. Next, we turn to the implications of the ecological-network approach for multilevel theoretical models of context effects more generally by considering the consequences of residential and nonresidential activity-space exposures.

Limitations of Neighborhood-Bounded Approaches

Although social and spatial overlap in routine exposures among neighbors is key for developing eco-networks within residential neighborhoods, daily activities often take youth and adults well beyond the boundaries of residential neighborhoods. This observation is by no means new. Early theorists of the Chicago School of sociological thought, including Park, Burgess, and McKenzie (1925) and McKenzie (1921), highlighted the spatially embedded nature of neighborhoods. McKenzie (1921), for instance, was well aware of the partial and contingent role of neighborhoods in organizing day-to-day exposures. In his view, the Park-derived (Park, Burgess, and McKenzie, 1925) concept of "mobility" captured not only changes in residential address but also in patterns of daily travel. Writing in the early 20th century, McKenzie (1921) observed that streetcars and automobiles had extended the typical radius of activity beyond the local neighborhood, with disintegrating effects on neighborhood life. Observing increasing mobility and expanding activity radiuses, some mid-century urban planners expressed deep skepticism regarding the utility of the neighborhood concept, arguing that neighborhoods only partially captured the daily exposures characterizing a typical urban family (Isaacs, 1948).

Nevertheless, the practical application of neighborhood research over the course of the 20th century was dominated by the assumption of an autonomous and all-encompassing neighborhood unit (typically a census tract). Only recently has this model been subject to significant challenge, and empirical evidence on the actual day-to-day exposures of urban residents remains relatively scarce. Limited data from large-scale probability studies suggest adult urban residents' routine activity spaces encompass locations beyond the residential census tract. For example, findings from L.A.FANS indicate that roughly 12 percent of respondents' places of worship and 15 percent of grocery stores were located within residential census tract boundaries and 44 percent of places of worship and 63 percent of grocery stores were located within tracts contiguous to the residential tract (Sastry, Pebley, and Zonta, 2002). The limited data that are available on the geographic dispersion of adolescents' routine activity spaces also suggest youths' activities are situated beyond tract boundaries. For instance, Basta, Richmond, and Wiebe (2010) detailed the travel routes of a sample of Philadelphia adolescents during 1 day. The study revealed that the youth spent a considerable amount time outside their home census tracts, suggesting the spatial dispersion of adolescent routine activities is more expansive than previously assumed.

The restricted scope of most neighborhood studies, coupled with increasing evidence regarding the extent of nonresidential spatial exposure among youth and adults, leads to a number of concerns about the nature of extant findings regarding context effects on youth (Cook, 2003). First, focusing on an arbitrarily limited geographic context precludes assessment of the combined effects of multiple relevant developmental contexts. A joint contextual effect may be substantially greater than the effect of any given context in isolation. Second, accounting for only a subset of youth

exposures may lead to bias when estimating neighborhood effects (if omitted characteristics of unmeasured contexts are confounded with the effects of measured contexts on individual outcomes). Third, research designs and theoretical models that incorporate a limited number of contexts restrict the capacity to understand the influence of intercontext interactions on developmental outcomes (Inagami, Cohen, and Finch, 2007). For instance, the negative effect of residence in a disadvantaged neighborhood may be buffered by extra-neighborhood exposures (for example, attending a high-quality school in a more advantaged neighborhood).

Thus, by incompletely capturing actual exposures, conventional neighborhood research has likely failed to capture the "total" contextual effect by estimating biased residential neighborhood effects and obscuring the interactional dynamics of contextual exposures. In the absence of comprehensive assessment of contextual exposures, researchers may spuriously attribute outcomes to family- or individual-level factors—even when neighborhood factors are considered. These concerns highlight the need for assessing actual exposures to properly understand the nature of neighborhood and extra-neighborhood contextual influences. We specifically argue in the next section not only for assessing specific activity-space exposures within and beyond residential neighborhoods but also for understanding patterns of activity-space intersection as capturing independently influential "ecological communities."

From Neighborhoods to Ecological Communities

Recognizing the limitations of focusing exclusively on residential environment, researchers have begun to explore characteristics of nonresidential contexts to explain individual variation in health outcomes and behavior. For example, spatial dependence models consider the influence of nearby communities for individual and aggregate outcomes (Anselin, 1988), but the models typically neglect individuals' actual mobility patterns and spatial exposures (Mears and Bhati, 2006; Morenoff, Sampson, and Raudenbush, 2001). As an alternative to the focus on residential environment, activity-space approaches (Basta, Richmond, and Wiebe, 2010; Inagami, Cohen, and Finch, 2007; Miller, 1991; Nemet and Bailey, 2000) attempt to explicitly measure spatial exposures at the individual level (Kwan et al., 2008; Mason, Schmidt, and Mennis, 2012; Mennis and Mason, 2011). Relying exclusively on an activity-space approach, however, will neglect the larger sociospatial communities in which individual exposures are embedded.

The ambiguities associated with attempts to operationalize neighborhood of residence can be addressed by conceptualizing eco-networks as extending beyond the confines of residential neighborhood boundaries. As noted previously, extant studies of neighborhood context effects on adolescent outcomes have tended to assume that measurement of residential neighborhoods effectively captures the developmentally relevant set of exposures. By contrast, we argue that activity spaces and their aggregated structure in the form of eco-networks more directly measure such exposures. Although a predefined geographic area may be characterized according to the ecological network operating within its boundaries (and this may be a valid approach, depending on the research question considered), activity-space exposures and eco-network ties will frequently extend beyond the identified neighborhood boundary. In turn, regions of larger eco-networks characterized by relatively dense internal connections (regardless of the residential propinquity of constituent actors and the distance between locations) may be termed "ecological communities." We argue that these

clusters of interconnected actors and settings—which may be empirically defined through social network analytic techniques (Field et al., 2006; Frank et al., 2008)—are potentially significant units of social and spatial exposure beyond the geographic neighborhood.

Although neighborhoods and ecological (or "eco-") communities may overlap considerably, we take the degree of overlap to be an empirical question. In some instances, youth from the same residential area will exhibit overlapping activity spaces that are also contained largely within the residential boundary. We hypothesize that this scenario is less prevalent than often assumed, however. In fact, characteristics of the eco-communities of residentially proximate youth may vary considerably on the key social organizational dimensions we have thus far considered, with potentially important developmental implications. To the extent that an individual's activity-space locations place him or her in an eco-community largely outside the residential neighborhood, we may expect residential neighborhoods to be significantly less influential.

Theoretically and empirically distinguishing eco-community and neighborhood may shed light on mixed findings regarding the role of typically operationalized neighborhoods in youths' lives. Children and youth who reside in economically disadvantaged neighborhoods may nonetheless tap into resourceful communities. For example, Small (2009) found that childcare centers in high-poverty neighborhoods provided settings in which links to valuable (often weak) informal ties and organizationally brokered resources were established. In turn, mothers who participated in these organizations had increased access to other youth programs and beneficial activity settings result-ing in better outcomes for their children when compared with other geographically proximate residents. Small (2009) argues that ties established through organizational affiliations are rarely a result of informed, instrumental action. Rather, such ties often occur as a byproduct of more mundane social transactions (Coleman, 1990). Thus, the origins of eco-community affiliations are unlikely to be straightforwardly determined by the purposive actions and resources of individuals (that is, a selection model of community membership). At the same time, eco-community affiliations may be highly significant sources of contextual influence. In the absence of effective measurement of eco-networks and communities, divergent outcomes among youth who share the same neigh-borhood may be spuriously attributed to individual or family characteristics.

We graphically depict key differences between neighborhood eco-networks and larger community eco-networks in exhibit 3. First, Panel I displays a hypothetical neighborhood's (tract 4) ecological network. In this exhibit, circles represent youth and triangles represent activity spaces to which they are connected through routine daily activities. Only activities that take place within the geo-graphically defined census tract boundary (demarcated by dashed lines) are displayed in Panel I. In this exhibit, actor A is isolated, given she is not linked to any activity location within the neigh-borhood ecological network. On the other side of the spectrum, actors B and C exhibit high levels of structural embeddedness, given they are similarly situated in the ecological network and exhibit considerable activity-space overlap (Feld, 1997). Actors D and E are far less structurally embedded than B and C, because the former share only one activity location. Finally, in Panel I, one activity location is especially central in the network and is crucial in connecting the neighborhood's ecological network.

As previously mentioned, individuals' activity spaces most likely extend beyond residential neigh-borhood boundaries. We hypothesize that the geographic distribution of individuals' activity spaces

(including those beyond the neighborhood) and network configuration of actors and settings within larger eco-networks will reveal underlying "community structures" within more extended urban eco-networks (for example, city-level eco-networks). We illustrate the importance of examining community eco-networks in Panel II in exhibit 3. Panel II is similar to Panel I; however, it also includes individuals and activity-space settings from the adjacent neighborhoods. In addition,

Exhibit 3

Illustration of Neighborhood and Community Ecological Networks

Panel I: Neighborhood Ecological Network (Tract 4)

Panel II: Community Ecological Network
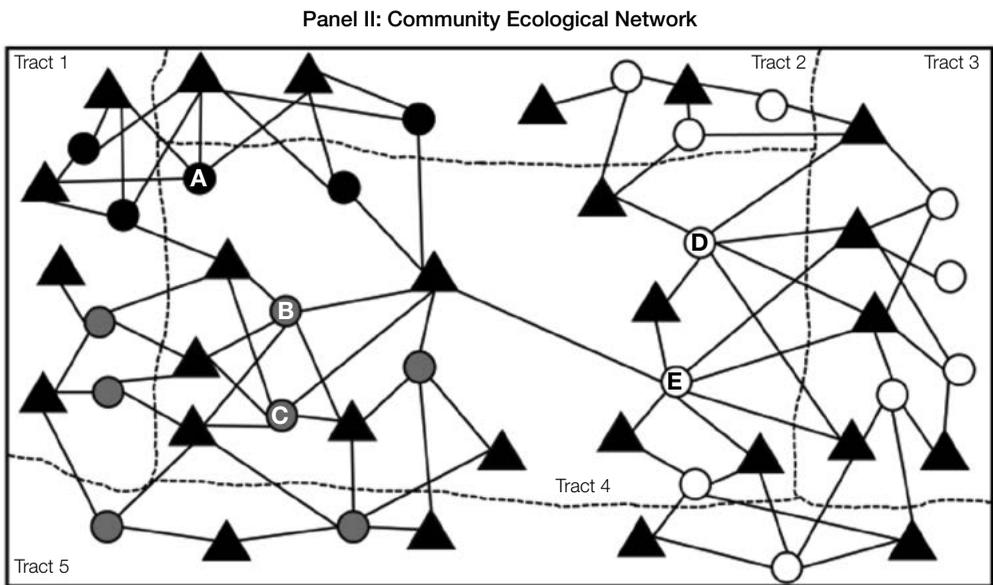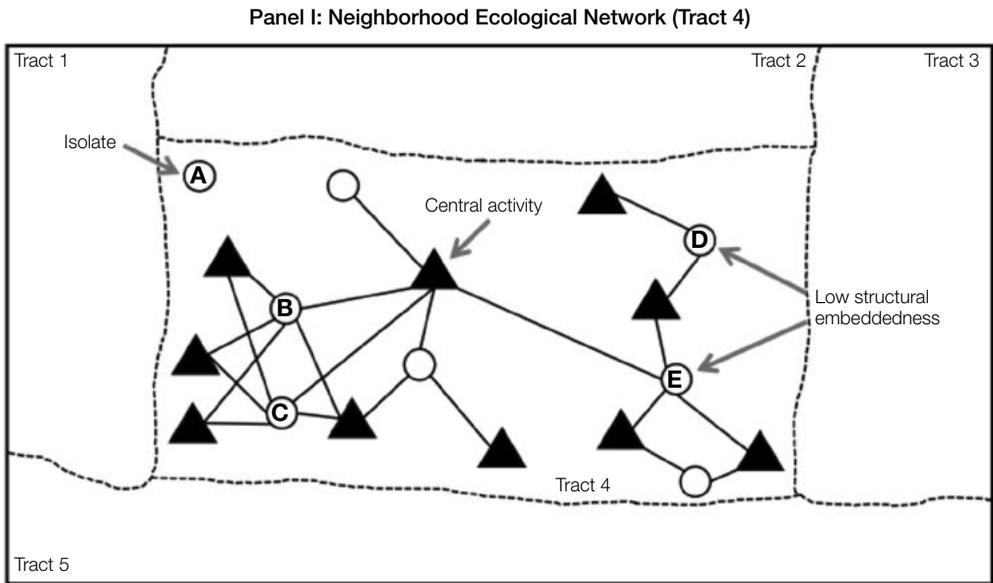
Notes: Triangles represent activity spaces. Circles represent youth.

shapes representing individuals are grouped according to shared participation in "local communities," which are identified on the basis of high degrees of overlapping activity spaces. (Individuals are shaded according to their eco-network communities.) Note that in Panel I, actor A did not share any activity spaces with other youth from her neighborhood. She has considerable activity-space overlap with adolescents from tracts 1 and 2 on the eastern and northern borders, however. In addition, actors B, C, and E have more overlap in routine activity spaces with individuals from adjacent neighborhoods than those from their own neighborhood. In addition, while actors D and E had low structural embeddedness in Panel I, Panel II reveals they share several activities that are located in tract 3. As exhibit 3 illustrates, attending to the structure of larger eco-networks may provide insight into the extent of variable exposure to neighborhood settings and of participation in communities that extend beyond identified neighborhood boundaries.

This illustration (exhibit 3) reveals eco-communities that span the neighborhood boundary but are nevertheless composed of settings that remain spatially proximate. Actual eco-communities may be significantly more complex from the standpoint of the spatial distribution of component settings and the residential locations of constituent actors. To date, however, the ecological structure of daily routines has been largely ignored in studies of neighborhood and youth outcomes. The absence of high-quality data on activity spaces has been a major encumbrance to research on socio-spatial exposures. The past few years, however, have brought dramatic advances in technology and resources to collect such data. We now turn to a discussion of these advances and the significant potential they offer to expand our understanding of contextual effects on youth.

New Approaches to Data Collection on Contextual Effects

The relative neglect of multicontextual influences on adolescent development in extant research is partly rooted in limitations of existing data resources. No large-scale dataset on adolescent behavioral problems and health collects high-quality data on families, residential neighborhoods, schools, and extensive social network and activity-space data over time. Although the National Longitudinal Study of Adolescent Health (AddHealth; Harris 2010) is an excellent resource to investigate peer network and school effects over time, it has limited information on neighborhood contexts and individual activity spaces. The Los Angeles Family and Neighborhood Survey (L.A.FANS) features a neighborhood-based design over two sampling waves and includes activity space data (Sastry et al., 2006). For younger respondents, however, activity-space information is limited to a few geocoded data points, such as schools, childcare providers, and churches. The L.A.FANS also contains limited information on school social processes and social network ties beyond family members. The Project on Human Development in Chicago Neighborhoods (PHDCN; Earls et al., 1995) is a highly innovative design for examining neighborhood effects. Information on social network ties is limited, however, and activity-space data are negligible.

Despite substantial investment in understanding the role of social context in the health and behavior of adolescents, limitations of existing data resources have precluded a comprehensive accounting of multicontextual influences on youth development. Future research that gathers fine-grained activity-space data will advance knowledge on the actual spatial exposures and interactional settings that youth experience and the role the exposures and setting play in shaping risk behavior and health

outcomes. Moreover, dense samples of youth will capture activity-space overlap, allowing for the construction of eco-networks from Global Positioning System data collected through smartphones or map-based interfaces that are displayed on computer screens (for example, Google Maps). Large-scale data collection efforts that combine survey data with cell phone-based GPS data on the locations of activity-space settings and real-time information through ecological momentary assessment (EMA; Shiffman et al 2007) will greatly advance understanding of the causal processes underlying the association between contextual characteristics and adolescent health and development. In the remainder of this article, we describe how information on youth's routine activities may be gathered and analyzed to understand how activity spaces, eco-networks, and eco-communities affect youth development. By using GPS technology, EMA, and social network analytic techniques for analyzing affiliation networks, future research may better understand how sociospatial patterns of routine activities affect the context of youth development.

Capturing Situational Influences on Adolescent Outcomes

To date, the process by which situations unfold to influence adolescent outcomes has remained elusive. We know little about actual adolescent behavioral settings and the larger patterns of routine activity in which they are embedded (Mason, 2010; Mason et al., 2010). Assessments of activity spaces of youth gathered through GPS technology may provide a detailed assessment of the routine spatial exposures and activities of a large sample of youth over an extended study period. By incorporating GPS-tracked spatial exposures directly into the conventional interview process, such as computer-assisted personal interviewing, or CAPI, that includes a map-based interface, youth can be prompted to report on the activities they engage in over a period of time (for example, more formal activities, such as organized sports, versus informal activities), features of the settings in which these activities occurred (including their level of structure), and the presence of peers and adults with whom they frequently interact (Wikström et al., 2012). Such methods facilitate thorough assessments of key qualities of adolescent contexts (for example, levels of parental/adult monitoring or informal social control) that influence adolescent health and development.

EMAs of youth routine activity locations can also be used to identify characteristics of adolescents' immediate social settings in real time. EMA encompasses a number of methodologies used to collect individual reports of context, behavior, and self-evaluations of mood and other health states as they occur in real-world environments. These methods have been used to study a wide range of health-related behaviors, experiences, and conditions, including poor diet, substance use, psychological stress, sexual behavior, and depression (Shiffman, 2009; Shiffman, Stone, and Hufford, 2007; Shrier, Shih, and Beardslee, 2005; Thiele, Laireiter, and Baumann, 2002; Todd et al., 2003). Researchers have used EMA methods successfully among children and adolescents (Freeman, Csikszentmihalyi, and Larson, 1986; Larson, 1989; Larson, Csikszentmihalyi, and Graef, 1980; Mermelstein et al., 2007) and low-education and low-socioeconomic status respondents (Finkelstein, Cabrera, and Hripcsak, 2000; Hufford et al., 2002). Advances in, and the increasingly availability of, GPS-enabled smartphone technology facilitate (1) EMAs of important adolescent outcomes (for example, risk behavior and mental health), (2) assessments of setting characteristics, and (3) latitude/longitude coordinates of routine activity spaces and locations of risk behavior.

EMAs capturing risk behavior, victimization, and affective states allow for direct linkage of setting characteristics to adolescent outcomes. At the same time, EMAs capturing appraisals of settings

(for example, extent of adult supervision) allow for fine-grained assessments of local environments. In turn, interview-based data on the risk behavior orientations of peers allow for the investigation of the contextual nature of peer effects. For instance, such methods enable researchers to assess such questions as, "Are the effects of time spent with risk behavior-oriented peers substantially accounted for by the amount of time spent in unsupervised and unstructured behavioral settings?" and "Are peers who are more generally involved in risk behavior less likely to encourage such activity when co-present with a focal adolescent only in supervised and structured settings?" Space-time situated network data offer unprecedented characterization of the typical settings to which adolescents are exposed (beyond the home and school) and their health and developmental consequences.

Beyond capturing individual exposure to micro-contexts, GPS-based activity-space data combined with reports from youth on other regular places they go (collected through survey data) will provide an opportunity to identify communities of respondents based on activity-location ties. Using techniques for analyzing affiliation networks comprising individuals attached indirectly through shared activity locations, geocoded activity-space data offer a detailed picture of clustering in activities among youth, thus capturing the larger subset of actors and places to which youth are connected (that is, eco-communities [Field et al., 2006; Frank et al., 2008]). Recent extensions of network methods (Borgatti and Everett, 1997; Doreian, Batagelj, and Ferligoj, 2004) for detecting cohesive subgroups to the two-mode case (in our case, actors and settings) enable researchers to cluster actors into single, nonoverlapping communities.

In turn, the effects of key characteristics of youth communities on youth outcomes can be measured using multilevel regression models of significant health and behavioral outcomes. For instance, because eco-communities are spatially bounded, qualities of eco-communities (for example, informal social control, trust) can be measured using survey responses from community residents. Multilevel regression models that incorporate survey- and EMA-based measures of eco-community characteristics as independent variables will likely provide novel insights into how exposures to activity settings beyond neighborhood environments contribute to adolescent outcomes. Individuals' positions within eco-communities may also be assessed to test the hypothesis that eco-network communities are more consequential for health and development for adolescents who are more "central" within them. Collecting data on time spent at different activity-space locations also allows for precise estimates of contextual "dosage" (Galster, 2012).

The availability of new technologies for collecting rich temporally and geographically referenced data on spatial and social exposures in combination with advances in approaches to the statistical modeling of network data offer neighborhood researchers a variety of opportunities to advance knowledge on contextual influence. The convergence of relevant data collection and methodological advances constitutes a unique opportunity and holds the potential to usher in a new generation of research on the social context of youth development (see Browning et al., 2014, for a description of a data collection effort employing new techniques for assessment of contextual influence on youth).

Discussion

We argue that the concepts of activity space and eco-networks offer unprecedented potential to address some of the major challenges that contemporary neighborhood research faces on children

and youth. It can be argued that the contemporary neighborhood-effects literature faces four key challenges: (1) the need to identify the mechanisms accounting for socioeconomic influences on youth outcomes; (2) the problem of identifying the appropriate neighborhood boundary; (3) the issue of causal inference in estimating neighborhood effects; and (4) the need for high-quality, precise data on the nature of routine exposures among urban residents.

First, we argue that ecological-network processes are key mechanisms linking neighborhood socio-economic characteristics (for example, concentrated poverty, racial/ethnic segregation) to dimensions of social organization (for example, trust, informal social control) relevant to youth well-being. We develop a novel theoretical perspective on the emergence of eco-networks—virtually ignored in earlier research—and their role in fostering key dimensions of social organization relevant to promoting youth development. To be specific, eco-networks emerge from the patterns of spatial overlap in neighborhood and community residents' conventional routine activities (for example, grocery shopping, childcare, extracurricular activities). The patterns of eco-networks are funda-mentally shaped by the availability of high-quality institutions, organizations, and amenities and, therefore, are intrinsically linked to neighborhood socioeconomic conditions. In the aggregate, more interconnected eco-networks enhance familiarity, trust, beneficial organizationally based social ties, collective efficacy, and the capacity for effective monitoring of youth. At the microlevel, organizational characteristics of activity settings (that is, setting structure) have important implica-tions for the mental and behavioral health of youth embedded within eco-networks.

The activity-space and ecological-network approach makes possible the investigation of a number of additional research questions critical for understanding urban neighborhood problems. Some proponents of mixed-income housing, for instance, argue that benefits to low-income residents will ensue from exposures to middle-class neighbors and class-integrated local institutions.[6] An ecological-network approach to assessing the effect of a mixed-income housing development would capture actual activity-space exposures of local neighborhood residents across socioeco-nomic status. The structure of resulting eco-networks would allow for detailed investigation of the extent to which low- and middle-income residents actually share routine activity settings, such as schools, commerce, and other amenities, and the conditions under which socioeconomically inte-grated activity settings emerge. Hypotheses about the level of integration characterizing ethnically and racially heterogeneous census geographies might also be tested based on ecological-network data. Substantial variability may exist in the extent to which members of different race/ethnic groups actually share activity settings in neighborhoods that are considered "integrated," based on census measures of racial/ethnic composition.

Second, ecological-network data make possible the identification of eco-communities that may be independently relevant units of contextual influence on youth outcomes. By identifying clusters of actors and settings that share ties at higher rates, this approach empirically uncovers potentially significant contexts of shared social and spatial exposure beyond often arbitrarily defined neigh-borhood geographies. Beneficial communities linking youth to clusters of pro-social institutions

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[6] See Joseph, Chaskin, and Webber (2007) for a review of theories about the benefits of mixed-income housing.

and settings may be observed in otherwise disadvantaged urban areas—understanding how such communities emerge and the processes by which youth become exposed to them is likely to yield important information for policymakers who are interested in urban poverty and child development.

Third, although the problem of causality and selection is particularly challenging for contextual effects research, activity-space and eco-network data provide information on the key mechanism assumed in the vast majority of neighborhood-based theoretical models—exposure.[7] By building actual exposures into theoretical models and data collection efforts, activity-space and eco-network approaches provide an opportunity to capture precise information on the causal processes typically assumed in extant research. Although selection processes remain difficult to capture (Chaix et al., 2013), exposure data allow for estimating "treatment" effects at a level of precision that limited neighborhood-of-residence information precludes. These approaches also allow for exploiting exogenous contextual shocks. For instance, externally imposed changes to contexts may be hypothesized to have an effect on a given population under the assumption of exposure to the environmental change. Activity-space and eco-network data allow for tests of the extent of actual exposure to a potential mechanism of influence and may be particularly useful when exposures are hypothesized to operate in a "dose-response" relationship. Such analytic approaches to dealing with the problem of causality are largely unavailable with existing, large-scale data resources on urban context effects.

Fourth, as noted, despite tremendous progress in the measurement of context, only recently have the technologies for collecting precise exposure data emerged. Ongoing technological advancements in the capabilities of smartphones and other technologies for collecting real-time geo-referenced data are occurring at breakneck pace. For instance, the Adolescent Health and Development in Context study, a large-scale investigation of the activity spaces of urban adolescents, is currently under way in Columbus, Ohio (Browning et al., 2014). In this study, adolescents provide GPS locations and EMAs of activity settings (including real-time reports of socializing with friends, violence, drug use, and mood states) using smartphones over the course of a week. These data, coupled with information on community characteristics (for example, collective efficacy) and traditional self-report data obtained from surveys of parents and adolescents, will allow for an unprecedented examination of the context of adolescent development. Moreover, with the increasing availability of "big data," including volunteered geographic information (for example, Twitter, Foursquare) and other administrative resources, the capacity for rich characterization of urban spatial contexts is unprecedented.

As scholars increasingly capitalize on these revolutionary advances, we anticipate a dramatic reinvigoration of contextual effects research. In combination with new data collection technologies, the incorporation of activity-space and ecological-network concepts into contextual effects research holds the potential to substantially advance understanding of the mechanisms through which urban environments channel influence—an increasingly pressing need as the global process of urbanization accelerates.

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[7] Although exposure is the dominant mechanism advanced in neighborhood theory, other mechanisms may also operate. For instance, youth who are known to reside in a neighborhood with a reputation for gang violence may be influenced by that reputation (for example, by school officials or employers), even if a resident youth spends little or no waking time in the neighborhood.

Acknowledgments

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Putting Children and Adolescents at the Center of Housing Policy: A Latin American Perspective

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The articles in this symposium build an interesting bridge between housing policy and child and youth development by establishing the direct connections between different dimensions of housing (dwellings, neighborhoods, and communities) and human development. Bringing concerns about the well-being of children and adolescents into the housing policy debate is important because housing is a basic dimension of child well-being that affects other dimensions of development, such as health and education. Yet, many times housing policies are designed and oriented from an adult-centered perspective.

The framework of Sara Anderson, Tama Leventhal, Sandra Newman, and Veronique Dupéré is useful for understanding the way in which residential mobility affects child development and how different contexts of housing (family, neighborhood, peers, and school) affect children and adolescents in varied ways, depending on their stage of development (Anderson et al., 2014). An important contribution of the article is to show that moving, per se, is not necessarily detrimental for children and that it is the change of those housing contexts that affects child development. Changes in the different contexts can go both ways (to a worse or a better context), and, thus, this framework is very useful for understanding how the circumstances of moving and changes in contexts at different levels affect child development.

One dimension of residential mobility the authors mention but do not develop deeply is the reasons for moving. The effects of mobility on child development may differ depending on the circumstances for moving and whether the decision for moving is because of "push" or "pull" factors (Coulton, Theodos, and Turner, 2012). Push factors, such as economic distress or disruptive changes in family composition (for example, divorce, death of the breadwinner) may be accompanied by changes to a worse context (in terms of family distress but also worse quality of housing, neighborhood, or school). By contrast, pull factors, such as a new job opportunity, are more likely to be accompanied by a planned move and will more likely be an improvement in housing and neighborhood characteristics.

A clear push factor in the international context is forced migration, in which families and children are pushed away from their homes and communities. Evidence suggests that moving is detrimental

for children when it is forced or unplanned. In the case of forced migration, research shows that, independent of the exposure to violent events, children who are displaced have worse developmental outcomes compared with those children who are not displaced (Reed et al., 2012).

Consistent with Anderson et al. (2014), apparently it is not "displacement" of moving, per se, that causes these detrimental effects, but rather the dramatic changes in children's developmental contexts. For instance, in the case of Colombia, a country with a high rate of internal forced migration, evidence shows that moving in a forced or emergency situation may bring detrimental consequences through different channels: (1) parental stress related to an unplanned and unwanted move; (2) job loss and income loss, especially when migrating from rural to urban areas, where the skills that parents (especially fathers) bring to the cities are not compatible with the labor market needs, and (3) loss of social and physical capital that was available in their homes (Ibáñez and Moya, 2010).

The "developmental-contextual framework" that Anderson et al. (2014) propose is also useful for understanding in a comprehensive way the link between housing policy in general (not only mobility) and child development and for guiding housing policy interventions to ensure or maximize child development. Within the more proximal contexts of housing, one aspect that is not very emphasized in the article but that is clearly shown by Rebekah Levine Coley, Melissa Kull, Tama Leventhal, and Alicia Doyle Lynch is the quality of the dwelling itself and access to basic services (Coley et al., 2014). In the international context, not only in terms of the achievement of Millennium Development Goals in developing countries (Fay et al., 2005) but also in terms of child poverty elimination in the developed world (Harker, 2007), it is clear that basic infrastructure related to housing quality both inside the dwelling (overcrowding, cooking with solid fuels, dirt floor, and poor quality of roof and walls) and outside the dwelling (access to clean water and sanitation, safety, and access to amenities such as parks and recreation areas) is imperative for achieving child development in terms of nutrition, health, and education outcomes in the long run.

Coley et al. (2014) show how complex neighborhood realties are and the difficulties of labeling neighborhoods as "good" or "bad." An important contribution of the article is to show the potential positive effects of housing and neighborhood quality (in terms of safety and order) on child development when it is accompanied by residential stability. Also, they argue that it is the interaction of different characteristics of housing, neighborhoods, and communities ("housing bundle") that can make a difference in child development.

This argument relates to recent research on multidimensional child poverty, in which different dimensions of child well-being, including housing and neighborhood characteristics, are considered to monitor and design child policy (CEPAL and UNICEF, 2010; Notten and Roelen, 2011). Using this approach, a child's well-being is conceived as the simultaneous achievement of different dimensions, including education, health, nutrition, and housing. Thus, a child is considered to be not poor not only when he or she lives in a decent dwelling (no overcrowding; good quality of floor, roof, and walls) and has access to clean water and sanitation, but also when he or she lives in a safe neighborhood and has access to parks or green areas. This multidimensional approach to child development imposes a challenge in terms of policy design because it requires the delivery of a bundle of services that goes beyond housing or the dwelling and requires the coordination of agencies of different sectors.

Lessons for Policy

Promoting the mobility of families from low-quality dwellings to residences of better quality (an improvement in a proximal context) can have positive effects on child development. If other developmental contexts are not improved (or if they worsen), however, the net effect on child development can be zero. This situation is the case of some public housing projects in Latin America, where culture and traditions were not taken into account; therefore, the spaces provided, although better in quality in terms of construction materials and access to water and sanitation, lacked the physical space that was important for the community in terms of the development of their activities, with a potential destruction of social capital (Mena, 2011). This example in Latin America illustrates the relevance of the developmental-contextual framework that Anderson et al. (2014) propose and the need for accounting for changes in both housing and neighborhood contexts when designing housing policy for families with children.

Another way to have a positive effect on child development through housing policy is to improve housing and neighborhood conditions. In the case of Latin America, these programs to improve housing and neighborhood conditions were originally created to address basic local needs, such as critical housing conditions and access to potable water and sanitation. In some cities, this idea has expanded to include other dimensions of housing and neighborhood quality, such as safety, order, and recreation. Some current pilot projects are under way in Colombia (*Mejoramiento Integral de Barrios*), where, in addition to improving housing conditions and providing access to water and sanitation, the intervention also includes constructing or improving public spaces such as parks, playgrounds, green areas, sports areas, community centers, healthcare centers, and schools. So, rather than improving access to services and to more desirable contexts by moving families to "better" neighborhoods, the intervention aims to improve the existing neighborhoods in different dimensions (order, recreation, education, and healthcare services).

This type of place-based initiative can have two main advantages. First, by keeping families in the same neighborhood, communities can stay integrated and thus social capital remains or can even be strengthened. Second, it avoids the parental and child stress of moving. As the article by Brett Theodos, Claudia Coulton, and Amos Budde shows, however, a potential risk for place-based initiatives is the high level of residential mobility of low-income families and of school mobility of children, even within the same neighborhood or school district (Theodos, Coulton, and Budde, 2014). Therefore, an important lesson of that article is to ensure that the improvement of services is distributed as uniformly as possible within the neighborhood so that a qualitative jump in the quality of services is offered to the community and, therefore, to the development of children.

A final policy lesson of these articles is that housing interventions should be sensitive to child and family characteristics. For instance, different interventions are needed depending on the age of children. For young children, changes in the most proximal context, the family, are more important than changes in the neighborhood. Conversely, for adolescents, they are more easily "permeated" by changes in the neighborhood quality. Also, different interventions may be needed depending on the reasons for moving. If it is a push situation, then families and children need support to ensure they are compensated for the losses that may not be reparable in their home of origin. In addition, if stress is higher, then families need special support to maintain a healthy relationship with their

children. Also, depending on the reasons for moving, changes in other contexts (neighborhood or peers) may vary. It is likely that in a push situation, families move to places where it is more difficult to have and build community ties. In both cases, however, policy must be sensitive to these changes in contexts and ensure that children's environments (home, neighborhood, and school) promote conditions that positively contribute to child development.

Putting children at the center does not mean that housing policy is the only intervention needed to enhance child development. Children also need access to good-quality education, food, healthcare services, and so on. If children are exposed to low-quality housing and neighborhoods, however, not only will their development be at risk, but also the potential effects of other interventions will be deterred.

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Housing, Contexts, and the Well-Being of Children and Youth: A European Perspective

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I have spent many years analyzing issues concerning urban segregation dynamics and effects from a demographic, social class, and ethnic perspective. Although my work focuses mostly on Sweden, U.S. scholars have provided much inspiration for me and other Europeans engaged in researching such issues. While I acknowledge that the urban scenes used to look very much different, with less presence of ethnic minorities, less segregation, less severe urban poverty, less violence, and more social cohesion in the European societies, urban realities are now gloomier in many European cities, including those in the northern European welfare states. It is still the case that phenomena such as racial segregation, homelessness, and poverty take on other, more severe proportions in the United States and that institutional differences are still profound, but research and policy issues addressed on both sides of the Atlantic seem to have converged; see, for instance, van Ham et al. (2012) and Manley et al. (2013) on neighborhood effects and related policy issues; Andersson and Musterd (2005) and van Gent, Musterd, and Ostendorf (2009) on urban area-based interventions; and Flouri, Mavroveli, and Midouhas (2013) on residential mobility and children's behavior. I hope for and also foresee a development in which more research will continue in the footsteps of, for instance, Wacquant (2008) and engage with cross-Atlantic comparative studies related to different aspects of urban segregation processes and policy interventions.

A European outsider has many reasons to welcome the contributions comprising the symposium in this issue of *Cityscape*. First, the authors raise fundamentally important issues concerning re-production of unjust social conditions: What does it mean for the opportunities and development of children to live in poverty, in inferior and unsecure housing, and in poor and segregated neigh-borhoods? What does it mean to be geographically mobile under such conditions? Second, the focus is on making research policy relevant; all contributors have this ambition. Third, the empirical analyses reported do not deny the challenges facing social science in finding causal relationships between individual trajectories and sociospatial contexts. The analyses employ statistical techniques that hopefully underestimate rather than overestimate contextual effects. Fourth, taken together, the research articles offer a generous reading list for younger researchers trying to grasp and enter this research field. Last, but not least, the authors also demonstrate the need for addressing our knowledge gaps. It is unfortunate, in my opinion, that those gaps identified are no better covered in European research.

Being a social and urban geographer by training, I should immediately say that some of the articles concern research fields in which I feel less at home; for instance, psychology. These contributions, however, such as the articles by J. J. Cutuli and Janette E. Herbers and by Rebekah Levine Coley, Melissa Kull, Tama Leventhal, and Alicia Doyle Lynch, are easy to read and have helped to further my own understanding of the substantive topics (Coley et al., 2014; Cutuli and Herbers, 2014). The latter of these two articles is closer to my own interest in neighborhood effects and inspired me to provide some reflections in this commentary. Coley et al. (2014) both confirms and advances existing knowledge about neighborhood effects on children's well-being. The four neighborhood profiles do not distinguish between good and bad neighborhoods; instead, they compose, for low-income people, a set of often-occurring housing and neighborhood characteristics in an interesting and realistic way and therefore open up possibilities for drawing more nuanced conclusions. I hope their article will be widely read because of their choice of empirical research strategy, the way they conducted the multivariate modeling, and the way they presented the final policy discussion in such a clear and well-balanced way. Only one thing disturbs me about the Coley et al. article, and that is the opening line: "Low-income families face numerous constraints but also opportunities in accessing affordable, decent, and stable housing in safe neighborhoods" (Coley et al., 2014: 37). If anything, poor families in the United States and elsewhere face severe constraints but often very little opportunity. This article shows that none of the four most common neighborhood profiles identified is characterized by this full set of positive attributes.

For those studying children's well-being and opportunities, school issues are naturally of key interest. The article by Brett Theodos, Claudia Coulton, and Amos Budde explicitly addresses this topic and is a very welcome contribution to the literature on an important but often overlooked topic; that is, how residential mobility affects a child's academic performance (Theodos, Coulton, and Budde, 2014). Although I have some problems understanding how much "choice" low-income neighborhood children in fact have, and what the "structural barriers to reaching high-quality schools" (Theodos, Coulton, and Budde, 2014: 81) are, I definitely share the conclusion that selective area-based interventions alone cannot solve the problem of structural injustice, unequal opportunities, and residential segregation. The statement "if the areas nearby are not experiencing similar improvements … gains as a result of the initiative may be lost" (Theodos, Coulton, and Budde, 2014: 81–82) is crucial and points in the direction of the need for a much broader structural reform of urban housing and school systems (which probably is easier said than done). It is a well-known fact that area-based interventions, albeit often well motivated and sometimes partially fruitful, are undermined by displacement effects and are thus potentially creating problems elsewhere.

The article by Sara Anderson, Tama Leventhal, Sandra Newman, and Veronique Dupéré also addresses childhood residential mobility (Anderson et al., 2014). Although many studies have addressed residential mobility in many countries, the studies tend not to explicitly focus on residential mobility's effect on children. The way the authors approach child mobility—that is, by applying a developmental perspective separating children into different developmental stages and linking these stages to proximal contexts (family, school, and neighborhood) is, I think, especially rewarding. Findings suggest that family instability co-occurs with residential moves. This finding is not surprising because such instability, per se, tends to generate moves and most families prefer not to move neighborhoods or schools while they have middle childhood or adolescent aged children. It is nevertheless of interest to analyze the effects of child mobility in a systematic and rigorous way. The United States

is certainly not the only country that lacks (federal or Central State) specific policies that could mitigate the negative effects for children of moving families, so simply bringing this issue to the table for discussion is productive. As the authors correctly point out, however, we do need further research to know better in what way moving families and children should be assisted in different stages of a child's development and whether such assistance should be general or targeted toward particular categories (nonvolunteer moves; immigrants, refugees, poor families, and so on). In my own research, I have demonstrated that ethnic minority households move much more often than do native Swedes and that this pattern cannot be explained by demographic or socioeconomic group-varying individual attributes (Andersson, 2012). The same research indicates that some of the most mobile minority groups are those who are the least integrated in the labor market and have the lowest employment incomes. This observation points in the direction of a similar conclusion as the one I read out from Anderson et al. (2014): that high mobility is very often an indicator of social marginalization and can further reinforce and reproduce social exclusion.

Unfortunately, a couple of the articles included in this volume appeared somewhat too late for me to give comments. Simply scanning the Robin Smith, Megan Gallagher, Susan Popkin, Amanda Mireles, and Taz George article leads me to a final reflection, however (Smith et al., 2014). Something like the Moving to Opportunity (MTO) for Fair Housing Demonstration program is difficult to find in Europe, be it because European social policies are more seldom developed by applying selective social experiments or be it because "hypersegregation" (Massey and Denton, 1993) or the level of "concentrated disadvantage" (Sampson, 2012) is still not comparable. As a research program, MTO has been used for addressing a range of important issues by applying quantitative and qualitative research techniques. One remaining issue is, of course, how to design social welfare and housing policies that minimize negative externalities, including neighborhood effects that reproduce different kinds of social inequalities. One thing is certain—it cannot be accomplished by upscaling the MTO idea by moving millions of disadvantaged households from one place to another.

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Point of Contention: The Home Mortgage Interest Deduction

For this issue's Point of Contention, we asked four observers with substantial knowledge of the topic to argue for or against the following proposition—"The federal mortgage interest deduction serves a public purpose that justifies the potential drawbacks of the tax expenditure." Please contact alastair.w.mcfarlane@hud.gov to suggest other thought-provoking areas of controversy.

The Efficiency and Equity of the Home Mortgage Interest Deduction

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Economists strongly favor an economically neutral tax system, and, when the National Commission on Fiscal Responsibility and Reform (the Simpson-Bowles Commission) suggested terminating the mortgage interest deduction for homeowners, many economists agreed on the basis that the deduction creates a bias in favor of homeownership. This argument would be valid if housing were simply a consumer good, but that perspective is incomplete. An owner-occupied home is an asset in addition to being a place to live. It is, as many in the housing industry have often said, "the biggest investment most people will ever make." A homeowner is therefore both an investor and a consumer—someone who owns a house and is renting it to himself or herself. Economic neutrality requires taking both aspects into consideration.

Like any other businessperson, a landlord can deduct business expenses. For rental housing, such expenses include interest on the mortgage, property taxes, maintenance expenditures, and depreciation on the property. After deducting these business expenses, the landlord has to pay tax on the rent he or she receives. A homeowner has the same business expenses but cannot deduct all of them. The homeowner can deduct mortgage interest and property taxes but cannot deduct maintenance or depreciation. The homeowner also does not have to pay taxes on the rental value of the home.

Homeowners therefore have a tax advantage over landlords because owners do not pay taxes on the rental value of their home, and landlords have a tax advantage over homeowners because they can deduct maintenance and depreciation. The treatment of capital gains also differs between the two groups. Homeowners do not pay taxes on the capital gain from the sale of their home, up to a gain of $500,000 for married couples ($250,000 for single individuals). Gains of more than these amounts are taxed at a rate of 15 percent. Rental property owners can defer taxes on the capital gain from the sale of a rental property if they buy another rental property of equal or greater value

with the proceeds, and they can continue to defer taxes on the capital gain each time they engage in the same sale and purchase process (known as a Section 1031 exchange). When they sell a property and do not buy another one, however, rental property owners have to pay taxes on all the capital gains deferred from the past sales. Homeowners and landlords are treated equally regarding mortgage interest and property taxes, however. Both can deduct these expenses.

Perhaps the question should be, "Does the exclusion of imputed rental income from the federal income tax serve a public purpose that justifies the potential drawbacks of the tax expenditure?" For that matter, "Is there a social cost from home maintenance and depreciation to justify the absence of a deduction for these expenses of property ownership?"

The mortgage interest deduction facilitates a more equal distribution of wealth in American society. Since 1992, the equity in owner-occupied homes has consistently amounted to between 20 and 25 percent of all household wealth; even after the housing finance collapse, home equity represented 21 percent of household wealth. Home equity is one of the three major components of household wealth, the others being financial assets (including retirement accounts) and equity in unincorporated business. Together these three components have consistently accounted for two-thirds to three-fourths of all household wealth. Unlike the other two components, however, home equity is widely distributed. The richest 1 percent of households own more than one-half of the equity in unincorporated business, and one-third of financial assets, but only about one-eighth of all home equity. At the other end, home equity accounts for more than one-half of the net worth of households in the lower income half of the wealth distribution.[1] As a society, we are rightly concerned with the distribution of economic well-being; the mortgage interest deduction is a significant contributor to a more equal distribution of wealth. To be clear, the distribution of wealth is very far from being equal, but it would be still more unequal without the mortgage interest deduction.

Homeownership may also provide other social benefits. About 15 years ago, Richard Green and Michelle White found that children of homeowners were more successful than children of renters, in several respects: they were more likely to finish high school, they had fewer behavioral problems, and teenage girls were less likely to become pregnant (Green and White, 1997). This article has been seminal. For several decades previously, economists had believed that homeownership did not generate any social benefits. The research underlying that conclusion had focused on adults rather than children, however. Green and White's paper generated a substantial body of research on the benefits to children of homeownership and a vigorous professional controversy, demonstrated by the discussion in the Point of Contention in the July 2013 issue of *Cityscape* (Barker, 2013; Green, 2013; Haurin, 2013; Newman and Holupka, 2013). It is not my intention in this article to assert that either side has predominated in this literature, but instead to point out that the question of social benefits is now an open question, at the least. It would be ironic if the mortgage interest deduction and, for that matter, other policies to promote homeownership were to be terminated, at the same time that the professional argument concerning social benefits and externalities, so long dismissed, has reopened.

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[1] My calculation is from "Tables Based on the Public Data," expressed in nominal dollars, published by the Federal Reserve Board as part of the 2010 Survey of Consumer Finances, available at http://www.federalreserve.gov/econresdata/scf/scf_2010.htm.

Many critics of the mortgage interest deduction focus on equity rather than efficiency. They argue that the deduction benefits primarily higher income households, because they are disproportionately homeowners and because lower income and moderate-income homeowners often cannot take advantage of the deduction because they do not have enough deductions to itemize. These criticisms overlook the fact that the federal income tax is progressive. In 2007, the last year of the economic expansion before the Great Recession,[2] taxpayers with incomes above $200,000—the richest 5 percent of taxpayers—received about one-third of the total income of all taxpayers, whereas taxpayers with incomes below $50,000—the lower half of the income distribution—received only about one-seventh of the total income of all taxpayers.[3] The distribution of the tax burden was much more unequal: the richest 5 percent paid more than one-half of all personal income taxes, whereas the lowest 50 percent paid less than one-tenth (Bryan, 2009). The pattern was similar for 2011, the most recent year for which the Treasury has published individual income tax return data in the *Statistics of Income* (Bryan, 2013).

The claim that the deduction primarily benefits higher income households is far more applicable to two other commonly claimed deductions, those for state and local income taxes and for charitable contributions. In both 2007 and 2011, the richest 5 percent of taxpayers received less than one-fifth of the aggregate deduction for mortgage interest; they received more than one-half of the deductions for state and local income taxes and for charitable contributions.

The argument that many homeowning taxpayers cannot claim the mortgage interest deduction is also more applicable to these other two common deductions. In 2007, 76 million Americans owned homes, of whom 47 million had mortgages and 41 million—nearly 90 percent of all mortgagors—claimed the deduction. The number claiming the mortgage interest deduction was the same as the number who claimed the charitable deduction and more than the number who claimed the deduction for state and local income taxes (37 million).[4]

Among the 41 million tax filers who claimed the mortgage interest deduction, some 5.6 million paid no income tax because their deductions exceeded their tax liability, which is a good indication that they were in the lower half of the income distribution.

Nearly one-half of the homeowners who did not have mortgages were elderly. Most of them previously had mortgages but had paid them off. Some 85 percent of homeowners in 2007 originally bought their home with a mortgage. It is very likely that they claimed the mortgage interest deduction for a number of years after they moved in.

The 41 million homeowners who claimed the mortgage interest deduction comprised 54 percent of all homeowners and 37 percent of all households. If the share of homeowners and households who claim it is an argument against the mortgage interest deduction, then a parallel, and stronger, argument can be made against the deduction for state and local income taxes. In California, for example, only 4.7 million of the 14.4 million state income taxpayers—less than one-third—were

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[2] The beginning of the recession is dated as December 2007 by the National Bureau of Economic Research.

[3] These data exclude households that did not pay the federal income tax.

[4] The data in this and the next two paragraphs are taken from Weicher (2013).

able to claim a federal tax deduction for their state taxes, and California has one of the highest state tax burdens in the country. In Illinois, which has a moderate tax burden, less than one-third of state taxpayers claimed the deduction; in Arizona, with one of the lowest burdens, about one-fourth claimed the deduction. Those in these and other states who could claim the deduction for state and local income taxes were disproportionately in the richest 5 percent of federal taxpayers. Should we eliminate the state and local income tax deduction because so few taxpayers who pay state and local income taxes are able to itemize their tax payments on their federal tax return?

The mortgage interest deduction provides several benefits, and they are widely diffused among American households. Most of us receive the social benefits from the deduction for most of our lives.

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Congress Should Phase Out the Mortgage Interest Deduction

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The mortgage interest deduction is one of the most expensive federal tax preferences. The Joint Committee on Taxation (2013) estimated that the deduction will cost about $380 billion from fiscal years 2013 through 2017. Homeowners also benefit from the deduction of real property taxes and the exemption of the first $250,000 ($500,000 for couples) of capital gains on the sale of principal residences.

Defenders of the mortgage interest deduction claim that it stimulates homeownership, which they argue has many broader benefits to society beyond the benefits to the owners themselves. I argue instead that the case for these "external" social benefits is unproven and that, even if these benefits exist, the mortgage interest deduction is an ineffective tool for increasing homeownership. Instead, the deduction mostly serves as an incentive for middle-income and upper income people to acquire larger and more expensive homes than they otherwise would have purchased. These increased investments in homes that the tax subsidy generates divert resources from business investments with a larger social yield but without a comparable tax subsidy. If promoting homeownership is the goal, a subsidy directed to people who might be choosing between buying and renting would be a more effective tool for doing so.

Does Owning Instead of Renting Provide Net Social Benefits?

Proponents of homeownership subsidies cite social benefits of homeownership. An extensive body of research (DiPasquale and Glaeser, 1999; Galster, 1983; Glaeser and Sacerdote, 2000; Glaeser and Shapiro, 2003; Rossi and Weber, 1996) has found that owner-occupied homes are better maintained than rental properties, homeowners have higher rates of voting and other forms of civic participation than renters, and crime rates are lower in areas with more homeowners. The studies do not establish, however, whether homeownership *causes* these benefits or whether people who are civic-minded or less likely to commit crimes are more likely to buy homes (Gale, Gruber, and Stephens-Davidowitz, 2007). Some analysts also suggest that promoting homeownership among low-income people may help them accumulate wealth and thereby promote social mobility (Lerman and McKernan, 2008). Homeownership also comes with downsides, however. Homeownership may limit job mobility because of the much greater costs associated with buying and selling homes than with moving

from one rental property to another. Events in the past few years have shown that excessive home mortgage debt can expose individuals and the broader economy to significant risk. Although it is important to maintain financial arrangements that enable people to obtain long-term loans to buy homes, doing so does not mean that federal policy should tilt the playing field toward owning instead of renting.

Does the Mortgage Interest Deduction Increase Homeownership?

Even if one accepts that the federal government should promote homeownership, it does not follow that the mortgage interest deduction is a good way to do it. The current deduction provides no subsidy to the 65 percent of taxpayers who do not itemize deductions on their tax returns or the many households that have no tax liability at all. It provides only a modest subsidy to itemizers in the 15-percent tax bracket. The subsidy value is greatest among upper middle-income taxpayers, those who are most likely to own a home without a subsidy. Studies have found no evidence that the change in the value of the mortgage deduction over time (as marginal tax rates have changed) has affected homeownership rates in the United States (Glaeser and Shapiro, 2003), and no drop in homeownership occurred when the United Kingdom reduced its mortgage interest subsidy (Gale, 2001, 1997). Culturally similar countries, including Canada, New Zealand, and Australia offer no mortgage interest deduction but have homeownership rates similar to those in the United States (Mann, 2000).

The subsidy very well might help upper middle-income taxpayers in high-rate brackets to afford larger mortgages and thereby purchase more expensive homes. It is unclear, however, why federal taxpayers should subsidize relatively well-off people's acquisition of more expensive homes.

What Are More Effective Ways of Promoting Homeownership?

Subsidies that are better directed to those on the margin between buying and renting would more effectively increase homeownership, in general, and would enable low-income people to become homeowners, assuming that the social benefits of community stability and the need for asset build-ing are greatest among that population. Converting the deduction to a uniform percentage credit for mortgage interest or to an investment credit for first-time homeowners would provide a more direct incentive for homeownership and reduce the subsidy for upper income households to buy more expensive homes with borrowed money. Decreasing the cap on the amount of debt eligible for a tax subsidy and eliminating the deductibility of interest for vacation homes and home equity loans could achieve further budgetary savings to pay for homeownership incentives or deficit reduction.

What Would Be the Effects of Phasing Out the Mortgage Interest Deduction on Housing Markets?

If the mortgage interest deduction did not exist, the federal government would have no good reason to invent it. Taking away the deduction quickly, however, would have adverse effects on

housing markets. Housing prices have recovered much of the ground lost in the Great Recession but are still weak in many regions. Some homeowners, especially younger people who have recently purchased homes, would experience increased housing costs and reduced home value.

For these reasons, any limits on deductibility should be phased in gradually to allow markets to adjust and to limit capital losses to homeowners. Permanently maintaining a subsidy, however, that is not effective in achieving its stated goal, contributes billions to the federal deficit, and diverts scarce capital from better uses to larger homes is not the answer. We should phase out the mortgage interest deduction.

Acknowledgments

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Eliminate the Mortgage Interest Deduction or Tax Imputed Rent? Leveling the Real-Estate Playing Field

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Many commentators call for reducing or eliminating the mortgage interest deduction, arguing that the tax subsidy to owner-occupied housing distorts the economy by encouraging excessive housing investment and costing the government a substantial amount of tax revenue. They argue that nothing is sacred about this deduction, pointing to other countries (including our neighbor Canada) that do not provide it. It is not widely recognized, however, that the tax subsidy to homeownership arises not from the mortgage interest deduction per se but rather from a broader failure to treat owner-occupiers and landlords symmetrically. The failure of the tax code to treat owner-occupiers as landlords renting to themselves, as symmetry would require, is the real source of the subsidy. Eliminating this asymmetry, thus "leveling the playing field" in the tax treatment of real estate, would require taxing imputed rent and preserving, not eliminating, the interest deduction. The argument is that, if the tax code treated the owner-occupier as a landlord renting to himself or herself, this rent payment would be treated as income and taxed. The owner-occupier, like any business, would then be allowed to deduct all operating costs in computing taxable income, with mortgage interest being one of these costs.

Taxing imputed rent involves a measurement problem, because the rent that any particular owner-occupied dwelling would command in the rental market is not observed. However, a number of countries, including Switzerland and the Netherlands, follow this practice, and the United States could implement it by setting imputed rent equal to some fraction of the assessed value used for property tax purposes. Although feasible, taxing imputed rent would be very unpopular and thus politically problematic. Because their tax liabilities would rise, homeowners would strongly oppose paying taxes on imputed rent, matching their likely opposition to eliminating the mortgage interest deduction. It is nevertheless important for policymakers to gain a better understanding of the logic behind taxing imputed rent, and a better understanding requires a deeper analysis.

The analysis relies on the notion of the "user cost" of owner-occupied housing, a concept familiar to real estate economists. The *user cost*, in effect, gives the annual cost of inhabiting an owner-occupied house, a cost that is composed of mortgage interest, property taxes, and depreciation, with capital gains netted out. Let i denote the mortgage interest rate, p denote the property tax rate, d denote the

depreciation rate, *g* denote the rate of capital gains (the growth rate of house prices), and *V* denote the value of the dwelling. The owner-occupier's costs are $(i + p + d - g)V$, with iV equal to mortgage interest,[1] pV equal to the property tax payment, dV equal to the loss from physical depreciation, and gV equal to the gain from price appreciation (a negative cost). Because mortgage interest and property taxes are tax deductible, however, the owner-occupier in effect pays only a fraction, $1 - t$, of these two costs, where *t* denotes the (marginal) tax rate. Therefore, the user cost of owner-occupied housing equals

$$u = [(1 - t)(i + p) + d - g]V. \tag{1}$$

Note that, because depreciation is not tax deductible and capital gains earned by homeowners are effectively untaxed, neither *d* nor *g* is multiplied by the $1 - t$ factor.

In deciding whether to own or rent, a consumer compares the user cost *u* with the rental cost of a comparable dwelling, *R*. In purchasing this dwelling for rental purposes, the landlord pays *V*, the same price that an owner-occupier would pay to purchase it. In a competitive housing market, in which profit is competed away, rent should just cover the landlord's costs (net of capital gains) on an after-tax basis. Letting *t* be the landlord's tax rate (assumed the same as the owner-occupier's tax rate), the net-of-tax income from renting out the dwelling is $(1 - t)R$, and the costs are the same ones incurred by the homeowner: mortgage interest, property taxes, and depreciation (net of capital gains). Because all three costs are tax deductible for landlords, and capital gains are taxable, all these elements are, like *R,* multiplied by $1 - t$ to get net-of-tax costs. Because the $1 - t$ factor cancels out when equating after-tax rental income to after-tax costs, however, the equality requires *R* to equal the landlord's costs on a *before-tax basis*. Therefore, *R* is given by

$$R = (i + p + d - g)V. \tag{2}$$

Comparing equations 1 and 2 reveals the tax subsidy to homeownership. The presence of the $1 - t$ factor multiplying $i + p$ in the user cost formula makes *u* smaller than *R*. As a result, a consumer would achieve a lower housing cost by owning than by renting. The implication, then, is that no household should want to rent. Although this conclusion is unrealistic, introducing other factors that are ignored in this simple framework would upset the prediction, leading to a more realistic outcome in which both renters and owner-occupiers coexist. For example, downpayment accumulation provides a barrier to homeownership for some households, forcing them to rent, and landlord tax benefits such as accelerated depreciation, which tend to depress *R* and thus make renting more attractive for some households, have been omitted.

The superiority of owning in this framework is a consequence of the asymmetric tax treatment of owner-occupiers and landlords. Owner-occupiers do not pay any tax on imputed rent or capital gains, which decreases their user cost. They are not allowed to deduct depreciation, a prohibition that increases their user cost. Depreciation is not important enough, however, for this omission to reverse the negative effect on user cost from nontaxation of imputed rent and capital gains.

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[1] The owner-occupier is assumed to use a 100-percent, interest-only mortgage. Using a smaller mortgage has no effect on the formula (the forgone interest income on the funds used for a downpayment [a cost] exactly offsets the reduction in mortgage interest). Recognizing that mortgage payments usually contain both interest and principal, however, would lead to a more complicated formula.

If this asymmetry were eliminated, the owner-occupier's user cost would rise, becoming equal to rent, R. In particular, the tax on imputed rent, tR, would increase the owner-occupier's cost, as would the tax on capital gains, tgV. Conversely, the tax savings from deducting depreciation, tdV, would decrease the owner-occupier's cost. Totaling these changes and substituting for R using the rent formula, the increase in user cost turns out to equal $t(i + p)V$. It is easy to see that, by adding this amount to the u formula, the user cost becomes equal to R.

Therefore, leveling the playing field in the tax treatment of real estate requires not only taxing imputed rent but also taxing capital gains and allowing deduction of depreciation. These alterations are substantial changes to the tax code, but symmetric treatment of owner-occupiers and landlords requires them.

Eliminating the mortgage interest deduction could also narrow the gap between the owner-occupier's user cost and rent. By eliminating the deduction, the $(1 - t)(i + p)$ term in the u formula would be replaced by $i + (1 - t)p$, which is larger and thus nearer to the $i + p$ term in the rent formula, reducing the advantage of homeownership over renting. In fact, the advantage could be completely eliminated by also eliminating the deductibility of property taxes, in which case the $i + (1 - t)p$ term would become $i + p$, making the owner-occupier's user cost and rent identical.

This outcome is the same as that generated by taxing imputed rent and capital gains and allowing deduction of depreciation. In both cases, renting and owning are equivalent from the consumer's point of view, entailing identical costs. Does this equivalence mean that policymakers should be indifferent between these two different routes for leveling the playing field? The answer is *no*, and the reason comes from taking the point of view of an investor rather than a consumer.

An investor in rental housing earns the difference between rent and costs, multiplied by $1 - t$ to convert to an after-tax basis. Under the imputed-rent approach, the earnings of the owner-occupier (viewed as an investor) take an equivalent form: imputed rent minus costs multiplied by $1 - t$. Under the approach that eliminates the deductibility of mortgage interest and property taxes, however, no income elements are taxed and no costs are deductible, which means that earnings simply equal imputed rent minus costs, with the shrinkage factor of $1 - t$ absent. As a result, investment in owner-occupied housing appears more favorable than investment in rental housing or any other productive activity wherein taxes deflate net income. As a result, although eliminating the deductibility of mortgage interest and property taxes makes rental and owner-occupied housing appear equivalent from the consumer's point of view, it does not eliminate the investment bias toward the latter type of housing created by the current tax subsidy. Therefore, a true leveling of the playing field in the tax treatment of real estate requires following the imputed-rent route, not the path that focuses on eliminating the mortgage interest deduction.

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Misinformed and Misled About the Benefits of the Mortgage Interest Deduction

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Tax experts have long indicted the mortgage interest deduction (MID) for distorting the housing and mortgage markets and for inequitably distributing its benefits (Brazer, 1959; Paul, 1956; Surrey, 1958; Trammell, 1959; Ture, 1956; Vickrey, 1947). It creates a false baseline for the cost of housing (Anderson, 2007; Bruce and Holtz-Eakin, 2001; Capozza, Green, and Hendershott, 1996; Hendershott and Slemrod, 1982; Poterba, 1984), encourages taxpayers to pay for homes with debt rather than with cash or financial assets (Gale, Gruber, and Stephens-Davidowitz, 2007; Poterba and Sinai, 2011; Sullivan, 2008), causes wasteful and unproductive misallocation of physical and financial capital (Gervais, 2002; Jorgenson and Yun, 1990; Mills, 1987; Taylor, 1998), and distributes benefits disproportionately to upper income households (Brady, Cronin, and Houser, 2003; Carasso, Steuerle, and Bell, 2005; Eng et al., 2013; Gyourko and Sinai, 2003; Sullivan, 2011; Toder, Harris, and Lim, 2009; Toder et al., 2010). Furthermore, the MID results in less economic productivity (Acharya et al., 2011), reduced labor mobility and greater unemployment (Caplin, Freeman, and Tracy, 1997; McCarthy, Van Zandt, and Rohe, 2001; Winkler, 2011), depressed real wages, and a lower standard of living (Sullivan, 2005). The MID is so damaging to the economy that nearly every economist believes that "the most sure-fire way to improve the competitiveness of the American economy is to repeal the mortgage interest deduction" (Sullivan, 2005: 407).[1]

The MID nonetheless remains wildly popular among the American populace. Opinion polls reveal overwhelming support for preserving the subsidy[2] and equally strong opposition to eliminating or reducing its benefits,[3] even to pay for deficit reduction.[4] Politicians, too, remain committed to

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[1] For evidence of the overwhelming support among economists and market experts for eliminating or substantially reforming the MID, see http://www.prnewswire.com/news-releases/housing-experts-see-stronger-recovery-on-horizon-170477286.html.

[2] See http://www.nytimes.com/interactive/2011/06/30/business/20110630poll-full-results.html?ref=business and http://www.realtor.org/sites/default/files/american-attitudes-about-homeownership-2011-01-19-survey-results.pdf.

[3] See http://www.nahb.org/news_details.aspx?newsID=14563.

[4] See http://www.scribd.com/doc/117298635/CBS-News-Poll-Fiscal-Cliff and http://www.realtor.org/reports/housing-pulse-surveys/housing-pulse-survey-2011.

the deduction, scared to disturb the tax code's "most sacred tax break" (Birnbaum and Murray, 1987: 246), even as it siphons off more than $100 billion annually in forgone revenue (OMB, 2013).[5]

Both the public and the pols are misinformed about the importance of the MID, largely because they are misled by the MID's most resolute supporters. Proponents of the tax code's second most expensive subsidy, chief among them the real estate industry, participate in an endless campaign of misinformation and dissembling claims about the MID's shared benefits. This campaign costs money—lots of money. In 2013, the real estate industry spent nearly $82 million lobbying Congress and federal agencies.[6] Of that amount, the National Association of REALTORS® (NAR) spent nearly $38.6 million, making it the second most free-spending organization in terms of lobbying across all industries.[7] In addition, both the NAR and the National Association of Home Builders maintain websites dedicated to "oppos[ing] any changes that would limit or undermine" the MID[8] and that further purport to show how the subsidy benefits lower class and middle-class taxpayers.[9]

Examining What MID Supporters Say

Each of the following sections highlights the real estate industry's most troubling false claims about the MID. Each section focuses on supporters' inaccurate claims purporting to show how the MID benefits taxpayers at all income levels, and it scrutinizes the tax subsidy's allegedly positive effects on wealth accumulation and financial security.

"The mortgage interest deduction primarily benefits middle- and lower-income families." (NAR, 2013a)

Supporters of the MID deploy expansive definitions of "middle-income" and "lower income" households that defy any reasonable interpretation of the two categories. According to the U.S. Census Bureau, median household income in 2012 (meaning the income of the household precisely in the middle of the income spectrum) barely exceeded $50,000 (U.S. Census Bureau, 2013a). That income level, however, is not what the real estate industry considers middle class, although a full two-thirds of taxpayers report incomes of less than $50,000 (IRS, 2013a). Instead, the real estate industry's definition of middle class begins at $75,000 (at an income level below which more than

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[5] The MID also depletes state coffers. Of the 41 states with income taxes, 31 permit residents to reduce their incomes with a deduction for home mortgage interest, an allowance that costs these states considerable forgone tax revenue (FTA, 2013a, 2013b; Morris and Wang, 2012). In California alone, the MID is estimated to cost $4.4 billion in fiscal year (FY) 2013–14 (CDF, 2013). For additional perspective on the cost of the MID, consider that the $100 billion in lost annual revenue at the federal level could fund HUD—with a budget of $44.8 billion in FY 2013—for nearly 2.25 years (HUD, 2012).

[6] See http://www.opensecrets.org/lobby/top.php?indexType=i&showYear=2012.

[7] See http://www.opensecrets.org/lobby/top.php?showYear=2012&indexType=s. From 1998 to 2013, the NAR spent $258.4 million lobbying Congress and federal agencies (see http://www.opensecrets.org/lobby/top.php?indexType=s&showYear=a), and the real estate industry as a whole spent more than $1 billion (see http://www.opensecrets.org/lobby/top.php?showYear=a&indexType=i).

[8] See http://www.realtor.org/topics/mortgage-interest-deduction.

[9] See http://www.realtor.org/topics/mortgage-interest-deduction, http://www.nahb.org/page.aspx/generic/sectionID=2063, and http://www.protecthomeownership.com/showpage_details.aspx?showpageID=10294.

78 percent of taxpayers reside [IRS, 2013a]) and extends all the way to $200,000 (a level below which nearly 97 percent of all taxpayers reside [IRS, 2013a]).[10] Without denying that some of those 97-percenters may feel more middle class than upper class (for many of the same reasons that households earning more than $250,000 resent being called "rich" by politicians looking to raise taxes), the numbers do not lie. Those folks are nowhere near the middle.

Touching the MID would create a "de facto tax increase on the middle class."
(Phipps, 2011: 18)

For the sake of argument, consider the *middle class* to include taxpayers with incomes up to $100,000, which represents more than 86 percent of all taxpayers (IRS, 2013a). Barely 17 percent of that group claim the MID on their returns (IRS, 2013a), however, and that group receives just 23 percent of all tax benefits flowing from the MID (JCT, 2013). By comparison, taxpayers reporting incomes of more than $100,000 represent only 13 percent of all tax filers (IRS, 2013a), but they receive nearly 77 percent of MID benefits (JCT, 2013). Meanwhile, taxpayers with incomes of more than $200,000 account for only 3 percent of all tax filers (IRS, 2013a) but take home a 35-percent share of the MID's tax savings (JCT, 2013). Furthermore, households reporting incomes of less than $50,000—below which two-thirds of all taxpayers fall—receive a meager 3 percent of the tax benefits flowing from the MID (JCT, 2013).

The real estate industry and its representatives are right to say that reforming the MID might cause some taxpayers to pay more in taxes. Not the middle class, however. Taxpayers with incomes up to $100,000 receive a small fraction (about one-fifth) of MID benefits and would benefit most from replacing the MID with nearly any other tax policy alternative, including, most prominently, a tax credit for homeownership (Gale, Gruber, Stephens-Davidowitz, 2007; Ventry, 2012; Fischer and Huang, 2013; Eng et al., 2013).

The MID helps "make the income tax more progressive," and "[e]liminating the deduction would … make the tax system less progressive." (NAHB, 2013)

As a threshold matter, the MID is the classic upside-down subsidy. It distributes benefits to precisely the wrong people: taxpayers who would own homes even in the absence of the subsidy rather than taxpayers residing on the margin between owning and renting. It delivers 10 times the tax savings to households with incomes exceeding $250,000 as to households with incomes from $40,000 to $75,000 (Poterba and Sinai, 2008). Moreover, these inequitable features of the MID have worsened during the past 25 years, making the tax system less, rather than more, progressive (Anderson and Roy, 2001; Gyourko and Sinai, 2001). In 1987, taxpayers earning less than $50,000 took home 48 percent of the tax savings from the MID (JCT, 1986). By 2012, however, taxpayers earning less than $100,000 (a figure that approximates $50,000 in 1987 dollars)[11] received less than 23 percent of the MID's tax benefits (JCT, 2013).

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[10] See DelliBovi (2013), who wrote, "The greatest share of the mortgage interest deduction lies not with the super rich but with the middle class. More than half of this deduction is claimed by households within the $75,000 to $200,000 income range."

[11] See http://www.bls.gov/data/inflation_calculator.htm.

Several factors help explain the inequitable distribution of the tax savings from the MID, the most significant of which is that the subsidy is delivered in the form of an itemized deduction.

First, to receive any benefit from itemized deductions—and the MID is the most expensive of all itemized deductions (OMB, 2013)—taxpayers must actually itemize deductions rather than take the standard deduction. Furthermore, the promised land of itemized deductions is available only to those taxpayers whose total itemized deductions (including, for instance, the MID, property taxes paid, state and local taxes paid, qualifying charitable contributions, and so on) exceed the dollar value of the standard deduction. In tax year 2013, the standard deduction was $12,200 for married taxpayers and $6,100 for unmarried taxpayers (IRS, 2013b). In a typical year, no more than one-third of all taxpayers itemize, while the remaining two-thirds claim the standard deduction.[12] In 2011 (the year for which the most recent data are available), only 31.84 percent of tax filers itemized (IRS, 2013a). Moreover, not all itemizers claim the MID, such that in the end less than 25 percent of all taxpayers received any tax benefit from the MID in 2011 (IRS, 2013a). In other words, 75 percent of all taxpayers received *no* tax savings from the MID.

Second, higher income households claim a disproportionate share of itemized deductions compared with lower income and middle-income households. For tax year 2011, 13.2 percent of taxpayers reporting incomes of less than $50,000 claimed itemized deductions, compared with 96.6 percent of taxpayers with incomes exceeding $200,000 (IRS, 2013a).

Third, the value of a deduction depends on a taxpayer's marginal tax rate; that is, the rate imposed on the taxpayer's last dollar earned. A taxpayer's marginal tax rate depends on the taxpayer's income, with increasing tax rates levied on increasing increments of income. Therefore, a $100 deduction for a taxpayer in the 15-percent tax bracket yields tax savings of $15 ($100 x 0.15), whereas the same $100 deduction for a taxpayer in the 35-percent tax bracket yields $35 in tax savings.

With these technical details as background, consider the following example. A married, renting household that earns $100,000 falls into the 25-percent tax bracket. This household pays $4,000 in state income taxes and makes $1,000 in charitable contributions, for $5,000 in potential itemized deductions—much less than the standard deduction of $12,200. Thus, this household takes the standard deduction.

Now consider the same household after purchasing a house the following tax year. The new owners are excited for many reasons, including the tax benefits that their real estate agent promised would flow from the $10,000 in mortgage interest payments and $4,000 in property taxes. This household now has $19,000 in itemized deductions (assuming it still pays $4,000 in state income taxes and makes $1,000 in charitable contributions), which exceeds the standard deduction. This household will itemize, and receive additional tax savings.

How much will this household save? That is, what is the after-tax value of the $14,000 in new housing costs? Is it the full $14,000? Is it the $14,000 multiplied by the household's marginal tax rate? Is it something else altogether?

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[12] The average percentage of itemizing taxpayers from 1987 to 2011 was 31.63 percent (IRS, 2013c).

It turns out that the after-tax value of the new deductions is the amount by which total itemized deductions exceed the standard deduction multiplied by the household's marginal tax rate. In determining the after-tax benefit of a tax subsidy, we need to know the *marginal* benefit. In this example, the marginal benefit is only $1,700: $19,000 (total itemized deductions) – $12,200 (the otherwise available standard deduction) = $6,800 x 0.25 (the taxpayer's marginal tax rate).

That savings is better than nothing, but consider a household with the same new housing costs of $14,000 with an income of $400,000 subject to a marginal tax rate of 35 percent. This household is already itemizing deductions because it pays more state income taxes and makes more charitable contributions (that is, the sum of those itemized deductions already exceeds the standard deduction), so any additional deductions are simply multiplied by the household's marginal tax rate to determine their value. As a result, for this higher income household, on the same total out-of-pocket expenses, the marginal benefit of the tax subsidies increases dramatically from $1,700 to $4,900 ($14,000 x 0.35), or nearly three times the benefit enjoyed by the household in the 25-percent tax bracket.

Defenders of the MID routinely ignore or misunderstand the effect of marginal tax rates on the distribution of the deduction's benefits (Dietz, 2010, 2008; Drum, 2011). In so doing, MID supporters misrepresent the net benefits of the MID and its effects on the progressivity of the tax system and the distribution of income. For instance, they point to the "average deduction" among all MID claimants to prove that the subsidy "helps lower-income families" (Weicher, 2013: 5). They fail to mention, however, that using averages from the entire cohort of MID claimants distorts the net distribution of MID benefits. In tax year 2011, for example, the average deduction for all taxpayers claiming the MID was $10,129 (IRS, 2013a). MID claimants with incomes of less than $50,000 received an average deduction of $7,364, however, whereas claimants with incomes of more than $200,000 received an average deduction of $18,580. The true value of the deduction is further skewed by accounting for marginal tax rates; married claimants with incomes of less than $50,000 faced marginal rates no greater than 15.0 percent (meaning the deduction was worth 15 cents for every dollar of interest paid), whereas married claimants with incomes of more than $200,000 were subject to marginal rates ranging from 28.0 to 39.6 percent (meaning the deduction was worth from 28 to 40 cents for every dollar of interest paid).

Zealous MID supporters also misrepresent the subsidy's benefits through additional methods. Consider that one recent study concluded its homage to the MID by stating, "During the most recent normal year, about 37 percent of all families benefited" from the deduction (Weicher, 2013). For starters, the study in question used 2007 as its index year, hardly a "normal" year given that the number of itemizers in 2007 exceeded that in any year before or since. Even if we use 2007 as exemplary, just 35.31 percent of all taxpayers itemized (IRS, 2013c), and the only way that a taxpayer can receive a tax benefit from the MID is by itemizing. For yet another overstatement, the same study asserted, "Homeowners with mortgages nearly always itemize" (Weicher, 2013: 6). That claim, too, is exaggerated. Comparing Internal Revenue Service (IRS) figures for total MID returns against Census Bureau figures for mortgaged homes reveals that slightly more than 70 percent of homeowners with mortgages itemized in 2011, meaning that nearly 30 percent of mortgaged homeowners did not itemize (IRS, 2013a: 86; U.S. Census Bureau, 2013b).

In the end, the MID and its supporters promise considerably more than the subsidy delivers. The deduction provides no benefit to more than 75 percent of taxpayers (IRS, 2013a); no benefit

to 100 percent of nonitemizing taxpayers, reflecting more than two-thirds of all taxpayers (IRS, 2013a); no benefit to more than 20 percent of the taxpayers who *do* itemize (IRS, 2013a); no benefit to more than 50 percent of all homeowners (IRS, 2013a; U.S. Census Bureau, 2013b); and no benefit to nearly 30 percent of mortgaged homeowners (IRS, 2013a; U.S. Census Bureau, 2013b).

The MID helps American families "build their future," "build wealth," and "build the kind of financial security that owning a home can provide." (Phipps, 2011: 18; NAR, 2013a)

The real estate industry considers the MID "a remarkably effective tool that facilitates homeownership" (NAR, 2013b). Furthermore, it considers homeownership a prudent financial investment generating solid gains and financial security. Unfortunately, the investment returns to homeownership are not nearly as robust as the real estate industry would have us believe.

Adjusted for inflation, housing prices were flat throughout most of the postwar period until prices temporarily deviated from their historical pattern beginning in the 1990s, when an overheated housing market bubbled, burst, and contributed to global economic meltdown. According to economist, housing guru, and Nobel laureate Robert Shiller, the average annual investment return to housing from 1950 to 2000 barely kept pace with inflation, averaging less than 0.5 percent (Cauchon, 2008a). Historical real returns to housing were so unimpressive during the postwar period that $100 invested in a home grew a paltry $4 from 1950 to 1997 (Cauchon, 2008b). During the longer term, housing posted equally unimpressive returns, with inflation-adjusted prices growing only 0.4 percent per year from 1890 to 2004 (Shiller, 2013, 2005).

In addition to struggling to produce positive real returns for more than a century, owner-occupied housing has grossly underperformed compared with other investment opportunities. Real stock prices jumped 1,176 percent from 1950 to 2000 (Shiller, 2013), for instance, while the Dow Jones stock index grew more than 2,700 percent (Randazzo, 2011). Moreover, from 1926 to 2009, compounded annual returns for small stocks (11.9 percent), large stocks (9.8 percent), long-term U.S. government bonds (5.4 percent), and U.S. Treasury bills (3.7 percent) produced strong and reliable annual gains that far outpaced housing (Morningstar and Shooter Financial, 2010). In fact, $100 invested in 1928 in, respectively, stocks, Treasury bonds, and Treasury bills would have been worth $193,219, $1,971, and $6,926 at the end of 2012 (Damodaran, 2013).

Despite overwhelming evidence that homeownership is not the path to prosperity and amounts (at best) to a decent savings account, defenders of the MID continue to spread misinformation about the investment returns to housing and the pro-homeownership role of the MID. They grossly exaggerate the "importance of owning a home as an asset" (Weicher, 2013: 11) and in facilitating wealth accumulation (Weicher, 2013). Moreover, they blindly assert that disturbing the MID "would yank the safety net out from under millions of U.S. households as they stride toward the American dream" and financial security (DelliBovi, 2013).

For example, one recent study—prominently cited by the NAR (DelliBovi, 2013)—claimed, "For most of the last 25 years, homeowners' equity has constituted about a quarter of total household wealth" (Weicher, 2013: 1). According to the Federal Reserve, however, homeowners' equity as a percentage of total household net worth from 1988 to 2012 averaged only 16.44 percent (BGFRS,

2013a).[13] In fact, in no year—let alone in "most" years—did the ratio reach 25 percent; the closest that homeowners' equity as a percentage of total household net worth got to 25 percent was 20.86 percent in 2005 (BGFRS, 2013a).

The same study touted the financial wisdom and wealth-generating effects of homeownership by using data from 2007, a year that captured the wild runup in housing values (from $8.85 trillion in 1997 to $20.68 trillion in 2007) and mortgage debt (from $3.75 trillion to $10.58 trillion during the same period) (BGFRS, 2013a). By focusing on 2007, however, the study neglected the subsequent cataclysmic decline in household equity and wealth that ensued. From the first quarter of 2006 through the first quarter of 2009, the value of residential real estate declined a stunning $7 trillion, from $22.6 trillion to $15.6 trillion (FRBSF, 2009). Housing net worth fell another $1 trillion because of increased mortgage debt during the period, for a total decline in net worth of $8 trillion (FRBSF, 2009). With housing prices falling 33 percent from their peak in April 2006 to February 2012 (Haughwout, Sutherland, and Tracy, 2013), significant negative equity followed, topping out in the fourth quarter of 2009 with 26 percent of mortgaged households "under water" and average negative equity cresting $70,000 (Haughwout, Sutherland, and Tracy, 2013). The combination of negative equity and sharply increased unemployment rates (or reductions from full- to part-time employment) resulted in massive foreclosures: 4.5 million from September 2008 through July 2013 (CoreLogic, Inc., 2013).

The losses in equity, wealth, and homes hit the most vulnerable populations hardest. During the housing bubble, less expensive properties experienced greater percentage increases, but during the bust they experienced correspondingly greater declines (Ellen and Dastrup, 2012). Minority households absorbed the most severe equity losses among all households from 2005 to 2009, with median wealth falling 66 percent among Hispanic households and 53 percent among African-American households compared with 16 percent among White households (Ellen and Dastrup, 2012).

The housing market's boom-to-bust chronic condition belies the hollow assertions of the real estate industry that homeownership "builds financial security" and that the MID "makes sustainable homeownership more affordable for millions of middle-class families" (NAR, 2013a). Homeowners' equity as a percentage of household net worth plummeted from 2005 to 2011, from nearly 21 percent to less than 10 percent (BGFRS, 2013a). As part and parcel of the decline in housing values, owners' equity as a percentage of household real estate fell from 59.5 percent in 2005 to an all-time low of 38.5 percent in 2009 (BGFRS, 2013a). Although the ratio has ticked steadily upwards during the past few years, reaching 49.8 percent in the second quarter of 2013 (BGFRS, 2013b), the figure is misleading for several reasons.

First, the most prevalent definition of homeowners' *equity* captures households that own their home free and clear, unburdened by mortgage debt. Consider that nearly 35 percent of owner-occupied households had no mortgage debt in 2011 (U.S. Census Bureau, 2013b); thus, the remaining

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[13] The Federal Reserve tracks "owners' equity in household real estate" and total household net worth back to 1945 in its composite table, "B.100 Balance Sheet of Households and Nonprofit Organizations" (which is contained in the Historical Annual Tables compiled in 10-year increments). Dividing the two figures (a task that I performed for each year from 1988 to 2012) and then averaging all 25 years reflects homeowners' equity as a percentage of total household net worth during that period (the actual figure is 16.4384 percent).

65 percent of mortgaged households had even less equity in their homes than the aggregate figure of 49.8 percent would suggest, and millions of households had negative equity (McBride, 2013; U.S. Census Bureau, 2013b).

Second, and more importantly, figures pertaining to homeowners' equity also usually include not only *real equity*, in the form of downpayments and deleveraging through reductions in mortgage principal, but also *paper equity*, in the form of unrealized appreciation, which, as recent experience confirmed, can disappear overnight.

Third, in the quest to facilitate an ownership society, Americans have confused leveraged ownership with real ownership. From 1987 to 1998, home mortgage debt increased steadily at about $200 billion a year (BGFRS, 2013a). Starting in 1998, home mortgage debt made bigger and more sustained annual jumps: at least $300 billion in 1998, 1999, and 2000; $500 billion in 2001; $700 billion in 2002; nearly $900 billion in 2003; $950 billion in 2004; and $1 trillion in 2005 and 2006 (BGFRS, 2013a). The sharp increase in mortgage obligations, studies show, "increased the propensity at which households defaulted on their mortgages and there is evidence that leverage was the primary driver of the recession" (Bokhari, Torous, and Wheaton, 2013: 2). It also reflected a troubling longer run decline in the buildup of average equity in owner-occupied housing, which fell from 83.9 percent in 1945 to 38.5 percent in 2009 (BGFRS, 2013a).

Thus, even as a savings account or a hedge against inflation, homeownership has become less effective because of the availability of policies such as the MID that encourage debt-financed home purchases. Indeed, as one commentator has observed, "Without the homeowner putting equity into their home there is no actual wealth building. And if the government juices prices, then there is no investment gain either" (Randazzo, 2011).

Conclusion

In the early 1970s, Stanley Surrey—a Harvard University law professor, former Assistant Treasury Secretary for Tax Policy, and "father" of the tax expenditure budget—offered an analytical tool to help legislators, policymakers, and everyday Americans evaluate the equity of tax expenditures by restating them as direct expenditures.[14] Imagine, Surrey suggested, that the MID was run not through the IRS but through the U.S. Department of Housing and Urban Development (HUD). Now imagine a married couple with an annual income exceeding $200,000 (roughly $1.1 million in 2013 dollars) and a home mortgage (Surrey, 1973b). For every $100 of mortgage interest, HUD would pay $70 to the couple's mortgage lenders (which reflected the couple's 70-percent marginal tax rate at the time), and the couple would pay the rest, or $30. For a married couple with an annual income of $10,000 (roughly $55,000 in 2013 dollars) and a home mortgage, HUD would pay $19 to the couple's mortgage lenders (reflecting the couple's 19-percent marginal tax rate), and

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[14] As Assistant Treasury Secretary for Tax Policy under Presidents John F. Kennedy and Lyndon B. Johnson, Surrey oversaw the origin and development of the tax expenditure budget. The first such accounting of tax expenditure items appeared in 1968 as part of that year's Annual Report of the Secretary of the Treasury (Surrey, 1973a). Starting in 1974, Congress began requiring Treasury to publish an annual accounting of tax expenditures to accompany the President's direct expenditure budget (Budget and Impoundment Control Act of 1974. 1974. Pub. L. No. 93-344, 88 Stat. 297).

the couple would cover the remaining $81. For couples "too poor to pay an income tax," Surrey continued, "HUD would pay nothing to the bank, leaving the couple to pay the entire interest cost" (Surrey, 1973b: 37).

By stating the effect of the MID in these unqualified terms, Surrey laid bare its gross inequities. Unfortunately, the inequities have only worsened during the ensuing 40 years. When Surrey first conceived of restating tax expenditures as direct expenditures in the 1960s, considerably more taxpayers had a chance to enjoy tax savings from the MID, because more taxpayers itemized their deductions. Itemizers averaged 42.18 percent of all tax filers from 1960 to 1969 compared with 31.84 percent in 2011 (IRS, 2013c).

Despite overwhelming evidence to the contrary, defenders of the MID continue to push their campaign of misinformation on an unwitting public, touting their pet subsidy's false benefits. Given such intransigence, it is worth restating this article's summary findings: The MID provides no benefit to more than 75 percent of all taxpayers; no benefit to 100 percent of nonitemizing tax-payers, reflecting more than two-thirds of all taxpayers; no benefit to more than 20 percent of the taxpayers who *do* itemize; no benefit to more than 50 percent of all homeowners; and no benefit to nearly 30 percent of mortgaged homeowners.

Acknowledgments

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Information Externalities and Residential Mortgage Lending in the Hardest Hit Housing Market: The Case of Detroit

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Abstract

The flow of credit to the residential sector is a critical issue in the recovery of the housing market after the Great Recession. This study revisited the effect of the "information externality" from previous transactions on lending decisions during the housing crisis in a hard-hit market of the Detroit metropolitan area. The results of the study suggest that the lack of previous mortgage-financed sales and the concentration of foreclosures in a neighborhood present significant challenges for the access to credit for many mortgage applicants in Detroit. The significant effect of information externality is primarily relevant to the conventional mortgage market and the effect has a relatively low threshold: when the number of mortgage purchases is five or fewer in the previous year, the odds of denial increase 32 percent. More than 30 percent of the neighborhoods in the Detroit metropolitan area have been adversely affected by the lack of accurate information on neighborhood home sales prices. Results from this case study shed light on the systematic process of property valuation and mortgage underwriting during the recent housing crisis.

Introduction

To help explain the disparity observed in residential mortgage lending across neighborhoods, Lang and Nakamura (L-N) (1993) suggest that the level of housing market sales represents an "information externality" for future lending decisions in the corresponding neighborhood. According to the L-N theory, market activities measured by total loan volume reduce the uncertainty associated with the appraised value of a property and thus affect future loan decisions. A sufficient volume of market sales aids in price discovery, which provides more certainty about home values, enables lenders to distinguish observable risks, and leads to an increased supply of loans. By contrast, an insufficient number of mortgage originations could lead to greater uncertainty in house price appraisals, and as a result mortgage seekers are more likely to be denied because the homes' value cannot be determined accurately. Moreover, because the home sales pricing information generated by a particular lender is publically disclosed and all lenders benefit from it, individual lenders have little incentive to help facilitate loan transactions and gain a better understanding of market values. In other words, the market failure because of information externality could lead to equilibrium with suboptimal lending.

In the aftermath of the Great Recession, information externality is an important topic to examine in the residential mortgage market. Two information issues have become evident in many markets. First, many transactions have been sales of distressed properties, which may not provide suitable information for the valuation of a more normal market transaction. The preponderance of distressed home sales in certain neighborhoods may lead valuation estimates to be biased downward when they are used as comparable properties without appropriate adjustments. Second, transaction volume has been low for a variety of reasons. The lack of market sales, especially mortgage-financed home sales, may lead to high degrees of uncertainty in appraisals. Lenders may require a larger downpayment because of the uncertainty in the appraisal to ensure that borrowers have a sizeable equity stake. And when borrowers are unable or unwilling to come up with extra payment, lenders may deny the loan. If loans are not originated, transactions may not occur, and the true value of properties will not be determined. Since the Great Recession, no known research has examined how previous transactions influence future lending decisions through information externalities.

This study focuses on one of the hardest hit housing markets in the nation—the Detroit metropolitan area (hereafter, Detroit).[2] Having experienced a collapse in its housing sector, Detroit provides a unique opportunity for this empirical study. On the one hand, Detroit has many relatively strong neighborhoods,[3] primarily in the suburban areas, which have recorded relatively few foreclosures and have comparatively stable housing and mortgage markets. On the other hand, mortgage lending has nearly dried up in most neighborhoods in the city of Detroit and some neighborhoods in its suburbs, likely due to the regional economic recession and the aftermath of the recent housing crisis (exhibit 1). Most home sales prices available for comparison in these more challenged neighborhoods

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[2] This article considers the Detroit Tri-County Area (Macomb, Oakland, and Wayne Counties) as the Detroit metropolitan area, which had a population of 3.86 million in 2010, or about 90 percent of the population in the six-county U.S. Office of Management and Budget definition of Detroit-Warren-Livonia, MI Metropolitan Statistical Area (MSA) (4.3 million in 2010).

[3] Consistent with most early studies, *neighborhood* is defined as census tract. Considering the size of the neighborhood used by appraisers, census tract is a more appropriate geographic area for the analysis. The data are also readily available at the tract level in the Home Mortgage Disclosure Act.

Exhibit 1

Purchase Mortgage Originations in the United States, Detroit Metropolitan Area, and City of Detroit
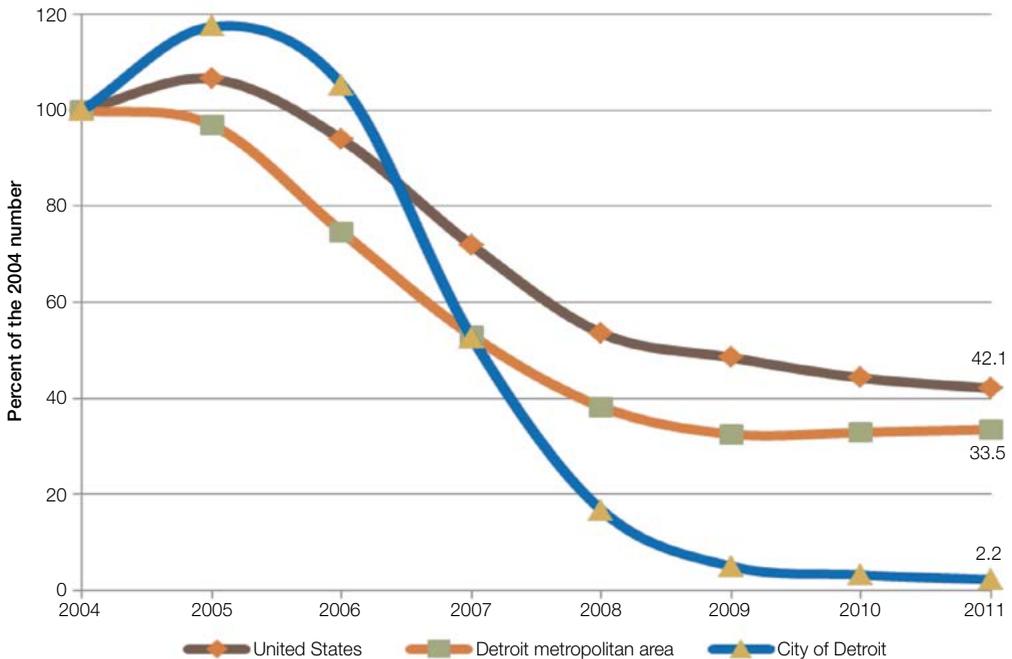
Note: First-lien home purchase loans only.
Source: Home Mortgage Disclosure Act data

are from foreclosed properties, Real Estate Owned (REO) properties, or cash sales. Thus, Detroit provides a full spectrum of neighborhoods in terms of different lending volumes and foreclosure concentrations.

To investigate the effect of the information externality provided by previous transactions on lending decisions during the 2010-to-2011 period in Detroit, the study examines whether prior lending volume and foreclosure rates in Detroit help explain lenders' decisions. Overall, the regression results confirm the existence of significant information effects in the Detroit market and that the effect is primarily relevant to conventional lenders and neighborhoods with a limited number of mortgage originations. If the number of purchase originations is five or fewer in the previous year, the odds of denial increase 32 percent. In fact, more than 30 percent of all neighborhoods in the Detroit metropolitan area, including nearly all neighborhoods in the city of Detroit, have been adversely affected by the lack of valid information on neighborhood home sales prices.

Evidence shows that previous foreclosures and delinquencies are important to estimating the empirical importance of information externalities. Neighborhood mortgage default rates are associated with higher probability of mortgage denial, likely because they are correlated with unobservable

risks of borrowers and neighborhoods or because foreclosures depressed home sales prices and appraised values. Additional research is needed to better understand the mechanisms of the effect of prior foreclosures.

Overall, the findings generally support the information externality theory in a radically changing environment. This study also demonstrates the importance of considering information externality from distressed home sales in information externality studies. Although the current analysis does not test explicitly the relationship between information externalities and the long-term suboptimal lending equilibrium, the correlation between past mortgage origination volume and current lending decisions is consistent with the information externality theory. Because of the information externality issue, there could be a reason for justifying government intervention in housing markets that have potential demand but face serious problems in obtaining information on home sales prices.

Background

To provide the background and context to the present study, this section provides an overview of role of appraisal in the mortgage lending process and reviews the empirical evidence of the effect of the information externality and other neighborhood characteristics on mortgage lending decisions.

The Role of Appraisal in the Mortgage-Lending Process

Among a variety of factors lending institutions use in making mortgage loan decisions, a comparison of the loan amount to the market value of the home is an important consideration. Such a comparison is important because the risk of a typical mortgage is connected to the level of equity in the property.[4] And the equity stake of a mortgage at origination, usually measured by the loan-to-value (LTV) ratio, reflects the credit risk of a mortgage application. The precise value of the home on the market consequently provides crucial information to the mortgage lender, which influences both the likelihood that the mortgage will default and the options that the mortgage lender has if the borrower falls behind in making payments.

Because of the critical importance of the property value for the lender's lending decision, creditors usually require home value appraisals or other home value estimates to determine the true value of a home. The lender typically contracts a third party to provide an independent appraisal because the lender cannot rely on the home's selling price alone as a measure of the collateral value of a property (Hutto, 2003). The appraiser estimates the probable market value of the property by taking into account the neighborhood characteristics, the condition and improvements to the home, and recent home sales prices of comparable homes in the area.[5] In practice, lenders usually use the lesser of the property's sales price and appraisal value as the value of the property and use it in

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[4] According to the option theory, the borrower has the incentive to default when he or she has a negative equity in the property (Foster and Van Order, 1984; Quercia and Stegman, 1992; Vandell, 1995).

[5] A property appraiser is tasked with making judgments based on market research and analysis to develop a "credible value opinion." Appraisers are required to consider all relevant transactions that have occurred in the market area and determine transactions that are the best comparable home sales to the property being appraised. Finally, the appraiser needs to make adjustments for material differences between each comparable and the subject property.

the calculation of LTV ratios (Nakamura, 2010). So the appraisal value and the difference between the appraisal value and the contract price are important considerations in underwriting residential mortgages.

In theory, an appraisal should reflect the true market value of the property. Appraisals are often biased, however, and could be significantly different from a home's true market value. For example, the fallout from the recent housing bubble raised questions about the accuracy of appraisals before the housing crisis. Several studies suggest that appraisals have often been biased upward and made mortgages riskier before and during the subprime boom (Cho and Megbolugbe, 1996; Leventis, 2006). When they do not have to bear the loss from default, lenders or the agents of the lenders may have an incentive to lean on appraisers to inflate values to make loans more attractive for resale on the secondary market. When appraisals are inflated, lenders may lend too much money relative to the home's actual value and, when this happens, mortgage defaults are more likely. LaCour-Little and Malpezzi (2003) used a small sample of mortgages from Alaska in the 1980s and found appraisal bias is positively associated with higher default risk.

A set of new and tighter regulations on appraisal practices has been adopted since 2009 (Murphy, 2012). The 2009 Home Valuation Code of Conduct (HVCC) was designed to ensure the independence of appraisers from the influence of lenders, brokers, and agents when appraising properties. Later, the Dodd-Frank Wall Street Reform and Consumer Protection Act[6] included a sunset provision for the HVCC, as well as other changes to the regulation of real estate appraisals.[7] With the tightened regulation of appraisals and the likely overreaction by lenders and appraisers, the bias of an appraisal could go the other way, causing home valuation to be underestimated, especially in some distressed markets (Nakamura, 2010; Steinke, 2012).

A low appraisal likely leads to higher rates of denial and withdrawal of mortgage applications. First, a low appraisal may force the homeowner to sell the property at a price lower than the agreed-upon contract price.[8] If the homeowner is unwilling to accept the new price, the sale could be canceled. Second, a low appraisal may push the lender to require a larger downpayment. When the borrower is capital constrained, this may cause the lender to reject the mortgage application. The result is that a low appraisal could make it more difficult for a sound borrower to conclude a home purchase. Third, a homeowner who wishes to upgrade or expand his or her home is unable to secure the financing if the appraisal for the property, including the improvements, is too low. All these challenges resulting from a low appraisal can introduce substantial uncertainty into the homebuying process, increase the likelihood of withdrawal or denial or mortgage applications, and derail home sales and disrupt the plans of homebuyers and sellers.

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[6] Public Law 111-203, H.R. 4173.

[7] The Act requires a property visit for appraisals of a home financed by a high-risk mortgage, conditions for a second appraisal at no cost to the home purchaser, mandated independence for appraisers, portability of some residential property appraisals, rules for customary and reasonable fees, standards for appraiser education, and a mandatory annual report to Congress by the Appraisal Subcommittee on its activities.

[8] For example, in Grandmont Rosedale, one of Detroit's strongest and most vibrant communities, appraisals had been on average 10 percent lower than the agreed upon sales price in the first half of 2011, and they nearly always resulted in a loss of sale or, at best, a home sold at below market value (SEMCOG, 2012).

Information Externality and the Accuracy of Home Appraisals

Appraisals may often be different from contract prices because they are related to many factors related to market conditions, neighborhood quality, appraisers' subjective judgment, and other factors that may affect property values (LaCour-Little and Green, 1998). As Nakamura (2010) pointed out, however, appraisals could become systematically inaccurate for three reasons: low volume of home sales, foreclosures, and bias. Discussed previously, the L-N's information externality theory explains how previous mortgage-financed transactions affect lenders' lending decisions: The volume of home sales affects the accuracy of appraisals and uncertainty may now be causing home appraisals to be biased too low; furthermore, low appraisals that result from few recent home sales affect the loan decision.

Several empirical studies, based either on national representative data or on data for particular metropolitan areas, provide evidence generally in support of the L-N theory (Avery, Beeson, and Sniderman, 1999; Blackburn and Vermilyea, 2007; Calem, 1996; Harrison, 2001; Ling and Wachter, 1998). Calem (1996) used nationwide Home Mortgage Disclosure Act (HMDA) data from 1990 to 1991 to explore the relationship between mortgage-lending decisions and recent home sales. He found that fewer transactions are associated with a higher rate of loan rejections; the mortgage denial rate for White households increases as the number of home sales increases in the corresponding county. Blackburn and Vermilyea (2007) provided the most comprehensive empirical test using data from loan application files from eight large banks. The authors controlled applicants' credit-worthiness in their test of information externalities in a mortgage-lending model. The results suggest that information externalities are relevant for about 10 percent of the applications for mortgages in neighborhoods with less than 20 home sales in the previous year. They found evidence supporting the presence of an internal effect (scale of economy) of information on underwriting decisions. Their sample is quite small (2,065 mortgage loans), however, and it is uncertain whether the conclusions could apply in the after-crisis markets.

Uncertainty because of low home sales volume is not the only source of low appraisals. The recent housing crisis resulted in markets with significant proportions of distressed properties and collapsed housing prices. The sales prices of distressed or foreclosed homes tend to be substantially lower than nondistressed market sales, often as a result of the increased time and risk associated with distressed home sales, differences in the condition of the properties, and the seller's motivation in completing the transaction (Campbell, Giglio, and Pathak, 2011; Forgey, Rutherford, and VanBuskirk, 1994; Hardin and Wolverton, 1996; Pennington-Cross and Ho, 2010). Consistent evidence generally suggests that foreclosed properties have a negative spillover effect on the values of properties in the surrounding neighborhood (for example, Immergluck and Smith, 2006; Lin, Rosenblatt, and Yao, 2009; Schuetz, Been, and Ellen, 2008). Distressed property sales continue to be recorded, however, and could be used as comparable properties in appraisals of nondistressed properties, which may cause a downward drag on estimates of home sales prices and affect would-be homebuyers' ability to secure financing.[9] This issue becomes more serious when distressed home sales become much more prevalent in neighborhoods where appraisers may not be able to find enough sales of nondistressed homes to provide a good estimate of normal home sales.

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[9] According to the Appraisal Institute (2008), an appraiser should not ignore foreclosure sales if consideration of such home sales is necessary to develop a credible value opinion. Only home sales that might have involved atypical seller motivations (for example, a highly motivated seller), such as a short sale, could be ignored. Of course, an adjustment for foreclosed properties based on property condition, sales concessions, and seller motivations may also be needed.

Neighborhood Effects on Mortgage Lending

Overall neighborhood characteristics such as socioeconomic factors may also influence mortgage-lending activities, which are often considered to be neighborhood effects. In the early 1990s, researchers conducted studies that tested the lending disparities in the mortgage market, and some studies have tested the associations among neighborhood incomes, racial components, and center city location with mortgage lending at the aggregate level (for example, Munnell et al., 1996; Tootell, 1996; see review in Ladd, 1998). Although not quite as conclusive as suggested by Schill and Wachter (1993), these studies generally found strong associations between neighborhood characteristics and mortgage denial rates. Another group of studies demonstrated that neighborhood characteristics, in addition to borrower-specific risks, are significantly correlated with mortgage performance (Berkovec et al., 1998; Calem, Gillen, and Wachter, 1999). Ross and Yinger (2002) moved the debate forward by providing a comprehensive analysis of lending disparities across borrowers and neighborhoods.

During the subprime boom, it appeared that subprime lending targeted many of the same neighborhoods that had previously been at risk of redlining by prime lenders (known as *reverse redlining*). Research on subprime lending patterns suggests that subprime lending disproportionately occurs among minority borrowers or within neighborhoods where minority and low-income households predominate (for example, Calem, Gillen, and Wachter, 2004; Ding et al., 2008).

In fact, the study of the neighborhood effects on mortgage lending is analogous to an even larger body of literature on the neighborhood effects of various social and economic outcomes. In addition to mortgage lending, neighborhood racial transitions, property values, and sociodemographic dynamics have been documented to change in nonlinear or threshold-like ways in response to changes in the neighborhood context (Galster, 2012; Quercia and Galster, 2000).

Overall, evidence in the literature suggests that certain neighborhoods disproportionately have high mortgage denial rates or a greater share of high-risk lending. Information externalities provided by previous mortgage-financed purchases in the neighborhood could help explain such patterns; however, the empirical tests of the L-N theory have been limited to the effect of home sales volume only and are based on data collected before the Great Recession. The current study revisits the information externality issue and explores how it applies to the residential housing market in Detroit, which has experienced significant policy changes, along with ever-changing market conditions.

Data and Methodology

The study presented in this article uses a set of logistic regression models in which the dependent variable is the mortgage application decision, equal to 1 if denied and 0 if approved. Denial has drawn most of the attention in lending outcomes analysis because it captures both the demand- and supply-side forces. This analysis focuses on 66,238 first-lien home purchase loan applications[10] in 2010 and 2011 in Detroit. For simplification, the term *purchase loans* is used to represent first-lien home purchase loans for owner-occupied one- to four-unit homes.

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[10] This sample size is for the preferred model. The sample size for other models may be slightly different because of the use of a different dependent variable or the missing value generated by the logarithmic transformation of the information variables.

The data primarily come from three sources: HMDA, the census, and the U.S. Department of Housing and Urban Development (HUD). First, measures on the characteristics of mortgage applicants and previous mortgage lending (mortgage originations in the previous year) were constructed based on HMDA data. HMDA data represent the universe of mortgage applications, with some exceptions for small lenders and lenders located outside a metropolitan statistical area.[11] HMDA provides mortgage application and origination information, in addition to rich information on borrower demographics, the geographic location of the property securing the loan (census tract), and limited loan characteristics. Applications that were approved and originated, applications that were denied, and applications that were approved but not accepted by the applicant are included in the analyses.[12]

Information variables, such as the measures of lending activity in the tract, are constructed based on HMDA data. Assuming that the amount of recent loan activity is more relevant, this study uses the number of mortgage purchases in the year before the mortgage application as the period during which updating might occur.[13] The relationship between the odds of denial and approved mortgage applications is expected to be nonlinear, with diminishing returns to the information provided from previous transactions. This nonlinearity is accounted for by incorporating these variables either in log form or by using a set of categorical variables.

Second, HMDA data are complemented by information on tract characteristics that might be relevant to mortgage lending from the census. Information on census tract characteristics is obtained from the 2010 census and the 5-year average of the U.S. Census Bureau's 2006–2011 American Community Survey, which roughly is the time period for mortgage applications reviewed in the study.

Third, this analysis uses data from other sources to construct proxies of neighborhood foreclosure rates and the creditworthiness of an average applicant, which are important contributions of this study. The neighborhood foreclosure data are from HUD. In 2010, HUD calculated tract-level foreclosure need scores, based on the estimated rate of loans in foreclosure or delinquency (90 or more days) in March 2010 to help community groups and organizations to geographically target Neighborhood Stabilization Program 3 assistance.[14] The foreclosure need score data from HUD

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[11] Although HMDA's coverage for lending by small depository institutions and for lending in the rural areas is quite limited, the coverage of HMDA for MSAs is quite complete. Because this study focuses on the more densely populated areas within an MSA, coverage should not be an issue.

[12] Eight possible outcomes for a loan application in HMDA include (1) loan originated, (2) application approved but not accepted, (3) application denied by financial institution, (4) application withdrawn by applicant, (5) file closed for incompleteness, (6) loan purchased by financial institution, (7) preapproved request denied by financial institution, and (8) preapproval request approved but not accepted. This study primarily focuses on the first three, except that the outcome of withdrawal (application withdrawn by applicant) was considered in one specification.

[13] Cash transactions are not considered in the preferred model because of the following considerations: (1) cash transactions are usually more prevalent in the low-value markets in which mortgage financing is less likely needed; (2) some cash purchases, especially those bulk transactions by investors, have different motivations than those of regular housing market sales; (3) cash transactions could go unreported; and (4) different from mortgage transactions, no public data sources are available for cash transactions. The information variable becomes insignificant when considering all transactions based on observations in the city of Detroit.

[14] The foreclosure need score (the serious delinquency rate) from HUD is estimated using the tract rate of subprime loans from 2004 to 2007, the increase in the unemployment rate between March 2005 and March 2010, and the decline in home values from peak to the first quarter of 2010.

provide a useful indicator of the mortgage default rate (or risk) for a given neighborhood. This study also uses the tract average credit score of all mortgage borrowers in the same neighborhood from 2005 to 2008 as a proxy for applicant creditworthiness.[15] Although the lack of direct control of individual borrowers' credit risk could be a potential shortcoming of the analysis, considering this proxy of average credit scores of previous purchasers should help address this concern. This proxy is similar to the control of neighborhood credit risk that was used in several empirical studies (for example, Calem, Gillen, and Wachter, 2004; Ding et al., 2011).

Measures of other controls include median household income, minority population percentages, the ratio of median monthly rent to median house value, owner-occupied housing stock, and the prevalence of owner-occupied and vacant units (see exhibit 2 for definitions of variables and descriptive statistics). The bank-level effect is addressed by incorporating dummies for major lenders, as suggested by Blackburn and Vermilyea (2007).

Exhibit 2

Variable Definition and Descriptive Statistics (1 of 2)

Variable	Data Source	Variable Definition	Mean
denial	HMDA	1 if denied, 0 if originated or approved but not accepted	0.197
pctinc	HMDA	Household income as a percentage of area median	1.256
fha	HMDA	Application of FHA or conventional mortgage	0.533
other race or missing	HMDA	Non-Hispanic borrower with missing info for race	0.121
Black	HMDA	Non-Hispanic Black borrower	0.104
Hispanic	HMDA	Hispanic borrower	0.019
White borrower	HMDA	Non-Hispanic White borrower	0.756
owner_occupied	HMDA	Owner occupied property or not	0.938
medinc	2007–2011 ACS	Tract median income ($ thousands)	72.104
owner_units (log)	2010 census	Total owner-occupied units (in log)	7.124
rent_to_value	2007–2011 ACS	Median monthly rent to median house value	0.596
vac_rate	USPS	Share of housing units vacant in March 2010	0.024
pct_black	2010 census	Share of tract residents Black	0.104
pct_his	2010 census	Share of tract residents Hispanic	0.029
pct_asian	2010 census	Share of tract residents Asians	0.042
pct_poverty	2007–2011 ACS	Share of households under poverty	0.087
pct_owner	2010 census	Share of tract house unit owners	0.806
tract del rate (high)	HUD	Serious delinquency/foreclosures rate >17% in March 2010	0.319
tract del rate (med)	HUD	Serious delinquency/foreclosures rate 14–17% in March 2010	0.472
fico_score_0508	Black Knight	Average credit score for prior mortgage borrowers (2005–08) in the neighborhood	706.6
2010_applications	HMDA	2010 purchase loan application	0.501
Detroit		Properties in Detroit or not	0.020
prior_orig (in log)	HMDA	Number of mortgage purchases in the previous year (in log)	3.549
prior_app (in log)	HMDA	Number of purchase loan applications in the prior year (in log)	3.960
prior_orig 0–5	HMDA	0–5 mortgage purchases in a census tract in prior year (%)	0.021
prior_orig 6–10	HMDA	6–10 mortgage purchases in a census tract in prior year (%)	0.026

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[15] The average credit score is calculated based on a merged dataset of proprietary national representative mortgage data and HMDA data. Because the subprime products have been largely eliminated since the housing crisis, the average credit score is calculated for first-lien mortgages without risky features (negative amortizations, low or no doc, prepayment penalties, or balloon payments).

Exhibit 2

Variable Definition and Descriptive Statistics (2 of 2)

Variable	Data Source	Variable Definition	Mean
prior_orig 11–15	HMDA	11–15 mortgage purchases in a census tract in prior year (%)	0.048
prior_orig 16–20	HMDA	16–20 mortgage purchases in a census tract in prior year (%)	0.083
prior_orig 21–25	HMDA	21–25 mortgage purchases in a census tract in prior year (%)	0.116
prior_orig 26–30	HMDA	26–30 mortgage purchases in a census tract in prior year (%)	0.121
prior_orig 31–50	HMDA	31–50 mortgage purchases in a census tract in prior year (%)	0.317
lender 1	HMDA	Lender 1	0.269
lender 2	HMDA	Lender 2	0.053
lender 3	HMDA	Lender 3	0.044
lender 4	HMDA	Lender 4	0.044
lender 5	HMDA	Lender 5	0.043
lender 6	HMDA	Lender 6	0.041
lender 7	HMDA	Lender 7	0.041
lender 8	HMDA	Lender 8	0.032
lender 9	HMDA	Lender 9	0.030
lender 10	HMDA	Lender 10	0.025
other lenders	HMDA	Other smaller lenders	0.593
Number of observations			66,238*

ACS = American Community Survey. Black Knight = Black Knight Financial Services, Inc. FHA = Federal Housing Administration. HMDA = Home Mortgage Disclosure Act. HUD = U.S. Department of Housing and Urban Development. USPS = United States Postal Service.

*The descriptive statistics are based on the study sample used by the preferred model (Model 2 in exhibit 3).

Note: First-lien purchase loan applications of one- to four-unit family housing in 2010 and 2011 in the Detroit metropolitan area (Macomb, Oakland, and Wayne Counties).

Empirical Results

Several sets of the logistic regression models are used to identify the impact of prior lending volume and foreclosures on mortgage-lending decisions. Exhibits 3 and 4 summarize results from logistic regression models using previous mortgage purchases or mortgage applications as the information variables, respectively. Exhibit 5 summarizes results for the conventional and Federal Housing Administration (FHA) and Department of Veterans Affairs (VA) markets, respectively, using the categorical information variables only. Model 1 uses the log of prior mortgage purchases (or applications) as the information variable, while Model 2 uses a set of categorical variables to identify the threshold effect of the information variable. Finally, an insufficient number of prior mortgage purchases could increase the probability of both mortgage denial and borrower withdrawal. Model 3 tests this contention by using application denial or withdrawal as the dependent variable.

The results in exhibit 3 provide statistical support for the existence of information externality effects. Mortgage purchases are statistically significant when entered in logarithmic form (Model 1). When categorical variables are used, the results suggest that the information externality is primarily relevant up to five purchase mortgage originations; the odds of denial increase 32 percent if the number of previous mortgage purchases is no greater than five. This threshold is much lower than the 20 home sales identified in Blackburn and Vermilyea (2007), which focused on mortgage lending before the recent housing crisis. The lower threshold partly reflects the generally much lower level of transactions during the study period. The increase in the overall denial rates may also help explain the results.

Exhibit 3

Logistic Regression Results Based on the 2010–11 Applications in Detroit With
Denial As the Outcome (home purchase loans)

Variable	Model 1 (denial)			Model 2 (denial)			Model 3 (denial/withdrawal)		
	Estimate	SE	OR	Estimate	SE	OR	Estimate	SE	OR
intercept	– 0.697	0.431		– 0.668	0.454		– 0.394	0.388	
pctinc	– 0.001***	0.000	0.999	– 0.001***	0.000	0.999	– 0.001**	0.000	0.999
fha	– 0.039***	0.012	0.925	– 0.036***	0.011	0.931	– 0.038***	0.010	0.926
race (other race)	0.121***	0.028	1.438	0.119***	0.028	1.439	0.142***	0.025	1.425
race (Black)	0.178***	0.032	1.522	0.174***	0.032	1.520	0.130***	0.028	1.408
race (Hispanic)	– 0.057	0.054	1.203	– 0.048	0.054	1.217	– 0.059	0.047	1.166
owner-occupied	– 0.275***	0.041	0.760	– 0.276***	0.041	0.759	– 0.243***	0.036	0.784
medinc	– 0.001	0.001	0.999	– 0.002	0.001	0.998	– 0.001	0.001	0.999
owner_units (in log)	– 0.026	0.038	0.974	– 0.059	0.037	0.943	– 0.058	0.032	0.944
rent_to_value	– 0.070	0.045	0.932	– 0.065	0.045	0.937	– 0.053	0.038	0.949
vac_rate	0.007	0.005	1.007	0.010**	0.005	1.010	0.011**	0.004	1.011
pct_black	0.006***	0.001	1.006	0.006***	0.001	1.006	0.006***	0.001	1.006
pct_his	0.008**	0.004	1.008	0.007	0.004	1.007	0.007**	0.003	1.007
pct_asian	0.005**	0.002	1.005	0.005**	0.002	1.005	0.004**	0.002	1.004
pct_poverty	0.014***	0.002	1.014	0.014***	0.002	1.014	0.014***	0.002	1.014
pct_owner	0.004***	0.001	1.004	0.005***	0.001	1.005	0.004***	0.001	1.004
tract del rate (high)	0.101***	0.024	1.264	0.095***	0.024	1.251	0.065***	0.020	1.171
tract del rate (med)	0.033**	0.015	1.182	0.034**	0.015	1.177	0.027**	0.013	1.126
fico_score_0508	– 0.001	0.000	0.999	– 0.001	0.000	0.999	0.000	0.000	1.000
2010 dummy	0.011	0.012	1.023	0.010	0.012	1.019	0.004	0.010	1.008
Detroit dummy	0.198**	0.088	1.219	0.200**	0.089	1.222	0.167**	0.082	1.182
prior_orig (in log)	– 0.070***	0.023	0.932						
prior_orig 0–5				0.197***	0.069	1.321	0.128**	0.063	1.194
prior_orig 6–10				0.025	0.053	1.112	0.011	0.047	1.063
prior_orig 11–15				– 0.022	0.041	1.061	– 0.006	0.036	1.045
prior_orig 16–20				– 0.042	0.034	1.040	– 0.006	0.029	1.044
prior_orig 21–25				– 0.016	0.031	1.067	– 0.032	0.027	1.019
prior_orig 26–30				– 0.021	0.031	1.062	– 0.029	0.027	1.021
prior_orig 31–50				– 0.040	0.027	1.042	– 0.015	0.023	1.035
lender 1	0.778***	0.039	1.646	0.780***	0.039	1.646	0.605***	0.034	1.535
lender 2	– 0.317***	0.057	0.550	– 0.326***	0.057	0.545	– 0.819***	0.055	0.370
lender 3	– 1.428***	0.075	0.181	– 1.428***	0.075	0.181	– 0.867***	0.047	0.352
lender 4	– 0.187***	0.052	0.627	– 0.194***	0.052	0.622	0.258***	0.037	1.086
lender 5	0.472***	0.045	1.212	0.474***	0.045	1.212	– 0.031	0.043	0.813
lender 6	– 1.770***	0.099	0.129	– 1.770***	0.099	0.129	– 0.208***	0.041	0.681
lender 7	0.275***	0.054	0.995	0.277***	0.054	0.995	– 0.012	0.049	0.829
lender 8	1.068***	0.051	2.199	1.071***	0.051	2.203	0.575***	0.049	1.490
lender 9	– 0.081	0.053	0.697	– 0.082	0.053	0.695	– 0.371***	0.047	0.578
lender 10	0.910***	0.049	1.877	0.915***	0.049	1.884	0.694***	0.043	1.678
Number of observations	65,997			66,238			72,574		

OR = odds ratio. SE = standard error.

* Significant at the .10 level. ** Significant at the .05 level. *** Significant at the .01 level.

Note: Based on the 2010–11 applications in the Detroit metropolitan area (Macomb, Oakland, and Wayne Counties). Applications that were approved and originated, applications that were denied, and applications that were approved but not accepted by the applicant are included for Model 1 and Model 2. Model 3 further includes applications that were withdrawn by applicants.

Exhibit 4

Logistic Regression Results Based on the 2010–11 Applications in Detroit, With Denial As the Outcome (loan applications as the information variable)

Variable	Model 1 (denial)			Model 2 (denial)			Model 3 (denial/withdrawal)		
	Estimate	SE	OR	Estimate	SE	OR	Estimate	SE	OR
Intercept	– 0.551	0.426		– 0.098	0.439		0.092	0.375	
pctinc	– 0.001***	0.000	0.999	– 0.001***	0.000	0.999	– 0.001**	0.000	0.999
fha	– 0.036***	0.011	0.930	– 0.037***	0.012	0.928	– 0.040***	0.010	0.924
race (other race)	0.121***	0.028	1.440	0.118***	0.028	1.439	0.141***	0.025	1.424
race (Black)	0.175***	0.032	1.519	0.176***	0.032	1.523	0.130***	0.028	1.410
race (Hispanic)	– 0.053	0.054	1.209	– 0.048	0.054	1.218	– 0.058	0.047	1.168
owner occupied	– 0.275***	0.041	0.760	– 0.278***	0.041	0.757	– 0.245***	0.036	0.783
medinc	– 0.001	0.001	0.999	– 0.002***	0.001	0.998	– 0.001	0.001	0.999
owner_units (in log)	– 0.062	0.038	0.940	– 0.132***	0.036	0.877	– 0.123***	0.030	0.884
rent_to_value	– 0.061	0.045	0.941	– 0.068	0.045	0.934	– 0.053	0.038	0.948
vac_rate	0.011**	0.005	1.011	0.008	0.005	1.008	0.009**	0.005	1.009
pct_black	0.006***	0.001	1.006	0.006***	0.001	1.006	0.006***	0.001	1.006
pct_his	0.007**	0.004	1.007	0.006	0.004	1.006	0.006	0.003	1.006
pct_asian	0.005**	0.002	1.006	0.005**	0.002	1.005	0.004**	0.002	1.004
pct_poverty	0.015***	0.002	1.015	0.013***	0.002	1.013	0.014***	0.002	1.014
pct_owner	0.005***	0.001	1.005	0.005***	0.001	1.005	0.004***	0.001	1.004
tract del rate (high)	0.096***	0.023	1.255	0.103***	0.024	1.267	0.071***	0.020	1.182
tract del rate (med)	0.036**	0.015	1.182	0.031**	0.015	1.179	0.025**	0.013	1.129
fico_score_0508	– 0.001	0.000	0.999	– 0.001	0.000	0.999	– 0.001	0.000	0.999
2010 dummy	0.009	0.012	1.019	0.011	0.012	1.023	0.005	0.010	1.010
Detroit dummy	0.258***	0.085	1.295	0.243***	0.086	1.275	0.208***	0.079	1.231
prior_app (in log)	– 0.038	0.023	0.963						
prior_app 0–5				0.443***	0.105	1.603	0.347***	0.098	1.408
prior_app 6–10				– 0.062	0.084	0.968	– 0.132	0.077	0.872
prior_app 11–15				0.013	0.063	1.043	0.041	0.055	1.037
prior_app 16–20				– 0.066	0.055	0.964	– 0.031	0.048	0.965
prior_app 21–25				– 0.108	0.049	0.925	– 0.090**	0.042	0.910
prior_app 26–30				– 0.122***	0.044	0.911	– 0.088**	0.038	0.911
prior_app 31–50				– 0.070**	0.033	0.960	– 0.052	0.029	0.945
lender 1	0.780***	0.039	1.645	0.781***	0.039	1.650	0.606***	0.034	1.539
lender 2	– 0.327***	0.057	0.544	– 0.329***	0.057	0.544	– 0.821***	0.055	0.369
lender 3	– 1.427***	0.075	0.181	– 1.428***	0.075	0.181	– 0.868***	0.047	0.353
lender 4	– 0.192***	0.052	0.623	– 0.188***	0.052	0.626	0.263***	0.037	1.092
lender 5	0.474***	0.045	1.212	0.474***	0.045	1.214	– 0.031	0.043	0.814
lender 6	– 1.769***	0.099	0.129	– 1.769***	0.099	0.129	– 0.207***	0.041	0.683
lender 7	0.278***	0.054	0.996	0.276***	0.054	0.996	– 0.013	0.049	0.829
lender 8	1.071***	0.051	2.201	1.071***	0.051	2.206	0.575***	0.049	1.492
lender 9	– 0.082	0.053	0.695	– 0.082	0.053	0.696	– 0.373***	0.047	0.579
lender 10	0.914***	0.049	1.882	0.914***	0.049	1.885	0.694***	0.043	1.680
Number of observations	66,199			66,238			72,574		

OR = odds ratio. SE = standard error.

* Significant at the .10 level. ** Significant at the .05 level. *** Significant at the .01 level.

Note: Based on the 2010–11 applications in the Detroit metropolitan area (Macomb, Oakland, and Wayne Counties). Applications that were approved and originated, applications that were denied, and applications that were approved but not accepted by the applicant are included for Model 1 and Model 2. Model 3 further includes applications that were withdrawn by applicants.

Exhibit 5

Logistic Regression Results Based on 2010–11 Conventional FHA/VA Loan Applications in Detroit

Variable	Conventional Model 2 (denial) [N = 30,514]			Conventional Model 3 (denial/withdrawal) [N = 33,260]			FHA/VA Model 2 (denial) [N = 35,284]			FHA/VA Model 3 (denial/withdrawal) [N = 38,784]		
	Estimate	SE	OR	Estimate	SE	OR	Estimate	SE	OR	Estimate	SE	OR
Intercept	– 0.191	0.682		0.157	0.583		– 2.555***	0.705		– 1.699***	0.574	
pctinc	– 0.002***	0.001	0.998	– 0.001***	0.001	0.999	0.000	0.001	1.000	0.000	0.001	1.000
race (other race)	0.090**	0.044	1.448	0.115***	0.038	1.433	0.153***	0.039	1.482	0.180***	0.034	1.476
race (Black)	0.245***	0.059	1.691	0.176***	0.052	1.523	0.145***	0.038	1.471	0.109***	0.034	1.375
race (Hispanic)	– 0.054	0.092	1.255	– 0.045	0.078	1.221	– 0.057	0.067	1.202	– 0.080	0.059	1.139
owner occupied	– 0.284***	0.043	0.753	– 0.252***	0.037	0.777	1.231***	0.334	3.426	0.666***	0.221	1.947
medinc	– 0.002	0.001	0.998	– 0.001	0.001	0.999	0.001	0.001	1.001	0.001	0.001	1.001
owner_units (in log)	– 0.061	0.055	0.940	– 0.079*	0.047	0.924	– 0.021	0.052	0.979	– 0.010	0.045	0.990
rent_to_value	– 0.094	0.072	0.910	– 0.092	0.061	0.913	– 0.025	0.058	0.975	– 0.011	0.049	0.989
vac_rate	0.015**	0.008	1.015	0.014**	0.007	1.014	0.006	0.007	1.006	0.008	0.006	1.008
pct_black	0.007***	0.002	1.007	0.007***	0.001	1.007	0.005***	0.001	1.005	0.005***	0.001	1.005
pct_his	0.010	0.006	1.010	0.012**	0.006	1.012	0.005	0.005	1.005	0.004	0.004	1.004
pct_asian	0.002	0.003	1.002	0.002	0.003	1.002	0.009***	0.003	1.009	0.007**	0.003	1.007
pct_poverty	0.013***	0.003	1.013	0.013***	0.003	1.013	0.017***	0.003	1.017	0.016***	0.002	1.016
pct_owner	0.005***	0.002	1.005	0.005***	0.001	1.005	0.003**	0.002	1.003	0.002	0.001	1.002
tract del rate (high)	0.106***	0.037	1.268	0.078***	0.032	1.170	0.083***	0.032	1.196	0.066**	0.027	1.164
tract del rate (med)	0.026	0.022	1.170	0.002	0.019	1.085	0.013	0.022	1.115	0.020	0.019	1.112
fico_score_0508	– 0.001	0.001	0.999	– 0.001	0.001	0.999	– 0.001	0.001	0.999	– 0.001	0.001	0.999
2010 dummy	– 0.012	0.018	0.976	– 0.006	0.015	0.988	0.027*	0.016	1.055	0.011	0.013	1.022
Detroit	0.220	0.156	1.246	0.208	0.146	1.232	0.163	0.112	1.177	0.143	0.101	1.153
prior_orig 0–5	0.375***	0.116	1.708	0.281***	0.108	1.480	0.116	0.088	1.170	0.065	0.079	1.088
prior_orig 6–10	0.069	0.089	1.259	0.059	0.079	1.185	0.019	0.067	1.061	– 0.001	0.059	1.019
prior_orig 11–15	– 0.031	0.068	1.139	– 0.022	0.059	1.093	0.001	0.053	1.042	0.008	0.046	1.028
prior_orig 16–20	– 0.057	0.053	1.110	– 0.058	0.046	1.054	– 0.033	0.044	1.008	0.030	0.038	1.051
prior_orig 21–25	– 0.039	0.049	1.130	– 0.043	0.042	1.070	– 0.017	0.040	1.024	– 0.039	0.034	0.982
prior_orig 26–30	– 0.069	0.048	1.097	– 0.062	0.042	1.050	– 0.012	0.041	1.029	– 0.022	0.035	0.999
prior_orig 31–50	– 0.088	0.041	1.076	– 0.045	0.035	1.068	– 0.033	0.035	1.007	– 0.020	0.031	1.000
lender dummies	included			included			lincluded			included		

FHA = Federal Housing Administration. OR = odds ratio. SE = standard error. VA = Department of Veterans Affairs.

* Significant at the .10 level. ** Significant at the .05 level. *** Significant at the .01 level.

Note: Based on the 2010–11 applications in the Detroit metropolitan area (Macomb, Oakland, and Wayne Counties).

An assessment of the size of the information externality effects is presented in exhibit 6. The odds ratios are based on the specifications of Model 2 in exhibit 3. The graphed numbers measure the odds of denial for different numbers of sales in that tract. The general declining pattern of the plot illustrates the diminishing marginal return to additional mortgage-financed sales as the number of sales increases. The threshold of the effect is about five mortgage purchases in the previous year.

Exhibit 6

The Threshold Effect of Previous Mortgage Purchases
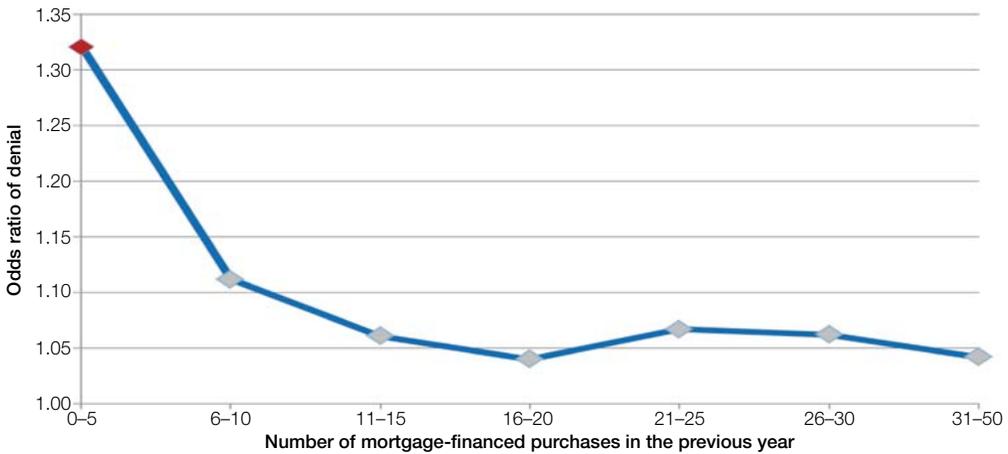
Note: Based on regression results from Model 2 in exhibit 4; odds ratio is only significant for the 5 or fewer purchase mortgages category; the reference group is tracts with more than 50 previous mortgage purchases.

Although the results suggest information externality effects are generally economically unimportant after passing the relatively low threshold (about five loans), in 2010 a total of 345 census tracts in Detroit (or 30 percent of all) had five mortgage originations or fewer. The number of tracts increased to 375 (33 percent of total) in 2011.[16] Exhibit 7 shows these tracts are concentrated in the city of Detroit, along with some neighborhoods outside its border. In the city of Detroit, 96 percent of all tracts had five or fewer purchase mortgage originations in 2011. Given that in the sample more than 30 percent of census tracts (even after excluding those with no mortgage originations even before the housing crisis), had five mortgage-financed purchases or fewer, the results suggest that the lack of previous mortgage originations in a neighborhood is an important obstacle to securing a mortgage for many potential homebuyers in Detroit.

When mortgage application denial or withdrawal is used as the dependent variable in the model, the results are quite consistent: when the number of previous mortgage purchases is five or fewer, the odds of application denial or withdrawal increase 19.4 percent. Of course, HMDA data do not provide information about the reasons for application withdrawals; insufficient appraisal value

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[16] A total of 29 tracts zoned for industrial or commercial uses, such as airports, shopping malls, industry, agricultural use, or no market activities, even before the housing crisis (in 2007), were excluded from the total. No residential mortgage originations are expected in these neighborhoods.

Exhibit 7

Census Tracts With Five or Fewer Mortgage Purchases in 2011 (Detroit metropolitan area)
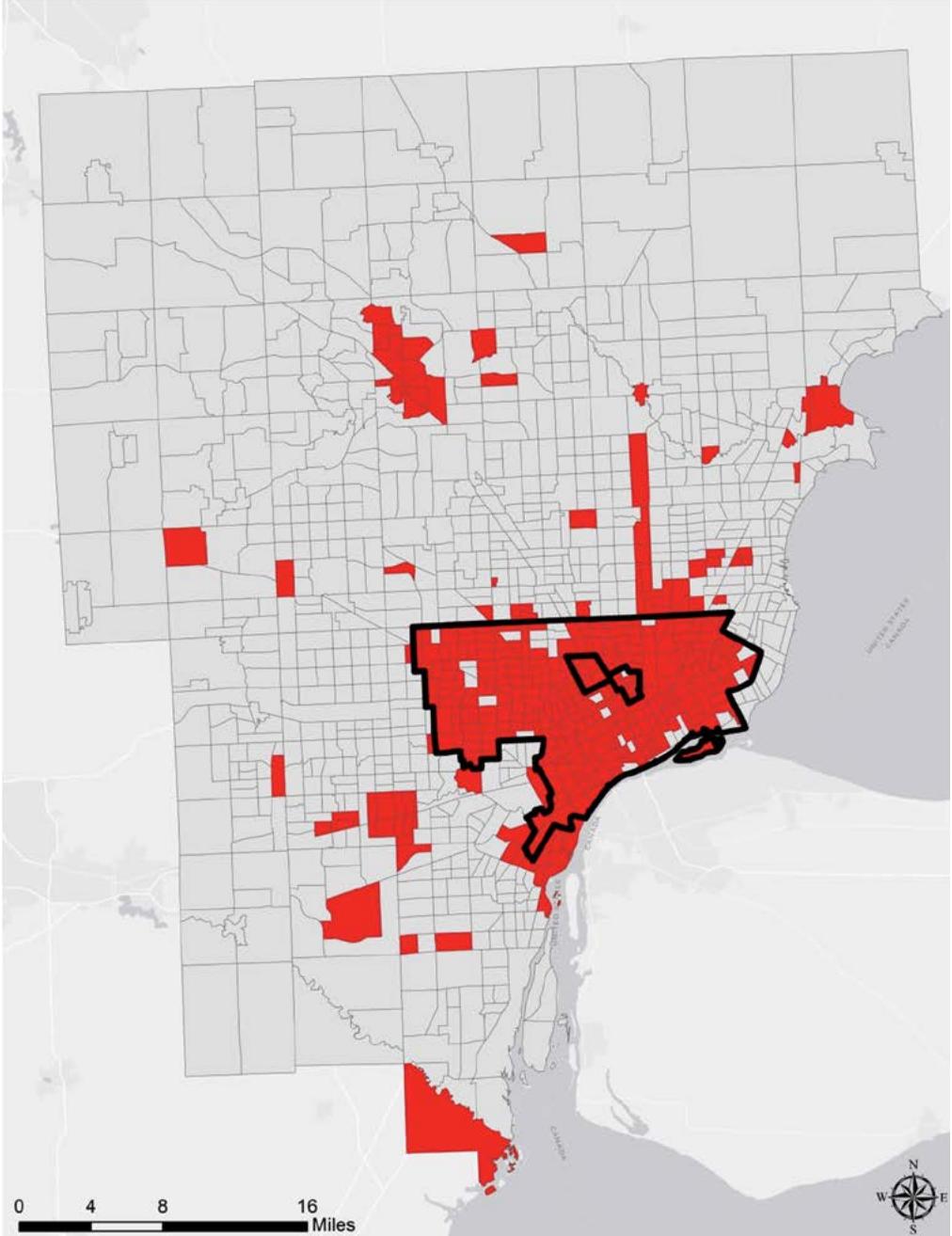
Notes: Tracts in red represent neighborhoods with five or fewer purchase loan originations in 2011. The bold black lines show the boundary of the city of Detroit.

Source: Home Mortgage Disclosure Act.

could be only one of many reasons. So the link between prior lending and application withdrawal is not so straightforward. The results similarly suggest a positive effect of prior mortgage applications on the denial (and withdrawal) decision (when the number of applications is five or fewer) (exhibit 4), but the number of mortgage applications (in log) is insignificant in predicting the loan decision, which needs additional future investigation.

Furthermore, would information externality be less of a problem for government-guaranteed (FHA and VA; hereafter, for simplification, FHA) loan applications or would appraisal uncertainty be a bigger problem because these loans tend to have high LTV ratios? The results seem to support the former contention. The results suggest that there is statistical support that FHA loan applications generally have a lower probability of denial, relative to conventional loan applications. Results from separate regressions of conventional and FHA loan applications indicate that the number of mortgage originations (either in log or in categories) is insignificant for FHA loans (exhibit 5). By contrast, the results suggest the same level of threshold (five or fewer mortgage originations) for conventional mortgage originations. In practice, FHA appraisal even adds additional requirements over a conventional appraisal to reduce the risk of major repairs that may be needed during the short term. FHA allows for a much higher LTV ratio, however, than that of conventional government-sponsored enterprise (GSE) loans (when they do not have private mortgage insurance), which should provide a greater cushion when appraisals are low. In addition, FHA lenders are usually specialized lenders with larger market share, and likely more local knowledge, in the many hard-hit neighborhoods. All these factors may help explain the result that information externality is a less serious problem for FHA lending in Detroit.

The neighborhood mortgage default rates also have a positive relationship with the likelihood of denial, which is consistent with expectation. If the property is in a neighborhood with a very high default rate (higher than 17 percent), the odds of denial are 26 percent higher. If the property is in a neighborhood with a relatively high default rate (14 to 17 percent), the odds of denial are 16 percent higher. Neighborhood mortgage default rates may capture some unobserved risk of the borrowers and properties in the neighborhood. In addition, lenders may have taken the unobservable information into consideration during underwriting. Furthermore, higher neighborhood default rates will likely lead to a higher share of distressed home sales, which may bias appraisals. This increased appraisal bias will also increase the likelihood that a mortgage application is denied.

Several neighborhood-level characteristics are significant in these specifications, such as the percentage of minorities (Black or Hispanic) and the neighborhood vacancy rate. As the percentage of minorities in a neighborhood increases, the probability of denial increases, which is consistent with most early studies on the redlining issue.[17] The city dummy is significant at the 0.05 level and associated with a higher probability of denial because of observable risk characteristics. The dummies for individual lenders are generally significant, which supports the proposition of the difference in mortgage-lending underwriting policies across banks. The coefficient for Hispanic borrowers is insignificant, although the coefficients for Black borrowers and borrowers with missing information on race information are significant and positive.

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[17] Few exceptions exist. For example, Blackburn and Vermilyea (2007) found mild statistical support for an increase in the percentage of minorities being associated with increased loan acceptance rates.

Conclusion

This empirical study focuses on the effect of information externality provided by prior transactions on lending decisions in Detroit, an extremely hard-hit housing market during the housing crisis. The results of the analysis suggest that the lack of mortgage-financed home sales in a neighborhood has become a serious challenge for the access to credit for future applicants and the recovery of the housing market in many neighborhoods in Detroit.

The results show that significant information effects exist in the Detroit housing market. The significant effect is primarily relevant in the conventional mortgage market and the effect has a relatively low threshold: when the number of purchase loan originations is five or fewer in the previous year, the odds of denial increase 32 percent. More than 30 percent of all neighborhoods in Detroit, including nearly all neighborhoods in the city of Detroit, have been adversely affected by the lack of reliable information on neighborhood home sales prices during the study period. The results also provide evidence that foreclosures and distressed home sales are important to estimating the effect of information externalities.

Results from this case study of Detroit help us understand how information externalities from previous transactions affected the loan decision outcome following the recent housing crisis. Information externalities may be viewed as a market imperfection in which potential borrowers may be able to obtain financing in high-activity areas but are unable to do so for an equivalent transaction in a lower activity neighborhood. The existence of such externalities may provide justification for narrowly tailored intervention programs in the hardest hit areas by the public or philanthropic originations. If well-targeted programs are designed to mitigate the effects of information externalities, they should provide a better understanding of market values, stimulate the flow of credit to economically disadvantaged neighborhoods, and stabilize the housing markets in distressed areas. Another strategy is to encourage greater information sharing among lenders for mortgage applications, or to have public or philanthropic organizations help people secure a mortgage with the most likely lenders. The significant effect that foreclosures have on property values also suggests, although not conclusively, that to attain more accurate estimates of the true values of properties for sale, GSEs and the FHA should exercise caution when accepting distressed home sales as valid comparable properties.

Acknowledgments

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Comparing Subsidies, Loans, and Standards for Improving Home Energy Efficiency

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Resources for the Future

Abstract

Residential buildings use approximately 20 percent of the total U.S. energy consumption, and single-family homes alone account for about 16 percent. Older homes are less energy efficient than newer ones, and, although many experts have identified upgrades and improvements that can yield significant energy savings at relatively low costs, it has proven to be difficult to spur most homeowners into making these investments. In this article, I analyze the energy and carbon dioxide (CO_2) effects from three policies aimed at improving home energy efficiency: (1) a subsidy for the purchase of efficient space heating, cooling, and water-heating equipment; (2) a loan for the same purchases; and (3) efficiency standards for such equipment. I use a version of the U.S. Department of Energy (DOE), Energy Information Administration's (EIA's) National Energy Modeling System, NEMS-RFF,[1] to compute the energy and CO_2 effects and standard formulas in economics to calculate the welfare costs of the policies. I find that the loan option is quite cost effective but provides only a very small reduction in CO_2 emissions and energy use. The subsidy and the standards both are more costly but generate CO_2 emissions reductions seven times greater than the loan option. The subsidy promotes consumer adoption of very high-efficiency equipment, but the standards do not; they lead to purchases of equipment that just reaches the standards. The discount rate used to discount energy savings from the policies has a large effect on the welfare cost estimates.

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[1] RFF in NEMS-RFF stands for Resources for the Future, as the small changes to the model inputs and assumptions were made for modeling runs completed for Resources for the Future. The views expressed in this article do not necessarily reflect the views of EIA or DOE. EIA makes the model available for use by others, but only select firms and some academics have the expertise to run the model. OnLocation, Inc. (http://www.onlocationinc.com/) ran NEMS-RFF for the purposes of this study.

Cityscape: A Journal of Policy Development and Research • Volume 16, Number 1 • 2014
U.S. Department of Housing and Urban Development • Office of Policy Development and Research
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Introduction

Commercial and residential buildings account for 42 percent of energy consumption in the United States, and residential buildings alone are responsible for one-half of this amount. Building codes, appliance standards, and general technological improvements have vastly improved the energy efficiency of new homes, but older homes lag behind newer homes in efficiency. A home built in the 1940s consumes, on average, 50.8 thousand British thermal units (Btus) per square foot, even with improvements made since it was built. An average home built in the 1990s, on the other hand, consumes only 37.7 thousand Btus per square foot (DOE/EIA, 2008). With 75 percent of the existing housing stock built before 1990, to make a serious dent in residential energy consumption will require policies that target retrofit and upgrade options to existing properties.

Experts have disagreed about the best approaches for spurring homeowners to use retrofit options, and current policy takes a somewhat scattershot approach. Since the mid-1980s, the federal government has set mandatory minimum efficiency standards for a variety of appliances and equipment and, in President Barack Obama's June 2013 Climate Action Plan, he proposed tightening those standards for a number of products (Executive Office of the President, 2013). In addition, the government operates the voluntary ENERGY STAR certification program for equipment and new homes that reach even higher levels of efficiency. Many state and local governments encourage building retrofit options in a variety of ways. Approximately 250 energy-efficiency-financing programs are in operation at the state, local, and utility level (Palmer, Walls, and Gerarden, 2012). These programs provide low-interest loans to consumers (and businesses) who upgrade their properties. The Rural Utilities Service also has long operated an energy-efficiency loan program, implemented by rural electric cooperatives, and President Obama also proposed an increase to this program (Executive Office of the President, 2013). Tax credits, rebates, and direct subsidies have also been available to varying degrees in different locations and at different times; in fact, these financial incentives were key components of the 2009 American Recovery and Reinvestment Act stimulus bill. Also, some cities recently adopted energy-disclosure requirements for commercial and multifamily residential buildings, on the premise that making energy information publicly available will spur improvements.

Studies of the effectiveness and cost effectiveness of policies that focus on end-use energy efficiency are limited. The often cited McKinsey & Company (2009) report identifies a number of building retrofit options with discounted streams of energy savings that more than offset the upfront costs of the improvements. These measures would purportedly yield 12.4 quadrillion Btus in energy savings in 2020, 29 percent of predicted baseline energy use in buildings in that year. The study does not describe or analyze policy options that will bring these changes about, however. A similar comment can be made about a 2010 National Academy of Sciences study (NAS, 2010). Brown et al. (2009) do focus on policies; they look at building codes, energy-performance-rating systems, mandated disclosure of energy use, and "on-bill" energy-efficiency-financing programs, as well as three policies targeted to utilities. The authors estimate energy savings and costs for each option, but these estimates are based on the authors' assumptions and results from other studies, not from detailed statistical or simulation modeling. Krupnick et al. (2010) estimate the costs and effectiveness of a variety of policies to reduce energy use and carbon dioxide (CO_2) emissions, including four end-use energy-efficiency policies: building energy codes; building energy codes combined with other policies, as specified in the 2009 Waxman-Markey climate bill (H.R. 2454); and two smaller

scale policies, one using a subsidy and the other a loan, for the purchase of geothermal heat pumps (GHPs). Krupnick et al. (2010) use a version of the National Energy Modeling System (NEMS), the market equilibrium simulation model used by the U.S. Department of Energy (DOE)/Energy Information Administration (EIA) for its short- and long-term energy-use forecasts (DOE/EIA, 2011) to have a consistent framework with which to evaluate energy and CO_2 reductions across policies. The authors then use standard methodologies from public economics to calculate the costs of each policy.

This article takes an approach similar to that of Krupnick et al. (2010), using a version of NEMS (NEMS-RFF, in which small changes to the NEMS inputs and assumptions were made for modeling runs completed for Resources for the Future) to analyze three policy options to reduce home energy use—two incentive-based instruments and a command-and-control approach. The study focuses on heating and air-conditioning equipment and water heaters, which together account for approximately 70 percent of an average home's energy use. I compare a subsidy for the purchase of high-efficiency equipment with a zero-interest loan of the same initial amount. I then contrast these two economic incentive-based policies with a policy that is of a more command-and-control nature—efficiency standards for new equipment.

NEMS-RFF has a high level of technological detail in the four end-use energy sectors—residential, commercial, industrial, and transportation—as well as the electricity sector, making possible detailed modeling of alternative policies. By using a consistent modeling framework with the same baseline assumptions for comparison, I am able to make an apples-to-apples comparison of the three policy options and contrast the results to those in Krupnick et al. (2010). I also can compare with baseline forecasts that are consistent with EIA's *Annual Energy Outlook* (AEO). I use model output to calculate the welfare costs of the policies; this approach, in turn, enables me to estimate the cost effectiveness of each policy in reducing CO_2 emissions—that is, the welfare costs per ton of CO_2 emissions reduced.

The use of welfare costs in the study is important, because they measure the costs imposed on society when resources are diverted away from the sectors in which they are most productive and toward other less-productive sectors. In this study, the policies shift resources toward high-efficiency heating, cooling, and water-heating equipment. Estimating welfare costs is the prevailing approach that economists use to measure the costs associated with government policies (Hines, 1999; Just, Hueth, and Schmitz, 2004). This approach is in contrast to some other energy-policy studies, however, which often calculate direct expenditure changes from scenarios in which one fuel substitutes for another or one more energy-efficient technology replaces another, less efficient one (Brown et al., 2009; McKinsey & Company, 2009). Studies that look at broad-based policies, such as a carbon tax or cap-and-trade program, often assess changes in gross domestic product (DOE/EIA, 2009c). Although such metrics provide important information, they usually do not reflect the true economic burden of the policy.[2]

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[2] The welfare cost terminology is often used interchangeably with *deadweight* loss or *efficiency loss*, and sometimes *excess burden*, although I use the *welfare* term throughout. It is important to understand that calculating the costs of policies does not mean that those policies are not worthwhile; that is, that the benefits do not outweigh the costs. When designing policies, however, it is worth searching for the ones that achieve the greatest benefit (in this study, the greatest reduction in CO_2 emissions) at the least cost.

I find the loan policy to be more cost effective than the subsidy, and, with low enough discount rates, the costs are even negative—that is, the discounted stream of future energy savings offsets the welfare cost in the equipment market to generate an overall negative net welfare cost. The loan achieves only a very small reduction in energy use and CO_2 emissions, however. The financial incentive to switch to high-efficiency equipment options is simply not that great because the loan has to be repaid. This result appears to be consistent with findings in the loan programs that have been operated to date, which have had quite low participation rates (Palmer, Walls, and Gerarden, 2012). Consumers respond more to the subsidy, and thus energy and CO_2 emissions reductions are much greater with this policy. CO_2 reductions are more than seven times greater than with the loan. This policy comes with higher welfare costs, however; thus, policymakers face a tradeoff.

The modeling results show the efficiency standards achieving CO_2 emissions and energy reductions approximately equal to those of the subsidy, but the costs of this policy option are greater. This finding highlights the importance of using a measure of welfare costs to analyze policies. Because a standard essentially removes a large number of product choices from the marketplace—all of the relatively low-efficiency space heating and cooling and water-heating equipment—it generates a larger welfare cost than the subsidy. Moreover, because the subsidy incentivizes purchases of all high-efficiency equipment, including the very high-efficiency but higher cost options, it generates somewhat greater CO_2 emissions reductions per dollar of welfare cost. The standard leads to more equipment that just meets the level of the standard.

The loan and subsidy policies compare favorably on a cost-effectiveness basis with the policies analyzed in Krupnick et al. (2010), with the exception of the broad cap-and-trade and carbon tax policies. In particular, they are more effective than building energy codes—that is, they provide a greater reduction in CO_2 emissions—primarily because they have a more immediate effect, whereas building codes provide energy and CO_2 reductions more gradually as new buildings replace older ones. On a cost-effectiveness basis, the building codes and subsidy policy are very similar. The subsidy is less cost effective than some other approaches, such as a clean-energy standard applied to electricity generation, but the very low cost of the loan option makes it compare favorably with almost all other options analyzed in the Krupnick et al. (2010) study,[3] although, again, it achieves very small reductions in CO_2 emissions. It is interesting that Krupnick et al. (2010) look at subsidies and loans for geothermal heat pumps, a very high-efficiency but high-cost space heating and cooling option, and find the policies were more cost effective than the more broadly applied policies analyzed in this article. These results suggest that, if the government is going to implement energy-efficiency policies, careful targeting of those policies may be appropriate from a cost-effectiveness standpoint.

In this article, the following section describes NEMS-RFF, with special attention to the residential module and how heating and air-conditioning equipment and water heaters are incorporated in the model. The subsequent section shows baseline results—forecasts of annual residential-sector energy consumption and CO_2 emissions to 2035 and the distribution of technologies in use during the period under a business-as-usual scenario. The next section describes the specific loan and

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[3] A clean-energy standard requires electric utilities to use a certain share of clean sources of fuel (for example, wind, solar, nuclear, and sometimes natural gas) for the electricity they produce (see Mignone et al., 2012).

subsidy policies and shows results from the model, along with the welfare cost calculations. I then compare the subsidy results with an equivalent technology standard in the section that follows. The penultimate section compares my cost-effectiveness results for the three energy-efficiency policies with cost-effectiveness estimates for alternative policies from other studies. The final section provides some concluding remarks.

The NEMS-RFF Model

NEMS is the primary model that the U.S. Energy Information Administration uses in its *Annual Energy Outlook* forecasts of future energy prices, supply, and demand (DOE/EIA, 2011). Some model modifications were made to represent the policy cases, thus we refer to the model throughout as NEMS-RFF. In this section, we provide a brief overview of the model.

Model Overview

NEMS-RFF is an energy-systems model, also often referred to as a bottom-up model. As in most energy-systems models, NEMS-RFF incorporates considerable detail on a wide spectrum of existing and emerging technologies across the energy system, while also balancing supply and demand in all (energy and other) markets. The model is modular in nature (exhibit 1), with each module representing individual fuel supply, conversion, and end-use consumption. The model solves

Exhibit 1

Visual Representation of NEMS
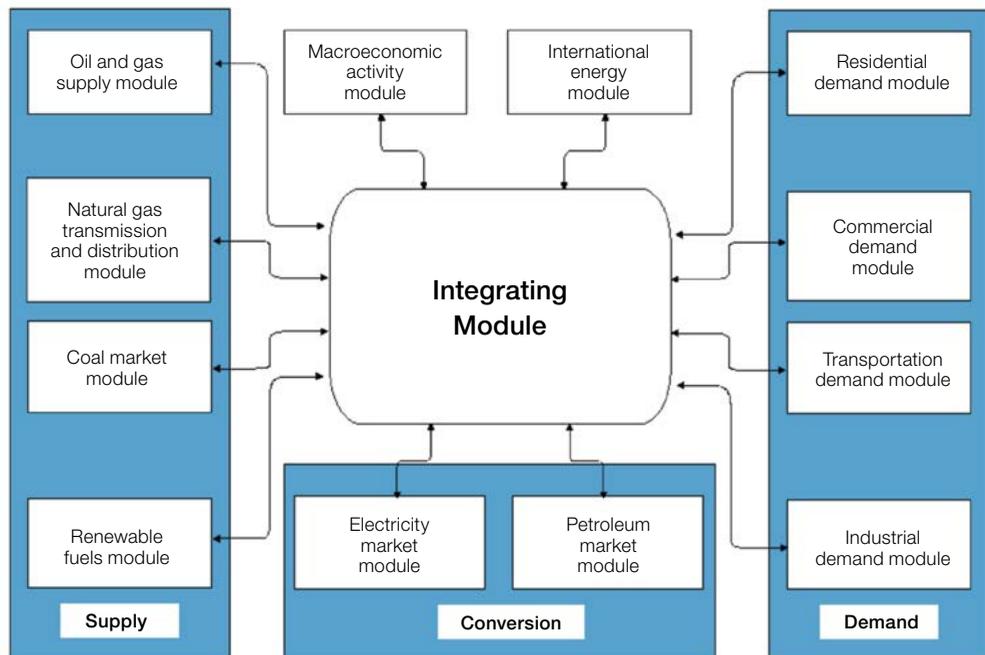
NEMS = National Energy Modeling System.
Source: DOE/EIA (2009a)

iteratively until the delivered prices of energy are in equilibrium. Many of the modules contain extensive data: industrial demand is represented for 21 industry groups, for example, and light-duty vehicles are disaggregated into 12 classes and are distinguished by vintage. The model also has regional disaggregation, taking into account, for example, state electric utility regulations. It also incorporates existing regulations, taxes, and tax credits, all of which are updated regularly.

NEMS-RFF incorporates a fair amount of economic behavioral assumptions in its various modules. These assumptions allow for the model to be used to capture the effects of various economic incentive-based policies, such as taxes and subsidies. The model will also measure the effects policies that are of a more command-and-control nature have on some fuel and electricity prices, although the model has some limitations in this regard. Price elasticities of demand, payback periods for capital investments, and other economic factors are chosen based on extensive reviews of the literature and evidence from equipment and fuel markets.

The Residential Module

The NEMS-RFF Residential Sector Demand Module[4] starts with exogenously given population and housing construction input data from the NEMS Macroeconomic Activity Module. The module contains housing and equipment stock flow algorithms, a technology choice and housing shell efficiency algorithm, end-use energy consumption, and distributed electricity generation. Equipment purchases are based on a nested choice methodology with the first stage determining the fuel and technology—for example, an electric heat pump or a natural gas furnace for space heating—for both new and replacement equipment. After the technology and fuel choice are selected, the second stage determines the efficiency of the equipment. Most equipment has several different efficiency types available in the model, and generally more efficient equipment has a higher upfront cost. Market shares of each type are based on installed capital and operating costs; parameters of these functions are calibrated to market data. It is possible to calculate observed discount rates from the model based on the calibrations; these rates can reach as high as 30 percent. For the space heating, cooling, and water-heating equipment, rates are approximately 20 percent. Thus, incentive-based policies directed at high-efficiency equipment are expected to have somewhat limited effects on consumer purchase behavior as these relatively high discount rates imply that consumers need to see a quick payback (large energy savings) from the more efficient equipment or they will not purchase it. This intrinsic feature of the NEMS-RFF model is based on the DOE-EIA study of observed consumer behavior.

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[4] For more detailed information, see DOE/EIA (2009b).

For the policy analyses in this study, I modify the capital and operating costs of the different types of heating, cooling, and water-heating equipment, and this shifts the share of purchases toward the subsidized technology types (within the limits of the model structure). For the technology standard policy, I remove the lower efficiency options from the choice set, as explained in more detail in the following section. NEMS-RFF assumes consumers replace equipment when it wears out, using typical lifetimes observed in the marketplace. Thus, the policies spur consumers to buy equipment that is more efficient than what they otherwise would have purchased, but they do not lead them to replace equipment before it wears out. For this reason, it is possible that NEMS underestimates the energy and CO_2 emissions reduction effects of the policies, although the extent to which consumers would replace earlier in response to the policies is unclear.

Space Heating and Cooling and Water-Heating Technologies in the Model

The NEMS-RFF model incorporates six different fuel types for space heating—(1) natural gas, (2) electricity, (3) liquefied petroleum gas (LPG), (4) kerosene, (5) distillate heating oil, and (6) wood—and four different types of heating technologies—(1) heat pumps, (2) radiant heat, (3) forced-air furnaces, and (4) geothermal heat pumps, or GHPs. In 2010, nearly 54 percent of the space heating equipment stock in place in the United States was natural gas forced-air furnaces. Electric heat pumps accounted for 9.5 percent. By 2035, the NEMS-RFF baseline predictions with no policy changes are that relatively more space heating will be supplied by natural gas forced air furnaces and electric heat pumps—the shares increase to 55.4 and 14.1 percent, respectively.

NEMS-RFF builds in five basic technology types for natural gas furnaces, each of which has different efficiencies and costs that vary somewhat over time and by region of the country. Improvements over time are also built in for most of the other space heating technologies in the model, including the four basic types of electric heat pumps and the four different types of central air-conditioning systems. In addition, NEMS-RFF incorporates any federal tax credits that are in place for specific technologies (GHPs are an important example) and phases them out if the legislation specifies a particular date at which they sunset. NEMS-RFF also includes room air-conditioners, which account for 41.6 percent of the air-conditioning equipment stock in 2010. As I explain in the discussion of the policy scenarios that follow, the focus in this study is on forced-air furnaces, electric heat pumps, GHPs, and central air-conditioning systems.[5] Exhibit 2 shows a breakdown of the different technology types in the NEMS-RFF model for the major sources of residential space heating and cooling and water heating. The high-efficiency models are the targets of these policies.[6]

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[5] Natural gas radiant heat makes up only about 7 percent of heating-equipment purchases in a given year, a percentage that is expected to decline in the future; that technology is not incentivized in the policy scenarios here.

[6] For ease of interpretation, I categorize the technologies, which in NEMS are distinguished by efficiency factors and costs, and give them the labels in exhibit 2.

Exhibit 2

Space Heating and Cooling Technologies in the NEMS-RFF Model

Space Heating and Cooling Equipment Type	Energy Efficiency
Heat pumps	**HSPF**
Low-efficiency models	7.7
High-efficiency models	
Current ENERGY STAR	8.2
Very high-efficiency	~ 9.5
Ultra high-efficiency	10.7–10.9
GHPs (all high-efficiency)	11.9–17.1
Natural gas, LPG, and oil furnaces	**AFUE**
Low-efficiency models	80–83%
High-efficiency models	
Current ENERGY STAR	90%
Very high-efficiency	96%
Central air-conditioners	**SEER**
Low-efficiency models	13.0–14.0
High-efficiency models	
Current ENERGY STAR	14.5
Very high-efficiency	16.0
Ultra high-efficiency	23.0

AFUE = annual fuel utilization efficiency. GHP = geothermal heat pump. HSPF = heating seasonal-performance factor. LPG = liquefied petroleum gas. NEMS = National Energy Modeling System. RFF = Resources for the Future. SEER = seasonal energy efficiency ratio.

Notes: HSPF measures a heat pump's energy efficiency during one heating season. It is heating output, in British thermal units (Btus), divided by total electricity consumed in watt-hours. AFUE measures the amount of fuel converted to space heat in proportion to the amount entering the furnace; it is typically represented as a percentage. SEER measures an air-conditioner's cooling output, in Btus, divided by total electric energy input in watt-hours. Information on ENERGY STAR requirements for heating, ventilation, and air-conditioning equipment, water heaters, and other equipment and appliances is available at http://www.energystar.gov/index.cfm?c=products.pr_find_es_products.

Baseline Modeling Results

Exhibit 3 shows the forecast of total energy consumption and residential energy consumption during the 2011-to-2035 forecast period under the baseline scenario. This baseline is consistent with the reference case in EIA's 2011 AEO (DOE/EIA, 2011). As the exhibit makes clear, residential sector energy use—both delivered energy and total residential, including electricity sector losses—is predicted to change very little, despite a forecasted growth of 28 percent in the number of U.S. households by 2035. Delivered energy consumption is only 5.2 percent higher in 2035 than in 2011. This relatively small increase is because of improvements in energy efficiency in the building sector over time. The improvements result from the replacement of older equipment and appliances with newer, more efficient models and newly constructed houses that have improved building shells and other efficiency upgrades. Energy intensity in the residential sector—measured as millions of Btus of energy used per household—declines by more than 20 percent between 2010 and 2035. On a per-square-foot basis, energy intensity declines even more—by 31.3 percent during the 2010-to-2035 period.

Exhibit 3

Baseline Energy Use, 2011–2035
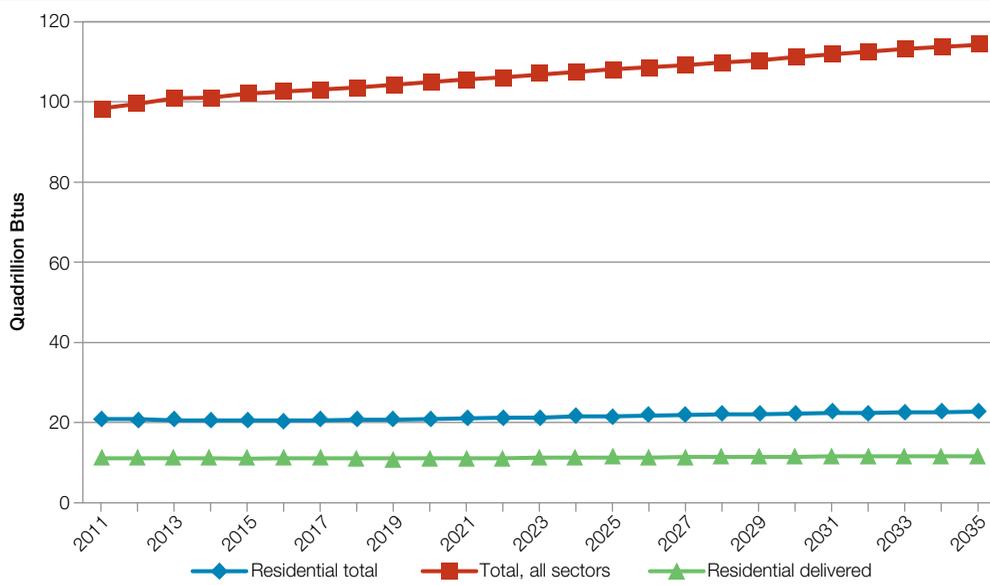
Btus = British thermal units.

Note: Residential total is residential delivered energy use plus electricity sector losses.

Source: National Energy Modeling System-Resources for the Future—NEMS-RFF—modeling results

Some of the improvement in the residential sector is because of heating and air-conditioning equipment replacement and new water heaters. All newer models are more efficient than older ones and some particularly inefficient technologies are no longer available in the future as standards ramp up. In addition, the high-efficiency models that are the focus of the policy scenarios that follow see their market share increase over time. As exhibit 4 shows, in 2011, the high-efficiency cooling-equipment and heating-equipment options accounted for 13.7 and 15.3 percent of all purchases, respectively; by 2035, they are expected to account for 23.4 and 24.1 percent even without any new policies. Less improvement is seen in water heater efficiencies in the baseline, which could be due in part to the equipment I characterize as efficient; these options have significantly higher efficiencies than the other technology options in NEMS-RFF. The percentage of purchases of efficient water heaters increases from 0.93 percent in 2011 to 3.75 percent in 2035.

These overall efficiency improvements are important when evaluating the cost effectiveness of energy-efficiency policies. As the baseline improves, achieving additional energy and CO_2 reductions beyond the baseline will prove increasingly costly. I return to this point in the following section.

Exhibit 4

High-Efficiency Heating and Cooling Equipment Sales As a Percentage of Total Sales, Baseline Case
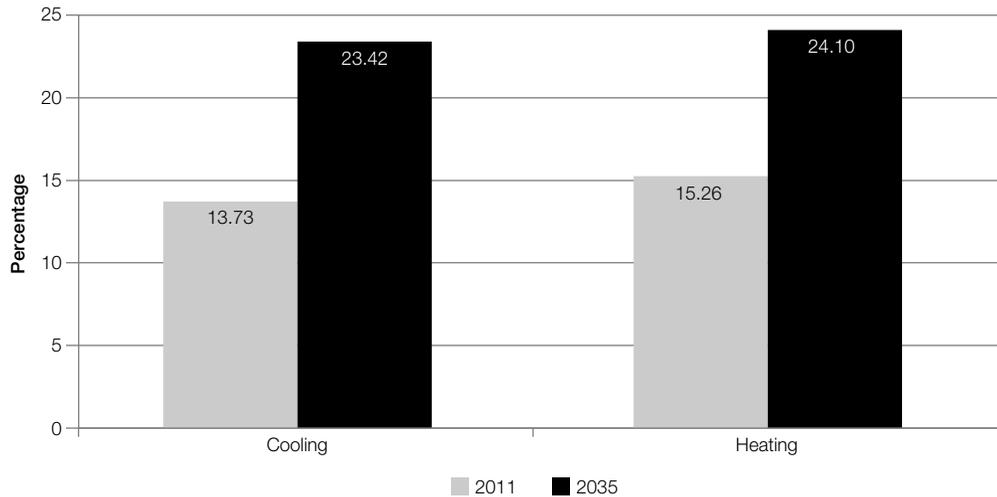
Source: National Energy Modeling System-Resources for the Future—NEMS-RFF—modeling results

Loan and Subsidy Policy Scenarios

This section compares a subsidy for high-efficiency equipment with a zero-interest loan. The subsidy and loan are applied to all high-efficiency options, as specified in exhibit 2, and the high-efficiency water heaters. The modeled subsidy lowers the upfront capital cost of new and replacement equipment by 50 percent more than the baseline NEMS-RFF assumptions. This percentage reduction means that the dollar amount of the subsidy is larger for higher cost equipment and that the subsidy falls in size if costs come down over time, as occurs for some of the technologies in NEMS-RFF. I choose a subsidy of this magnitude in an effort to spur a significant move toward high-efficiency purchases in the policy scenarios, while acknowledging that a government subsidy (or tax credit) that would reduce prices by 50 percent may be unrealistic.[7]

The loan policy reduces the capital cost (to the equipment purchaser) by exactly the same amount as the subsidy, 50 percent of the baseline cost, but assumes that the loan is fully paid back during a 3-year period, with no interest. The 3-year period is arbitrary, but, because the loan amounts are not large and zero interest is charged on the loan, a relatively short payback period seems appropriate. Most energy-efficiency loan programs that cover a wide range of home retrofit and upgrade options do not have a 0-percent interest rate; in fact, some loans have rates as high as 14 percent.[8]

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[7] Because running NEMS-RFF for alternative scenarios is time consuming and costly, I was unable to conduct sensitivity analyses with different-sized subsidies. In the results that follow, however, I do discuss how the cost effectiveness varies with discount rates, loan default rates, and other factors.

[8] The Fannie Mae Energy Loan program is one example. Many state and utility programs use the Fannie Mae program but buy down the interest rate to a more acceptable level, often about 7 percent (Palmer, Walls, and Gerarden, 2012).

Thus, this zero-interest loan is a generous feature of the policy. On the other hand, 3 years is a relatively short term for the loan. Most energy-efficiency-financing programs have terms of around 10 years, although these longer terms are typically available only for much larger loans (Palmer, Walls, and Gerarden, 2012). In the NEMS-RFF model, the subsidy simply lowers the upfront equipment cost, leaving annual operating costs unchanged; the loan lowers the upfront cost by the same amount as the subsidy but effectively increases operating costs for the first 3 years of the equipment's life. I assume a 2-percent default rate on loans. Existing loan programs have average default rates of less than 2 percent, but they tend to serve customers with very high credit scores.[9] In a national program available to all consumers, one would expect the default rate to be higher.

Policy Modeling Results: Loans Versus Subsidies

By lowering the purchase cost of high-efficiency heating, cooling, and water-heating equipment, the subsidy and the loan both shift purchases of new equipment toward the more efficient options over time. Exhibit 5 shows all efficient equipment purchases as a percentage of total equipment purchases during the 2011-to-2035 period. With the subsidy, more than one-half of all cooling equipment and nearly one-half of heating equipment purchased during this 25-year period are high-efficiency models; just less than 40 percent of water heaters are high-efficiency models. These increases are significant over the baseline case. Loans have less of an effect: high-efficiency cooling

Exhibit 5

High-Efficiency Equipment Purchases, 2011–2035, As a Percentage of All Equipment Purchases
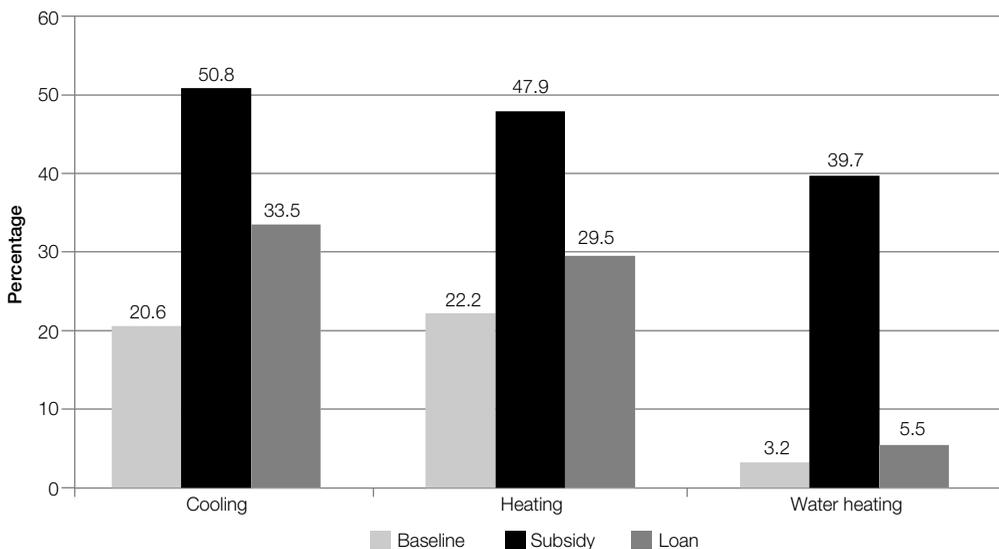
Source: National Energy Modeling System-Resources for the Future—NEMS-RFF—modeling results

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[9] Default rates on current loan programs are not widely available, but a program in Pennsylvania has had an average rate of 0.60 percent (State Energy Efficiency Action Network, 2011). The rate varies greatly by borrowers' credit scores, however, and those with credit scores (FICO credit score model) of less than 650 have an average default rate of 4.33 percent.

equipment purchases increase from 20.6 to 33.5 percent and high-efficiency heating equipment purchases increase from 22.2 to 29.5 percent. The loan policy has a much smaller effect on water heater purchases than does the subsidy.

As the new efficient equipment purchases gradually replace older equipment, energy use for heating and cooling declines relative to the baseline. Exhibit 6 shows residential delivered energy use during the 2011-to-2035 period under the baseline and the two policy cases. The subsidy has a much larger effect on residential energy use than does the loan. In fact, the loan is almost indistinguishable from the baseline. Neither policy has a large effect on energy use, however.[10] By 2035, delivered energy use under the subsidy is 0.66 quadrillion Btus less than the baseline, a difference of only 5.6 percent.

Energy use eventually increases in all three scenarios because of population growth, but with the subsidy, total energy use in 2035 is slightly less than the 2011 level. Energy use falls, on a per-household basis, by 16.8 percent in the baseline between 2011 and 2035, by 17.4 percent with the loan, and by 21 percent with the subsidy. Thus the energy-efficiency policies work in reducing residential energy use, and accompanying CO_2 emissions, but the forces of population and economic growth offset much of those reductions.

Exhibit 6

Residential Delivered Energy Use, 2011–2035
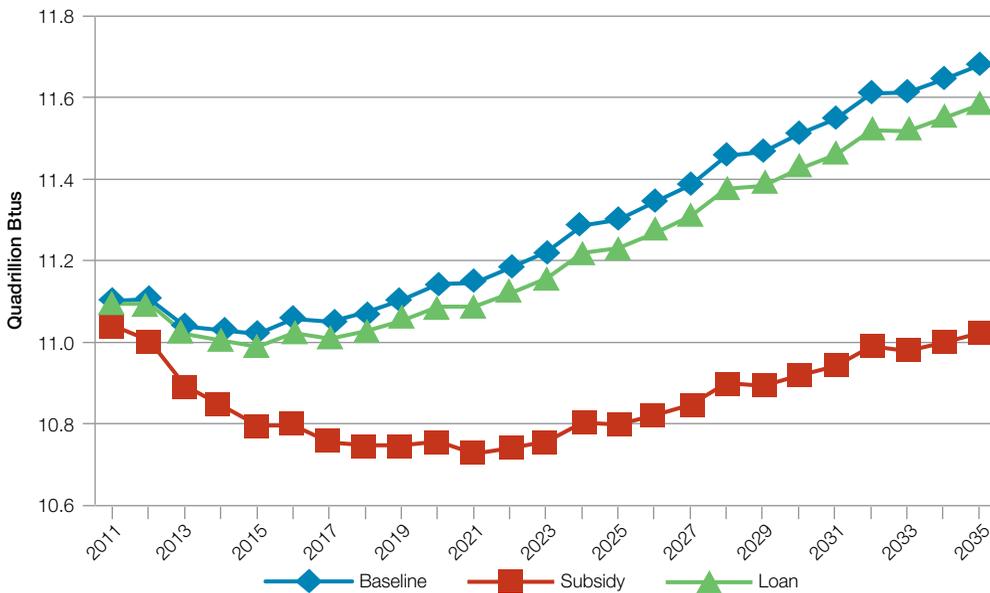
Btus = British thermal units.
Source: National Energy Modeling System-Resources for the Future—NEMS-RFF—modeling results

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[10] Note that the scale of the vertical axis is compressed in exhibit 6 so that the differences show up. By contrast, the scale in exhibit 3 is much wider.

Cumulative energy-related CO_2 emissions reductions during the 25-year forecast period from the subsidy are 672.5 million metric tons (mmtons), seven times greater than the 94.9 mmton reduction from the loan. With economywide CO_2 emissions during the same time period in the baseline case at 148 billion metric tons, however, neither residential energy-efficiency policy makes a major dent in the problem, reducing CO_2 emissions by less than 0.5 percent in the case of the subsidy and by a much smaller percentage with the loan. This result is expected: with heating, cooling, and water-heating equipment responsible for approximately 70 percent of the energy consumed in a residential building, and the residential sector as a whole accounting for approximately 20 percent of total energy use, these kinds of targeted energy-efficiency policies can make only a small contribution toward U.S. climate reduction goals. Nonetheless, in the absence of a broad-based carbon tax or cap-and-trade program, sector-specific policies may be the next-best solution, and thus it is important to assess their potential.

Welfare Costs and Cost Effectiveness of Loans and Subsidies

As explained in the introduction, I focus on welfare costs to measure the economic burden of the policies rather than simple expenditure changes or other measures of costs. Welfare costs are the costs imposed on society when resources are diverted toward the production of high-efficiency heating, cooling, and water-heating equipment and away from other sectors in the economy.

I use standard formulas from public economics based on the work of Harberger (1964, 1971) and others to estimate welfare costs. Graphically, this approach is illustrated in exhibit 7, which

Exhibit 7

Welfare Loss From High-Efficiency Equipment Subsidy
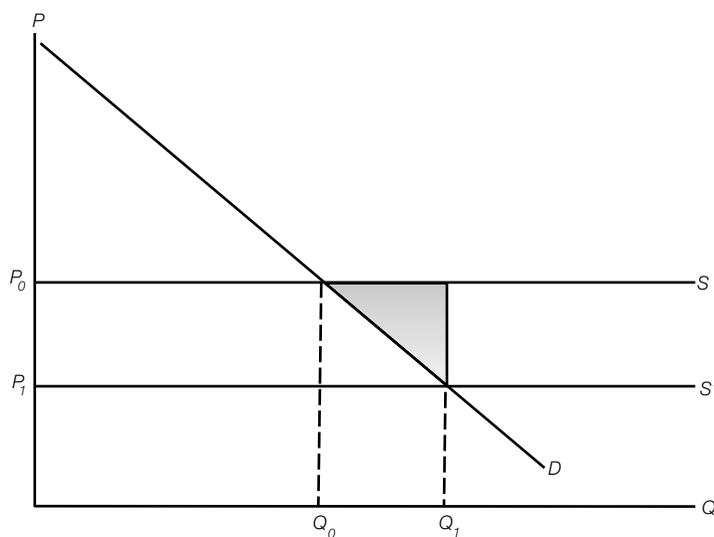
D = demand curve for high-efficiency equipment. P = price of high-efficiency equipment purchased. P_0 and Q_0 = equilibrium price and quantity without subsidy. P_1 and Q_1 = equilibrium price and quantity with subsidy. Q = quantity of high-efficiency equipment purchased. S = supply curve for high-efficiency equipment. S' = supply curve with subsidy. Shaded triangle = welfare loss from subsidy.

shows the market for efficient heating, cooling, and water-heating equipment. The supply curve, *S*, shows the additional units of high-efficiency equipment, *Q*, that will be supplied to the market as the price, *P*, increases.[11] The subsidy is shown as a horizontal shift downward in the supply curve. It lowers the net price to consumers, from P_0 to P_1, and it leads to a greater quantity purchased in equilibrium, Q_1. Consumers are better off as the subsidy lowers the purchase price they pay, but the shift of resources to this sector of the economy and away from other sectors imposes a welfare cost equal to the shaded triangle. This area measures the additional government subsidy payments above and beyond the benefit to consumers from lower prices.[12]

I treat the loan policy as having exactly the same effect in the market for high-efficiency equipment, but the loan shifts the supply curve downward by a smaller amount than does the subsidy. Rather than shifting it down by the per-dollar subsidy amount, it shifts it down by the discounted present value of the forgone interest earnings on the loan. I compute this value using a 5-percent interest rate and the 3-year loan term. The welfare losses for both policies are calculated for each forecast year and the discounted present value of these losses is then computed using a 5-percent discount rate.[13]

One final adjustment to the welfare cost calculations is important. If one believes that a market failure exists in the market for energy efficiency because of information barriers, myopic consumers, credit rationing, risk, and uncertainty about new types of equipment, or any of a host of other reasons for the so-called efficiency gap, or energy paradox (Alcott and Greenstone, 2012; Gillingham, Newell, and Palmer, 2009; Jaffe and Stavins, 1994), then these welfare costs in the equipment market may overstate the true welfare costs of the policies. To allow for the possibility of these market failures, I calculate the discounted stream of future energy savings from the policies under alternative discount rate assumptions. A 20-percent rate, consistent with underlying assumptions in the NEMS-RFF model, implies no market failure—in other words, the relatively high rate may capture hidden costs associated with the high-efficiency equipment, such as reduced quality, performance, or durability. Although high-efficiency equipment yields energy savings, these savings are assumed to be accurately reflected in consumers' decisionmaking. In this case, the welfare loss triangle in the equipment market is a full measure of welfare costs. I analyze using a rate as high as 25 percent to account for extra hidden costs not captured in the equipment market. At the other

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[11] The supply is drawn as perfectly elastic. This elasticity assumption simplifies the analysis and is consistent with the NEMS-RFF model, which does not include increasing marginal costs of production and changes in equilibrium prices as a result of demand shifts. In addition, for ease of graphical exposition, I show a single market for high-efficiency equipment, but the NEMS-RFF model, as explained previously, contains multiple equipment types.

[12] The government will likely have to raise distortionary taxes to obtain funds to make the subsidy payments. Thus, economists often add in the marginal cost of public funds to the welfare cost shown in exhibit 7 (Browning, 1976). I ignore that additional cost here.

[13] Although the subsidy may shift demand and supply curves in other markets, these pecuniary effects are not part of the standard welfare loss formula (Harberger, 1971; Hines, 1999). In this case, for example, the demand for low-efficiency equipment options should decrease in response to the subsidy, but changes in this market are not part of the welfare calculations.

end of the spectrum, I calculate energy savings using a 5-percent discount rate, which implies that the efficiency gap is due completely to market failures. I also calculate costs for discount rates between these two extremes.[14]

Exhibit 8 shows the total present discounted value of the net welfare costs during the 2011-to-2035 period for the two policy options under three alternative discount rates—5 percent, 10 percent, and 20 percent—as well as the net welfare costs per ton of CO_2 emissions reduced. Exhibit 9 shows the cost-per-ton numbers graphically across the full range of alternative discount rates.

The discount rate has a profound effect on both the total welfare costs and the cost per ton of CO_2 emissions reduced for both policies. A 5-percent discount rate, which reflects the belief that the market for residential high-efficiency equipment contains significant market failures, leads to negative policy costs—that is, the discounted stream of future energy savings offsets the welfare losses the policies impose in the equipment market. In the case of the loan, the energy costs far outweigh the deadweight loss in the equipment market: the policy generates a net welfare gain to society of $113 per ton of CO_2 emissions reduced. Higher discount rates lead to higher costs for both policies, although the loan option still has negative costs at a 10-percent discount rate. The estimated cost per ton of CO_2 emissions reduced becomes positive only for the loan policy at a discount rate of approximately 11.5 percent. The subsidy's cost per ton becomes positive at a 6-percent discount rate.

Increasing the discount rate increases the cost per ton of CO_2 reduced, but it does so at a decreasing rate. At lower discount rates, the stream of energy savings over time has a relatively larger effect on the overall cost calculation, thus changes in that component of welfare costs can have a sizeable effect. At higher discount rates, on the other hand, the upfront welfare loss in the equipment market is relatively more important, and this component is insensitive to the discount rate. Exhibit 9 also

Exhibit 8

Welfare Costs and Cost Effectiveness of Subsidy and Loan Policies Using Alternative Discount Rates for Energy Savings

Discount Rate (%)	PDV Welfare Costs, 2011–2035		Cost per Ton of Carbon Dioxide Reduced	
	Subsidy	Loan	Subsidy	Loan
5	− 16.1	− 10.7	− 24	− 113
10	22.9	− 1.2	34	− 13
20	44.3	4.0	66	42

PDV = present discounted value.

Notes: PDV welfare costs are in billions of 2009 U.S. dollars. The cost per ton is the PDV welfare costs divided by cumulative carbon dioxide emissions reduced.

Sources: Author's calculations; National Energy Modeling System-Resources for the Future—NEMS-RFF—modeling results

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[14] Krupnick et al. (2010) provided a detailed discussion of the market failure versus hidden costs debate with respect to the energy-efficiency gap and how varying the discount rate used to calculate the present value of energy savings can capture these different beliefs. A 5-percent rate is generally considered an (approximate) social rate of discount—the rate used to discount future costs and benefits associated with government spending (Cowen, 2008). It is important to understand that these alternative discount rates are applied only to the energy savings component of the welfare cost calculations. The normal discounting associated with converting future dollars to a present value, which is necessary for computing the discounted present value of welfare costs, remains at a 5-percent social rate throughout this analysis.

Exhibit 9

Cost Effectiveness of the Subsidy and Loan Policies for Reducing Carbon Dioxide Emissions, Under Alternative Discount Rates for Energy Savings
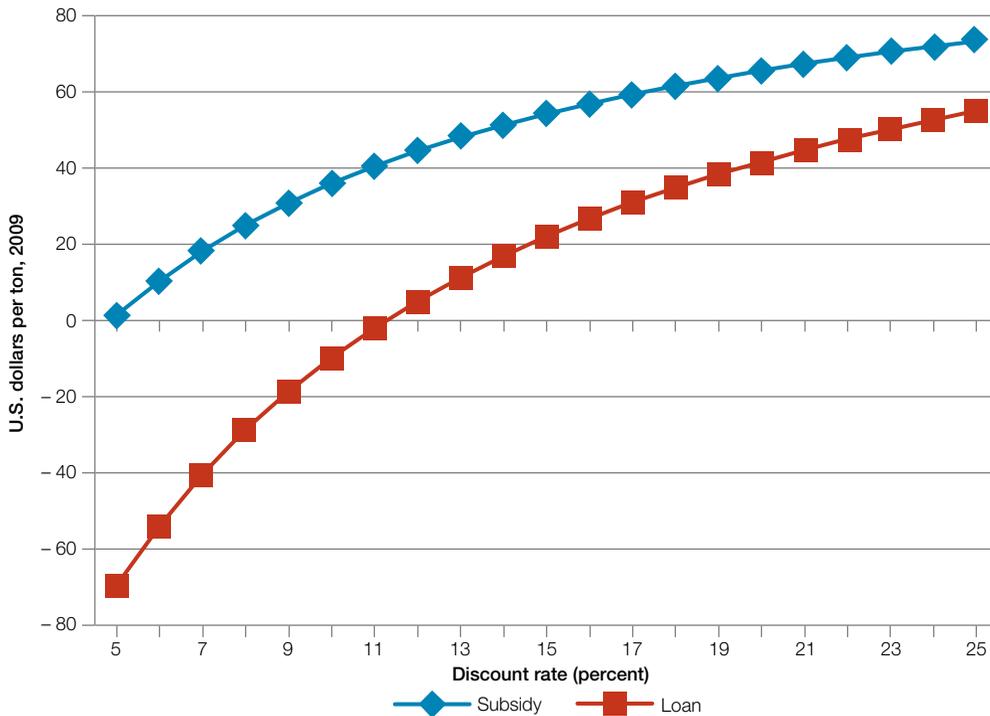
Sources: Author's calculations; National Energy Modeling System-Resources for the Future—NEMS-RFF—modeling results

shows that the costs of the loan policy increase by a greater amount than do those of the subsidy as the discount rate is increased; the two policies' costs per ton gradually approach one another.

The loan policy has lower costs per ton of CO_2 reduced than does the subsidy across the range of discount rates for two reasons. First, because it provides a smaller financial incentive than the subsidy, the loan induces less switching to high-efficiency equipment; this approach keeps down the cost of the policy (although it also limits the benefits in terms of energy and CO_2 emissions reductions). Second, because the loan is repaid, the welfare loss triangle in the equipment market is calculated using only the forgone interest earnings on the money that is loaned to consumers. This amount clearly is significantly less than the full subsidy amount.[15]

The loan achieves a far smaller reduction in CO_2 emissions, however, as described in the previous section. This result highlights the policy tradeoff: the loan is a low-cost policy, but it does not reduce CO_2 emissions by as much as the subsidy. It is unlikely that any loan policy would ever

[15] I used a 5-percent interest rate to calculate those forgone earnings, which is consistent with the social rate used to discount future equipment costs and a reasonable rate in today's economic environment. It is important to note, however, that the loan policy costs could be higher if a higher interest rate is used to compute these forgone earnings. I do not include any administrative costs for either policy.

have as great an effect on energy use and CO_2 emissions as a subsidy. This message appears to be lost in some of the discussions about energy-efficiency financing as a policy approach. Some advocates for efficiency financing—from the government sector, the financial industry, and the environmental community—seem to hold out hope that widespread availability of low-cost loans will spur significant reductions in energy use (Hayes et al., 2011; Hinkle and Schiller, 2009). My results suggest that, although loans may provide CO_2 emissions reductions with very low costs to the economy—perhaps even negative costs—those CO_2 emissions reductions are relatively small.

A Policy Alternative: Efficiency Standards

The loan and subsidy policies provide financial incentives for consumers to change their behavior. By lowering the costs of high-efficiency heating, cooling, and water-heating equipment, the policies spur greater purchases of those types of equipment and thereby reduce energy use and CO_2 emissions. Some efficiency advocates view the incentive-based policy approach with some skepticism and prefer instead that government tighten efficiency standards. Appliance and equipment standards have been in place since the mid-1980s in the United States and, by some estimates, have led to significant energy savings. Gold et al. (2011) estimate that energy use in 2010 was 3.6 percent less than what it would have been in the absence of standards. In an earlier study, Meyers et al. (2003) combine energy prices with engineering estimates of energy savings from appliance standards in place during the 1987-through-2000 period and find a cumulative net benefit of $17.4 billion (in 2003 dollars).

I use the NEMS-RFF model to investigate the effects of tighter standards for heating, cooling, and water-heating equipment and compare those results with my findings for the loan and subsidy policies. The standard I model sets a requirement that all new equipment purchases be high-efficiency. It removes the low-efficiency options in NEMS-RFF from the choice sets, leaving only the high-efficiency options listed in exhibit 2 available for purchase. Multiple equipment options are available, but they all are greater than the minimum efficiency level set by the policy. The prices consumers face are the same as in the baseline—that is, the model does not provide the function to adjust equipment prices in response to the removal of the low-efficiency technology.[16]

Exhibit 10 shows residential delivered energy use during the 2011-to-2035 period under the subsidy and the standard, with the baseline case shown for reference and the loan omitted for simplicity. The difference in energy use between the two policies is quite small. The standard has a smaller effect on energy use than does the subsidy, but cumulative residential delivered energy consumption during the 2011-to-2035 period is only 1.2 percent higher with the standard than with the subsidy. Cumulative economywide CO_2 emissions are nearly identical for the two policies. The standard reduces CO_2 emissions by 671.1 mmtons, compared with 672.5 mmtons for the subsidy. Before 2027, the standard reduces CO_2 emissions by slightly more than the subsidy in each year; however, this outcome is reversed in the latter part of the forecast period, from 2027 to 2035. As a result, overall cumulative CO_2 emissions are roughly the same.

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[16] This lack of adjustment in equipment prices is a potential limitation of the modeling framework. In reality, an increase in demand for the high-efficiency equipment, forced by removal of the lower efficiency options, could increase prices (although to what extent is unclear). These market movements are not captured in my framework.

Exhibit 10

Residential Delivered Energy Use Under Subsidy and Standard, 2011–2035
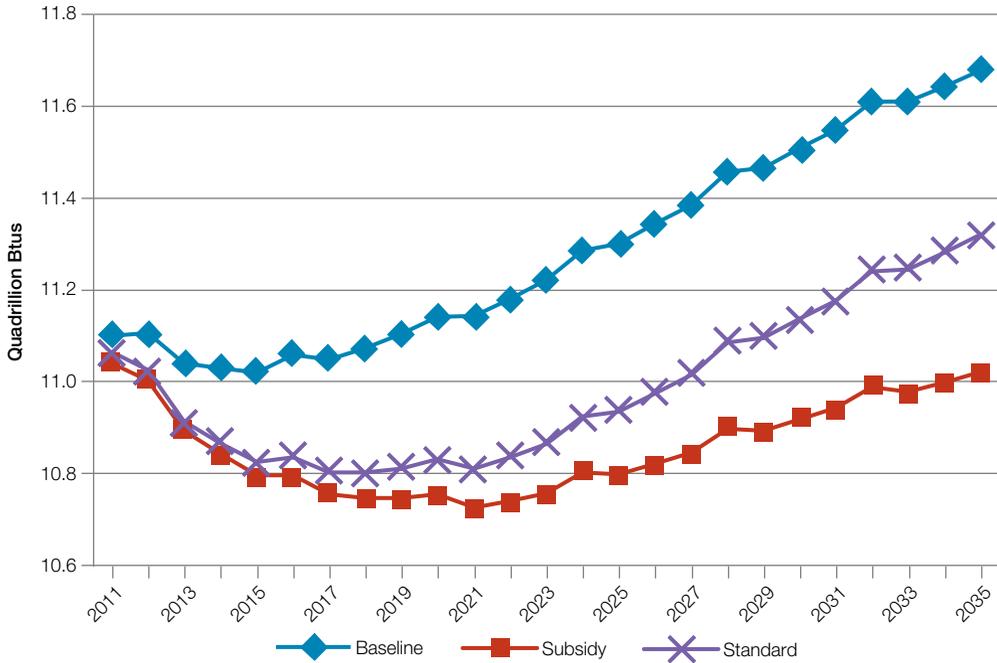
Btus = British thermal units.
Source: National Energy Modeling System-Resources for the Future—NEMS-RFF—modeling results

These results may seem somewhat surprising at first glance. The standard forces all purchases of new equipment to be high-efficiency, whereas some consumers continue to purchase low-efficiency options in the subsidy case. On the other hand, the subsidy also incentivizes the purchase of extra high-efficiency equipment, whereas the standard does not. Although 100 percent of new equipment is efficient with the standard, a much smaller percentage ends up being extra high-efficiency compared with the subsidy case. The subsidy makes all the efficient options (exhibit 2) less expensive to the consumer and, thus, encourages purchases of the extra high-efficiency options and all other efficient equipment.

When analyzing the subsidy option, the model predicts that 48 percent of cooling equipment and nearly 38 percent of heating equipment are extra high-efficiency (labeled "very high-efficiency" and "ultra high-efficiency" in exhibit 2); the corresponding percentages in the case of the standard are only 19 and 12, respectively. This finding highlights one of the drawbacks of technology standards in general: no incentives are provided to do better than the standard.

The important difference between the standard and the subsidy concerns the welfare costs. By removing the low-efficiency options from the marketplace, the standards create a welfare loss in the low-efficiency equipment market, as shown in exhibit 11. The demand and supply curves for low-efficiency equipment are D_L and S_L, respectively, and the equilibrium price and quantity

Exhibit 11

Welfare Loss From Efficiency Standard
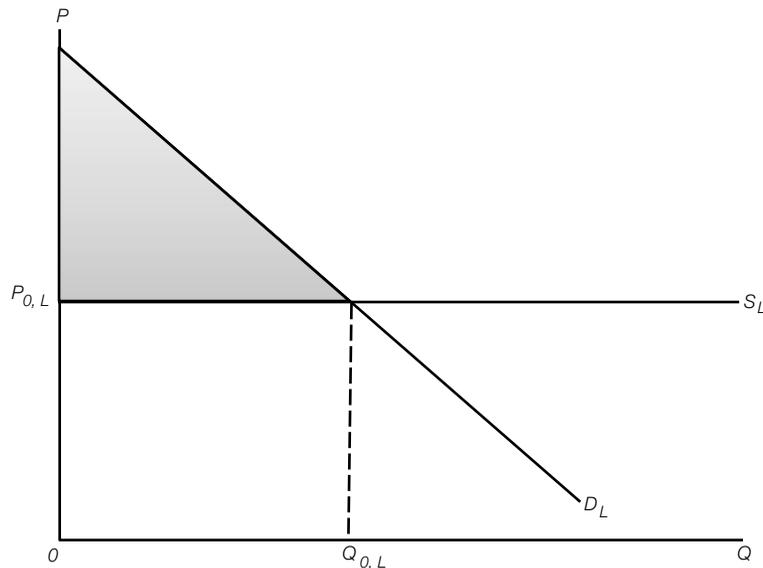
D_L = demand curve for low-efficiency equipment. P = price of low-efficiency equipment purchased. $P_{0, L}$ and $Q_{0, L}$ = equilibrium price and quantity without standard. Q = quantity of low-efficiency equipment purchased. S_L = supply curve for low-efficiency equipment. Shaded triangle = welfare loss from standard.

of low-efficiency equipment in the baseline, no-policy case are $P_{0, L}$ and $Q_{0, L}$.[17] Mandating that all equipment have the efficiency levels of the high-efficiency equipment effectively removes the low-efficiency options from the marketplace, which leads to a welfare loss illustrated by the shaded triangle in exhibit 11. This welfare loss is a measure of the cost to the economy from shifting re-sources away from these low-efficiency equipment options to the high-efficiency equipment market.

Calculating this area is not straightforward as I do not know the price at which the demand for low-efficiency equipment drops to zero. I assume it is equal to the equilibrium price of high-efficiency equipment—in other words, if consumers can buy high-efficiency equipment for the price of low-efficiency equipment, then demand for the latter should fall to zero. In the NEMS framework, this drop to zero actually does not happen. The market shares specification in the residential module will keep some low-efficiency models in the market even if their prices increase to more than the price of higher efficiency equipment. In this sense, my estimates understate the welfare costs. On the other hand, one would expect the price at which low-efficiency equipment demand falls to zero to be more than the high-efficiency equipment price because the latter options have lower energy costs. I simply point out the great deal of uncertainty in this reservation price and thus in my welfare cost calculations.

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[17] For ease of graphical exposition, I show a single market for low-efficiency equipment (as I did for high-efficiency equipment previously), but the NEMS-RFF model contains multiple equipment types.

Exhibit 12 shows the present discounted value of welfare costs for the standard, as well as the welfare costs per ton of CO_2 emissions reduced for three discount rates. For comparison purposes, the results for the subsidy are shown as well.

Because the low-efficiency equipment purchases drop to zero, the welfare loss triangle in the equipment market is relatively large, which makes the cost of the standard significantly higher than that of the subsidy for the same discount rate. In other words, forcing all consumers who would otherwise have purchased low-efficiency equipment to purchase high-efficiency options comes at a substantial cost. This assumption is by contrast to some studies of appliance and equipment standards, such as the Meyers et al. (2003) study cited in the previous section, which come up with negative costs for U.S. appliance efficiency standards. But if consumers are heterogeneous in their choices of efficiency, then imposing uniformity through efficiency standards imposes costs on some consumers (Hausman and Joskow, 1982). My scenarios with lower discount rates provide for some market failure in these purchase decisions, as I explain in the previous section. Again, I emphasize that more research is needed into these important questions about consumer behavior in the markets for energy-using equipment and appliances.

Exhibit 12

Welfare Costs and Cost Effectiveness of Efficiency Standard and Subsidy Using Alternative Discount Rates for Energy Savings

Discount Rate (%)	PDV Welfare Costs, 2011–2035		Cost per Ton of Carbon Dioxide Emissions Reduced	
	Standard	**Subsidy**	**Standard**	**Subsidy**
5	11.1	– 16.1	17	– 24
10	36.8	22.9	55	34
20	50.8	44.3	75	66

PDV = present discounted value.

Notes: PDV welfare costs are in billions of 2009 U.S. dollars. The cost per ton is the PDV welfare costs divided by cumulative carbon dioxide emissions reduced.

Source: Author's estimates from model

Comparing the Cost-Effectiveness Estimates With Other Policy Options

Cost effectiveness is a relative metric; thus, it is useful to benchmark the estimates in this article to estimates from other studies and for alternative policies. The recent study by Krupnick et al. (2010) provides the most useful benchmarks because it relied on the NEMS-RFF model (albeit an earlier version) and used similar welfare cost formulas. The authors assessed the costs and effectiveness of two building energy-efficiency policies: (1) building codes as specified in the 2009 Waxman-Markey climate bill (H.R. 2454) and (2) the full set of building codes, building retrofit options, and other efficiency requirements in Waxman-Markey. They also looked at loan and subsidy policies for heating, cooling, and water-heating equipment, but those policies targeted a single technology, geothermal heat pumps. The study also analyzed a range of other options, including economywide carbon cap-and-trade policies, carbon taxes, and various forms of clean-energy standards for the electricity sector (that is, mandated use of certain fuels—renewable, nuclear, and, in some cases, natural gas).

The Waxman-Markey building codes provision called for a 30-percent reduction in energy use in new buildings upon enactment of the law, a 50-percent reduction for residential buildings by 2014 and for commercial buildings by 2015, and a 5-percent reduction at 3-year intervals thereafter up until 2029 (residential) and 2030 (commercial). The retrofit provision required the U.S. Environmental Protection Agency to develop building retrofit policies to achieve the utmost cost-effective energy-efficiency improvements; the programs were to be administered through the states, which would receive CO_2 emissions allowances under the cap-and-trade program in H.R. 2454 to help finance the programs. The bill also contained lighting provisions that created new standards for outdoor lighting, portable light fixtures, and incandescent reflector lamps and some provisions covering institutional appliances.

The results in the first two rows of exhibit 13 show the cumulative CO_2 emissions reductions and cost effectiveness of the two Waxman-Markey efficiency-related policy options. It is interesting to note that the building codes and full Waxman-Markey building energy-efficiency provisions reduce cumulative CO_2 emissions by less than the heating-, cooling-, and water heating-equipment subsidy analyzed in this article (as shown in the fifth row of exhibit 13). CO_2 emissions reductions from the building codes policy amount to only 37 percent of the reductions achieved with the heating-, cooling-, and water heating-equipment subsidy; the full Waxman-Markey provisions' CO_2 emissions reductions are 44 percent of the reductions achieved with the subsidy. The primary reason for these findings is the long time period necessary for building codes to have an effect because they apply only to new construction.[18]

At \$25 per ton of CO_2 emissions reduced, the building codes policy has a lower cost per ton than the subsidy, which is \$34 per ton—identical to the full Waxman-Markey energy-efficiency provisions. I have shown only the results for a 10-percent discount rate in exhibit 13, but the comparisons with the results in this study hold for other discount rates as well.

Exhibit 13

Estimated Emissions Reductions and Cost Effectiveness of Alternative Policies: Comparison With Results From This Study

	Cumulative Carbon Dioxide Emissions Reduced, 2011–2035 (mmtons)	Welfare Cost per Ton of Carbon Dioxide Emissions Reduced ($)
W-M building codes	249.6	25
Full W-M energy-efficiency provisions	298.8	34
GHP subsidy	306.3	– 9
GHP loan	172.5	– 36
High-efficiency equipment subsidy	672.5	34
High-efficiency equipment loan	94.9	– 13

GHP = geothermal heat pump. mmtons = million metric tons. W-M = Waxman-Markey.

Notes: Cumulative carbon dioxide emissions reductions for W-M building codes, full W-M provisions, GHP subsidy, and GHP loan from Krupnick et al. (2010). I adjust the numbers in that study, which were based on a 2010-to-2030 period, to a 2011-to-2035 period for comparison with the estimates in this study. A discount rate of 10 percent is used for discounting energy savings.

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[18] The full Waxman-Markey energy-efficiency policy includes more than only building codes, but the codes are the primary driver in that policy; the other components are less important.

Rows 3 and 4 of exhibit 13 show the results for the GHP subsidy and loan policies analyzed in Krupnick et al. (2010). It is interesting to note the GHP subsidy is more cost effective at reducing CO_2 emissions than the broader equipment subsidy I analyze in this article, and likewise, the GHP loan is more cost effective than my broader loan policy. These findings suggest that targeting subsidies and loans to very high-efficiency options—of which GHPs are one option—might be a more cost-effective approach. The GHP subsidy achieves smaller CO_2 emissions reductions than the broader subsidy policy, but the GHP loan achieves slightly larger reductions.[19]

Compared with the other policy options analyzed by Krupnick et al. (2010)—particularly the economywide cap-and-trade policies and the various types of clean-energy standards in the electricity sector—these building energy-efficiency policies are much less effective at reducing emissions and, except for the loan policy, less cost effective as well. The cap-and-trade policy, or an equivalent carbon tax, obviously is the most cost-effective instrument and the policy that generates the biggest reduction in CO_2 emissions because it targets all sources of CO_2 emissions. In Krupnick et al. (2010), the estimated cost per ton of CO_2 emissions reduced for the cap-and-trade policy was $12. The clean-energy standards evaluated in Krupnick et al. (2010) are the next best options. These standards require electricity generators to use clean sources for a specific share of the electricity they produce. Krupnick et al. (2010) found that a policy that incentivizes all fuels except coal (renewables, nuclear, and natural gas) in inverse proportion to their carbon content provides the largest reduction in CO_2 emissions and does so at a cost per ton of $15, very close to that of the cap-and-trade policy. Cumulative CO_2 emissions reductions for both policies are several times what can be achieved with the energy-efficiency policies evaluated in this article.

Concluding Remarks

Energy experts have identified a number of improvement, upgrade, and retrofit options that homeowners can adopt to reduce their home's energy use, and several of these changes seem to more than pay for themselves in the stream of energy savings they yield over time. Nonetheless, it has proved difficult to get homeowners to make these changes. One important barrier may be the upfront costs of new furnaces, additional insulation, more efficient windows and doors, upgraded appliances, and other options. In this study, I analyzed two policies to reduce the upfront cost of high-efficiency heating, cooling, and water-heating equipment—a direct subsidy and a zero-interest loan. Using the NEMS-RFF energy-market simulation model, I found that a subsidy that reduces upfront costs by 50 percent would cause a substantial shift in purchases toward high-efficiency options: during the 2011-to-2035 forecast period, approximately one-half of all heating and cooling equipment purchases are predicted to be high-efficiency units versus only about 20 percent in the baseline case. By 2035, the residential delivered energy-use forecast is 5.6 percent less than the baseline; on a per-household basis, the reduction is much larger, approximately 21 percent. Because residential buildings account for only about one-fifth of total CO_2 emissions in the economy, however, economywide CO_2 emissions during the 2011-to-2035 period are only 0.5 percent less than the baseline predictions for that period.

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[19] The subsidy and loan policies in Krupnick et al. (2010) are not exactly the same as the ones analyzed here. The GHP subsidy was $4,000 (more than the amount applied to GHPs here) and the loan was financed at 0 percent for 7 years, rather than the 3 years in this study.

The welfare costs of the subsidy policy are fairly large: $34 per ton of CO_2 emissions reduced when future energy savings are discounted at a 10-percent annual rate. The cost estimate is highly sensitive to this discount rate, however: at 5 percent, the cost is negative—that is, the discounted stream of energy savings offsets the welfare loss from higher equipment costs—and, at 20 percent, the cost is as high as $66 per ton of CO_2 emissions reduced. Deciding which discount rate is the correct one depends on one's belief about the extent to which the efficiency gap, or energy paradox, is due to market failures. My 10-percent discount rate provides for the possibility of some market failure because that rate is higher than the 5-percent social discount rate but lower than the 20-percent rate in NEMS-RFF that reflects actual consumer behavior. More research is needed, however, into reasons for the energy paradox and how to discount costs and benefits.

The welfare costs are much lower for an energy-efficiency loan policy. I analyzed an option that reduces the upfront cost by 50 percent, exactly like the subsidy, but consumers must pay this money back during a 3-year period at a 0-percent interest rate. Estimated welfare costs for this policy option are -$13 per ton of CO_2 emissions reduced at a 10-percent discount rate, less than -$100 at 5 percent, and +$42 at 20 percent. The negative costs mean that the discounted stream of energy savings offsets the welfare loss from higher upfront equipment costs. The loan policy does not make a noticeable dent in energy consumption and CO_2 emissions, however: the reduction is one-tenth of the reduction that the subsidy accomplishes. Nonetheless, these results suggest that energy-efficiency-financing programs could be very cost effective. In reality, such programs have not accomplished much thus far (Palmer, Walls, and Gerarden, 2012), but it is possible that a large-scale national program could provide some CO_2 emissions reductions at relatively low cost.

I compared these incentive-based approaches with a command-and-control option—an efficiency standard applied to heating, cooling, and water-heating equipment. The specific policy I analyzed removes the low-efficiency options from the marketplace, thus all consumers are forced to buy high-efficiency equipment (that is, equipment that is at least as efficient as current ENERGY STAR models). This option reduces CO_2 emissions by about the same amount as the subsidy but at a much higher cost. The welfare costs of a standard are higher because all consumers who purchase low-efficiency options in the baseline must now buy high-efficiency equipment at a higher price. I estimate that CO_2 emissions are reduced at a cost of $55 per ton when the discount rate is 10 percent, more than $20 higher than the cost of the subsidy.

The strength of the NEMS modeling framework is that it is benchmarked to national EIA forecasts and is continuously modified and updated to reflect current market and policy conditions. It captures economic behavior to some extent, thus one can see the incentive effects of policies that change effective prices. Moreover, by using a consistent modeling framework, an apples-to-apples comparison of the three policies is possible. But like any simulation model, NEMS is not perfect. Some experts have criticized it for being conservative in its forecasts—that is, the responsiveness to policies is less than some believe is realistic. If NEMS should turn out to be excessively conservative, the estimated CO_2 emissions reductions in this study may be biased downward. In addition, because of its complexity, it is difficult to know what features of the model are central to the results one obtains. The model is costly to run, thus it is virtually impossible to run it under alternative assumptions to conduct sensitivity analyses on key parameters. Finally, my loan and subsidy policies targeted only

heating, cooling, and water-heating equipment; thus, the results do not necessarily carry over to other equipment or to whole-house retrofit options. A whole-house retrofit loan or subsidy policy would be difficult to model precisely in NEMS.

The findings about the relative effectiveness and cost effectiveness of the loan, subsidy, and standard policy options are useful for providing a starting point for further discussions. In the absence of an economywide carbon tax or cap-and-trade policy, policymakers may be searching for options to deal with individual energy-using sectors one at a time. Improving the efficiency of residential and commercial buildings should be high on the list because these sectors account for more than 40 percent of current energy use, and many experts have identified a number of examples of low-hanging fruit in the building sectors. The retrofit problem, however, remains a challenging one. Further analysis is needed through modeling, case studies, and empirical-econometric studies to identify the most cost-effective and effective options for spurring building owners to adopt energy-saving retrofits and improvements.

Acknowledgments

Author

Margaret Walls is a research director and senior fellow at Resources for the Future.

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Home Energy Efficiency and Mortgage Risks

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Abstract

As part of President Barack Obama's Climate Action Plan, the Obama administration recently proposed that energy efficiency should be factored into mortgage underwriting upon the sale or refinancing of new and existing homes. Little empirical evidence unfortunately exists on the relationship between energy efficiency and mortgage risks. Using a unique dataset, we examine the performance of mortgages backed by ENERGY STAR-certified homes. We find that default and prepayment risks are significantly lower in such certified homes. Even for ENERGY STAR-certified homes, more energy efficiency is associated with even lower loan risks. These results offer support for taking energy efficiency into consideration in the mortgage underwriting process. Because this research is the first of its kind, further research needs to replicate the present study with other datasets during different time periods and with alternative methodologies.

Introduction

During the past few decades, even as houses were becoming more energy efficient, energy costs per household and the total energy used in the residential sector were continuing to rise. Today, many people are living in smaller households but in larger houses, with increasing reliance on space conditioning and appliances, which results in higher energy consumption per household (Kaza, 2010). According to the Energy Information Administration's 2009 Residential Energy Consumption Survey, households spend about $230 billion each year on energy, not including the cost for transportation (Energy Information Administration, 2012). Although utility costs of urban households, on average, are one-fifth of the total housing costs, it is as much as 30 percent for rural households. Although the households in the top income quintile pay more than three times in shelter costs as the bottom quintile, they pay only 75 percent more in utility costs, suggesting that energy consumption is relatively income inelastic

and that a greater burden is placed on low-income households (Bureau of Labor Statistics, 2013). Therefore, high utility costs make some households more vulnerable than others and pose greater challenges to meeting other needs, such as housing-related expenses. Promoting energy efficiency in the residential sector is a mechanism for reducing utility expenses of households.

In general, energy-efficient houses have higher upfront costs because of better construction practices and use of efficient but costly appliances. Kahn and Kok (forthcoming) found that green-rated homes in California have an average premium of 5 percent over regular homes, although operational savings over a lifetime can recoup these premiums.[1] As Jaffe and Stavins (1994) argued, however, the nonrapid adoption of energy-efficiency measures indicates that the present valuation of savings is less important to consumers than are other market and nonmarket barriers. These barriers include transaction costs, uncertainty and cost of the initial investment, and information asymmetries, all of which are still poorly understood.

Keoleian, Blanchard, and Reppe (2000) argued that, although an energy-efficient house recoups any additional premium in sales prices, the mortgage underwriting process does not account for these savings, contributing to lower adoption rates of energy-efficient measures. The Federal Housing Administration's (FHA's) Energy Efficient Mortgage program, which is designed to promote rapid adoption of efficient technologies in the residential construction sector, remains a very small program. In a recently proposed Climate Action Plan, the Obama administration suggested that the FHA would consider, "… options for factoring energy efficiency into mortgage underwriting and appraisal processes upon sale or refinancing of new or existing homes" (Executive Office of the President, 2013: 9). In this article, we focus on reasons why the mortgage underwriting process, as a matter of rule rather than exception, could account for energy efficiency and spur wider adoption of energy efficiency. In this article, we investigate whether energy-efficient homes are associated with reduced mortgage termination risks. If our hypothesis is confirmed, it would suggest that flexible mortgage underwriting could be used for borrowers living in energy-efficient homes.

Although the evidence of a relationship between mortgage risks and residential energy consumption and efficiency is sparse, some research examines the combined transportation and utility burden of households and their relationship to mortgage performance. Burt, Goldstein, and Leeds (2010) theorized that mortgages on energy-efficient houses should have lower risks than those on standard houses because the savings from residential energy and transportation costs leave more income available in case of emergencies or unexpected events. Using proxy measures for transportation energy costs such as Walk Score™, Rauterkus, Thrall, and Hangen (2010) found that transportation energy savings are associated with lower mortgage delinquency risks in high-income areas but with higher risks in low-income areas. Increased vehicle ownership for households, as a proxy for higher transportation costs, increases the delinquency risks. These results contradict the earlier study by Blackman and Krupnick (2001),

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[1] Green-rated homes, such as LEED (Leadership in Energy and Environmental Design) or GreenPoint, conserve energy and materials in both the operation and the construction phases.

who found that location-efficient mortgages do not have any significant effect on delinquency risk compared with conventional mortgages.[2] Data deficiencies and use of proxy metrics to capture important features of energy consumption may have led to these inconclusive and contradictory results.

In this article, we address some of the limitations of previous work and examine whether residential energy efficiency is associated with lower mortgage risks. More narrowly, we use a national sample of 71,000 loans from CoreLogic, Inc., (from 38 states and the District of Columbia) and examine whether two measures of energy efficiency (one discrete and one continuous) are associated with lower default and prepayment risks. In this particular article, we narrowly focus on household energy consumption and their effect on mortgage risks, leaving the effect of transportation energy burden for future work.

In this article, we first describe the different financing mechanisms for residential energy efficiency. Next, we provide an overview of the mortgage risk literature. Then, we describe the research design and methods used to examine the effects of energy efficiency on mortgage risks. In closing, we discuss the results and derive implications for future research and policy.

Household Energy Efficiency

The residential sector accounts for 20 percent of the total energy consumed in the United States (EIA, 2011). A widely cited study by McKinsey & Company suggests that energy efficiency in the residential sector has the potential to save $41 billion annually (Granade et al., 2009). It is, thus, not a surprise that building energy efficiency is considered the "fifth fuel" and is actively promoted through government policy and voluntary action.

One widespread way of promoting residential energy efficiency in the United States is through the U.S. Environmental Protection Agency's (EPA's) ENERGY STAR program for appliances, commercial and industrial buildings, and new home construction. The market penetration of the ENERGY STAR label in new housing construction is noteworthy—25 percent of new U.S. housing starts were ENERGY STAR-certified in 2011 (EPA, n.d.a). Homes awarded the ENERGY STAR label are at least 15 to 20 percent more energy efficient than the typical new home and must meet rigorous guidelines for a high-efficiency thermal enclosure (such as windows and insulation); heating, ventilation, and air-conditioning (HVAC) system; and appliances, as well as a comprehensive water management system.

To earn an ENERGY STAR rating, homes must also undergo an inspection by a certified home-energy rater who examines construction plans and conducts post-construction evaluations, including a blower door test (to test the envelope infiltration) and a duct infiltration test. The rater uses these data to assign the home a relative performance score, called the Home Energy Rating System (HERS) Index Score. The index is normalized to the climatic zone, size, and type of the house. A home built to current market standard (2006 International Energy Conservation

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[2] This study is limited to FHA loans in Chicago, Illinois. Because the mandate of FHA is to increase homeownership among low-income households, the results from this study may not be generalizable.

Code standard) is given a rating of 100.[3] A lower HERS Index Score for a house indicates higher energy efficiency; that is, a HERS rating of 60 indicates that the house is 40 percent more energy efficient than a similar one that is constructed to the current market standards. A score of 0 corresponds to a net-zero-energy home. A standard resale house has a rating of 130. A HERS rating of 85 is typically required to achieve ENERGY STAR certification. Residential Energy Services Network (RESNET), a standards-making body that certifies the raters and the procedures, is responsible for ensuring consistency and quality in certification.

Within the United States, other comprehensive, but smaller or regional, programs promote energy efficiency in new housing construction, such as Leadership in Energy and Environmental Design (LEED) for Homes, National Association of Home Builders' Green Building Standard, EarthCraft (in the Southeast), Earth Advantage Label (in the Pacific Northwest), and GreenPoint Rated certification (in California).[4] These rating systems generally exceed the building performance of ENERGY STAR and promote comprehensive green building technologies and materials.

Nearly all rating systems rely on some version of modeled and hypothetical energy use. It is important to note that, although the construction is tested for leakage and other inefficiencies, the rating systems do not account for actual post-occupancy energy use.[5] Household energy consumption, although dependent on building envelope and appliances, also crucially depends on occupants' behavior and use patterns. As Stein and Meier (2000) pointed out, although ENERGY STAR certification is a useful predictor of a home's relative energy efficiency, the difference between a homeowner's expected, modeled, and realized energy savings may vary. This consideration plays an important role in qualifying the conclusions drawn in this article. Nevertheless, ENERGY STAR-certified houses, on average, are expected to save energy compared with conventional homes.

Financing Energy Efficiency in the Residential Sector

Promoting energy efficiency in the residential sector requires providing mechanisms to offset the higher upfront costs generally associated with energy-efficiency measures. Although many of these measures have a reasonable payback period, some barriers, such as transaction costs and information asymmetries, prevent rapid and widespread adoption of energy efficiency (Gillingham, Newell, and Palmer, 2009). Part of the challenge for public- and private-sector programs is to provide mechanisms, including innovative financing mechanisms, that will overcome these barriers.

One way to finance energy efficiency is through grants geared toward energy-efficiency retrofits. A well-known and long-running program is the Weatherization Assistance Program, or WAP,

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[3] Fairey et al. (2000) provided a historical overview of the development of HERS ratings in the United States.

[4] As of 2012, only about 15,000 U.S. homes were LEED certified. On average, about 400,000 new homes are constructed every year in the United States. (See U.S. Census Bureau, n.d.; USGBC, 2012.)

[5] This performance statement is true for the residential sector. ENERGY STAR ratings for the nonresidential sector rely on building performance by comparing the actual energy use to other buildings of similar type in that year.

that offers grants to qualified low-income families for the purpose of weatherization. State-sponsored energy-efficiency loan funds are also in vogue. They, too, have grown recently using funding from the American Recovery and Reinvestment Act of 2009. The National Association of State Energy Officials tracks 79 such funds that are available in 44 states. The total amount of funding dedicated to state energy-revolving-loan funds covered in their database is over $2 billion (NASEO, n.d.).[6]

However, residential energy efficiency is predominantly funded by the rate payer. Total spending on U.S. ratepayer-funded energy-efficiency initiatives more than doubled in the latter half of the past decade—from $2 billion in 2006 to $4.8 billion in 2010. Two-thirds of the total was concentrated in only 10 states, however, with California, New York, New Jersey, Massachusetts, and Washington as leaders (Barbose et al., 2013; Barbose, Goldman, and Schlegel, 2009). One such initiative, on-bill financing, is provided by the utilities as part of their efficiency efforts. Utilities provide zero- (or near-zero-) interest loans for qualified customers, which are then recouped through a line item in the utility bill. Most of these programs are primarily targeted at nonresidential customers, however, rather than homeowners because of the complexity of collection and resistance on the part of utilities (Fuller, 2009). In 2011, New York State authorized residential on-bill loans, which are currently being implemented by the New York State Energy Research and Development Authority (NYSERDA) in cooperation with New York utilities (Henderson, 2012).

Property Assessed Clean Energy (PACE) bonds are a financing mechanism that uses locally issued tax bonds to fund residential energy-improvement activities. The funds are gradually paid back (more than 20 years or so) through special taxation placed on the property through a lien. In the event of resale, the new property owners take on the responsibility of special taxes. Because of the first lien placed on the property, secondary market institutions have been reluctant to embrace mechanisms such as PACE bonds, thus limiting their widespread adoption to date. A recent Ninth Circuit Court ruling effectively ended the involvement of PACE in the residential sector.[7]

By far, the most widely used mechanism is direct borrowing. Most energy improvements for existing homes can be financed through consumer loans, a home-equity loan secured by property, or by traditional or specialized mortgages. Although not widely available, energy-improvement mortgages (EIMs) enable the homeowner to fold the costs of energy improvements into the mortgage.

The financing mechanisms listed previously are geared toward improving the energy efficiency of existing homes; they are not set up to offset the higher upfront costs of new houses that are energy efficient and make them affordable. By contrast, energy-efficient mortgages (EEMs) enable lenders to have flexibility in the debt-to-income ratio and other underwriting considerations so that borrowers can qualify for larger loans or obtain a lower interest rate. EIMs and EEMs both are relatively small because of the transactional complexity and lack of information

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[6] These funds include financing for both energy efficiency and renewable energy projects.

[7] *County of Sonoma v. Federal Housing Finance Agency.* 2013. (Vol. 710). Court of Appeals, 9th Circuit.

(EPA, 2010). Furthermore, very few lenders currently offer them, except for FHA and Veterans Benefits Administration mortgages. For example, only three such lenders exist for Texas and only two for Arizona—the two states with the largest number of new ENERGY STAR residences in 2011 (EPA, n.d.b).

The programs and financing options listed previously have grown and show promise but, at less than $6 billion in aggregate, reflect poor market penetration.[8] Of all these mechanisms, EEMs and EIMs have the greatest potential to encourage energy efficiency because they rely on the mainstream financial system. Because other mechanisms rely on funding from multiple sources, institutional fragmentation creates barriers for widespread adoption. The limited availability and appeal of EIMs and EEMs, in large part, may be because of the uncertainty and lack of information about their inherent risks. If, indeed, mortgages on energy-efficient homes have lower risks than those on less efficient homes, a lower pricing or more flexible underwriting standard is likely to result in an increased demand for these products. In addition, with more accurate information on risks, lenders may be able to more effectively develop and tailor these mortgage products. In a wide-ranging study, T'Serclaes (2007) showed that, contrary to popular expectations, the more important financial barrier than the availability of funding is the financiers' belief of higher risk exposure, which prevents widespread adoption of energy efficiency. She suggests, "… [U]ncertain quantification of energy benefits, small size of investments as well as difficult standardization of investment and continuing debate on the nature of discount rate, still discourage investments in energy efficiency" (T'Sercales, 2007: 6).

Estimating Mortgage Default and Prepayment Risks

Mortgage lending can play an important role in promoting energy efficiency by making it more mainstream and in addressing some of the problems associated with financing energy-efficient residences. For this reason, it is important to understand the risks inherent in such lending. Many insights fortunately have been gained from a large number of mortgage termination studies that can be applied to better understand the relationship between energy efficiency and risks. Previous studies focused on two aspects of mortgage risks: default and prepayment. Mortgage default occurs when mortgage borrowers stop making scheduled payments and when certain conditions required by law occur.[9] Prepayment occurs when borrowers prematurely pay off loans. From a lender's perspective, prepayment can be considered a risk because, when borrowers prematurely pay off the loan, often when interest rates fall, the lender does not realize the expected stream of payment and return. Default and prepayment both can lead to a loss to lenders, although, given the relative size of the loss, researchers and practitioners tend to focus more on the risk of default than on the risk of prepayment (Quercia and Stegman, 1992).

[8] Mortgage debt as of June 2013 in the United States for single-family residences was in excess of $9.5 trillion, although the estimated value of owner-occupied housing stock is close to $18.5 trillion (Federal Reserve, 2013; n.d.).

[9] In the United States, laws governing the conditions of default and foreclosure can differ by jurisdictions. (See, for example, Cutts and Merrill, 2008.)

Researchers have advanced two complementary frameworks to explain these two risks. One framework has focused on the financial benefit of options (Foster and Van Order, 1984; Kau et al., 1992). This group of studies treats default and prepayment as financial options. The framework assumes that borrowers make constant evaluations about the financial benefits of these options and will exercise them once the options become beneficial. For instance, regarding default, borrowers are expected to consider their equity position: borrowers who owe to the lender more than the house is worth, net of costs, are expected to be more likely to default than those who have positive equity positions. This explanation, although powerful in explaining certain key aspects of mortgage performance, does not seem to fully explain why borrowers stop making their mortgage payments. During the past two decades, a complementary view has emerged in which most borrowers are said to evaluate their equity position (or option) only in the event of a crisis or trigger event, such as job loss or divorce (Vandell, 1995). Most recent studies of default use a combination of these two frameworks—the option-based framework and the trigger-event framework.

Researchers have found evidence empirically supporting the complementary views of the option-based and adverse trigger-event frameworks. The loan-to-value (LTV) ratio, value of the prepayment option, and local unemployment rates have been found to have consistent effects on both mortgage default and prepayment. Also, certain characteristics of the borrower and the financial and servicing institutions have a consistent effect. For instance, Quercia, Pennington-Cross, and Tian (2012) found support for the importance of current LTV ratio, borrower credit, income, and unemployment. As a rule, ability to pay (captured by debt-to-income ratio) has been omitted from most loan termination studies because of lack of variation in the variable in the available samples.[10] Consistent with previous works, we use 3 months late in payments (90 days delinquent) to model the default decision. To control for unobserved quality differences of loans generated after the onset of the recent housing crisis, we incorporate an indicator for loans originated during or after 2006.

The savings resulting from energy efficiency, as previously discussed, can be viewed as a cushion to unanticipated crises or adverse events that could make mortgage repayment more difficult. It is also likely that homeowners in the market for efficient homes weigh the long-term savings derived from energy efficiency against the short-term higher costs, thus reflecting a higher degree of financial savvy. On the basis of the mortgage termination literature, we expect mortgages on energy-efficient homes to have a lower probability of default than those on less efficient ones.

Research Design and Methods

To deal with the right censoring, researchers often use hazard analysis in mortgage evaluation. In such an analysis, researchers estimate the conditional event probability (hazard); that is, they estimate the probabilities of default and prepayment, conditional on surviving to date, as

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[10] Two exceptions include Quercia, Pennington-Cross, and Tian (2012) and Berkovec et al. (1998).

statistically defined. Default and prepayment are considered competing risks because, when borrowers act on one, they preclude action on the other. In the context of this competing-risk model, consider two termination risks: default D and prepay P. The hazard $\lambda_i^r\left(t|X_i(t),\beta_r,\theta_r\right)$ for individual i, risk $r + D$, P, given characteristics $X_i(t)$, parameters β_r, and unobserved heterogeneity parameter θ_r is defined as

$$\lambda_i^r\left(t|X_i(t),\beta_r,\theta_r\right) = \lim_{\Delta t \to 0} \frac{Pr\left(t < T_i^r < t + \Delta t | T_i^r \geq t, X_i(t), \beta_r, \theta_r\right)}{\Delta t}. \tag{1}$$

With a discrete time assumption, a multinomial-logit model is often used to estimate the previous equation.

We use a treatment-control research design to estimate the differences in mortgage termination risks. We use the loan information for ENERGY STAR (treatment) and non-ENERGY STAR (control), supplemented with information about factors that contribute to household energy consumption. We adopt the competing risk framework of mortgage terminations and estimate the effect of prepayment and mortgage default simultaneously (Quercia and Spader, 2008). We use a multinomial logit model to quantify these risks relative to one another and to test whether risks of loans of energy-efficient homes are different from those of energy-inefficient homes.

$$\ln\left(\frac{Pr(Y_i = D)}{1 - Pr(Y_i = D)}\right) = \alpha_D + \beta_D' E + \gamma_D' X + \tau_D' T + \vartheta_D' S + \delta_D C + \epsilon_D, \text{ and} \tag{2}$$

$$\ln\left(\frac{Pr(Y_i = P)}{1 - Pr(Y_i = P)}\right) = \alpha_P + \beta_P' E + \gamma_P' X + \tau_P' T + \vartheta_P' S + \delta_P C + \epsilon_P, \tag{3}$$

where Pr is the probability, E is a set of variables of the house that relate to energy consumption (such as square feet and climate), X is the standard set of explanatory variables from the mortgage termination literature (such as LTV ratio and unemployment rate), T is the set of dummy variables representing age of loan, and S is the set of dummy variables representing other fixed effects (such as state). C is an indicator variable referring to the treatment (ENERGY STAR/regular). δs are the estimates of interest.

To understand whether the extent of energy efficiency matters, we also compare the risks of default of mortgages on ENERGY STAR homes for which a HERS Index Score is available. These HERS ratings are included in the model as a continuous variable (0 to 85), thus enabling us to examine whether better energy efficiency (lower HERS rating) is associated with lower mortgage risks. Thus, instead of an indicator variable for treatment, we use a HERS rating variable. Because the HERS model primarily compares the loan performance of ENERGY STAR residences, the results may be interpreted as an argument for considering the degree of energy efficiency in the mortgage underwriting process.

Data Description

The study described in this article uses a carefully constructed sample of loans across the nation. First, we directly obtained addresses of 226,962 HERS-rated homes from RESNET's database and from individual HERS providers. These houses obtained a HERS rating from

2000 through 2010. Because of data-privacy restrictions,[11] inconsistent addresses, and low market share of HERS-rated homes, the states of Alaska, Arizona, California, Louisiana, Maine, Minnesota, North Dakota, Oregon, South Dakota, Tennessee, West Virginia, and Wyoming are excluded from the sample (exhibit 1).

The addresses from this sample are matched to the addresses in the CoreLogic, Inc. loan level database. For each matched record within the ZIP Code, loan information of approximately three other loan records was also included in the sample. It is assumed that these houses are not energy efficient and are considered part of the "control" group. Furthermore, the sample is restricted to single-family, owner-occupied houses for which loans originated from January 2002 and for which loans were used only for purchase.

CoreLogic, Inc., provided all the loan-level variables, including payment stream. Prepayment is defined as loans being paid off prematurely. Consistent with previous work, 90 days of delinquency is the marker used for defining mortgage default. The key risk determinants at origination are included in the model: the borrower's credit score (FICO—that is, Fair Isaac Corporation credit scoring model), LTV ratio, loan type (conventional/government and

Exhibit 1

Geographical Distribution of the Sample (ENERGY STAR and Non-ENERGY STAR Homes)
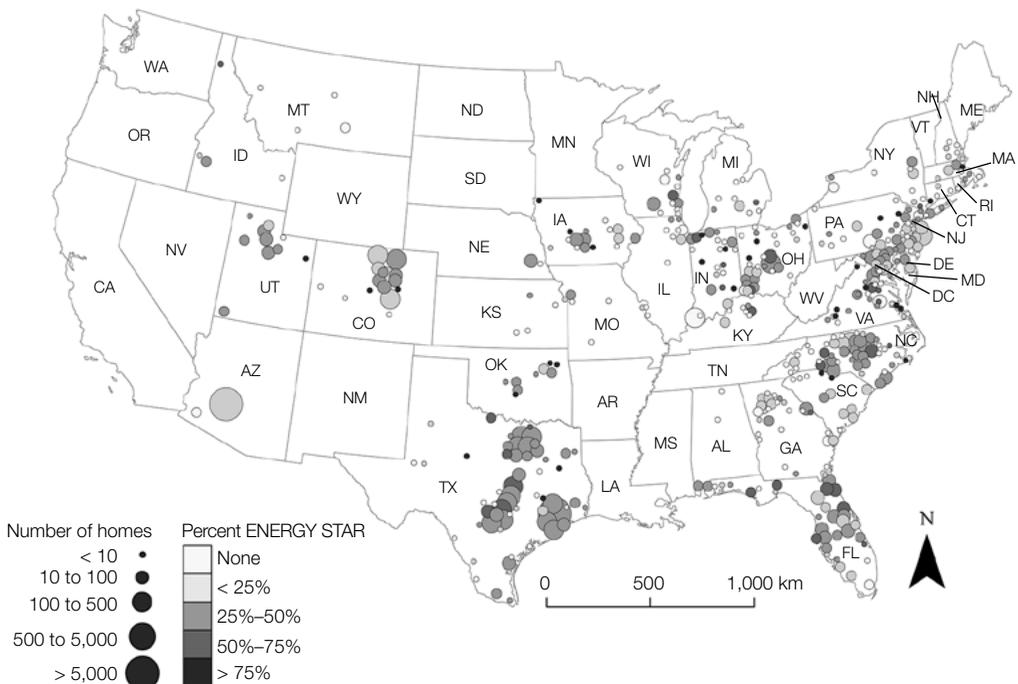
km = kilometers.

[11] Although energy-efficient homes enjoy a large market share in California, consumer privacy restrictions prevented the access to address and rating data for California HERS-rated homes.

nonprofit-organization backed),[12] local unemployment rate, neighborhood income, house value relative to the area median value, size of the house, and age of the house (exhibit 2).[13]

We constructed the neighborhood-level variables from multiple sources. We used the CoreLogic, Inc. MarketTrends database to include variables such as average income and average home sales price. We retrieved unemployment rate, median housing value, and household income from the 2006 through 2010 American Community Surveys at the census-tract level (U.S. Census Bureau, 2012). We used geographic weighting to aggregate the data to the ZIP Code level. Such aggregations were necessary because the spatial resolution of the MarketTrends database was at the ZIP Code level.

In addition to including the ENERGY STAR and HERS ratings in the analysis, we include a number of other energy-use-related variables, including number of cooling degree-days, number of heating degree-days, electricity prices, and area of the house. We obtained weather data, such as average annual (during the past decade) cooling degree-days and heating degree-days, from the National Climatic Data Center. We assigned each weather station to a block group and then aggregated data to the ZIP Code level through geographic weighting. As a proxy for the cost of energy, we used electricity prices, which were obtained at a ZIP Code level that is compiled for investor-owned utilities (IOU) and non-IOU utilities by National Renewable Energy Laboratory and Ventyx. For the approximately 1,300 ZIP Codes that are without the price data, we estimated them from neighboring ZIP Codes and through manual lookup.

Exhibit 2

Average Values for ENERGY STAR and Non-ENERGY STAR Homes in the National Sample

Variables	Non-ENERGY STAR Homes	ENERGY STAR Homes
n	46,118	24,944
Age of the house (years)	13.2	4.2
Area of the house (square feet)	2,183	2,283
Original LTV ratio	0.91	0.93
FICO score (in 100s)	7.06	7.05
ZIP Code average income (dollars)	73,741	73,550
ZIP Code unemployment (percent)	6.4	6.4
Time to default (months)	30.6	29.9
Percentage of defaults	15.2	8.9
Percentage of prepayment	32.2	22.1
Sales price (dollars)	218,461	221,919
Cooling degree-days	1,486	1,494
Heating degree-days	1,308	1,199
Electricity price (¢/kWh)	12.2	12.1

¢ = cents. FICO = Fair Isaac Corporation (credit scoring model). kWh = kilowatt hour. LTV = loan-to-value.

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[12] Government and special program loans include FHA loans and other special programs run by government agencies and nonprofit organizations (which are designed for traditionally underserved borrowers who would otherwise have difficulty obtaining credit in the conventional market).

[13] Option-based theory suggests including the value-of-prepayment option in estimating the probability of prepaying. The outstanding loan balance is not available in our data, however. Because we do not have complete loan delinquency information, imputing the loan balance would cause serious endogeneity issues. We experimented with crude measures of interest rate differences, but the results are not sensible.

We then added these ZIP Code-level neighborhood variables to the address-level loan information. Privacy restrictions dictated that CoreLogic, Inc. data were made available to us after stripping identifying information such as addresses.

Overall, the final analysis file for the baseline model includes information on about 71,000 loans. This number results from limiting the sample to 30-year fixed-rate mortgages,[14] the first 5 years after origination, and loans with original LTV ratios between 50 and 150 percent and from excluding cases with missing values in key determinants. We include all 71,000 loans in our baseline-model estimation. We include the ENERGY STAR homes (about 35 percent, or 21,000 loans) only in the model that examines the relationship between the degree of energy efficiency and mortgage termination risks.

ENERGY STAR homes descriptively show lower incidences of default and prepayment. About 22 percent of the ENERGY STAR home loans prepaid compared with 32 percent for the non-ENERGY STAR group. Although mortgages on only 9 percent of ENERGY STAR homes similarly experienced default (on average after 29.9 months), about 15 percent of mortgages on the non-ENERGY STAR homes group did (on average, after 30.8 months). Other notable differences include the fact that ENERGY STAR houses are newer than other homes and, although the average ENERGY STAR house is larger, the price per square foot is remarkably similar between the two groups (about $106 per square foot). As for the rest of the key variables, the treatment group and the control group have similar characteristics.

From the literature, we expect that a higher FICO score is negatively associated with default risk and positively associated with prepayment risk. We also expect that a special purpose loan should carry a higher risk of default and that default risks, which are mitigated in areas of higher incomes, should go up in areas with higher unemployment. We expect that a disproportionately expensive house is likely to carry a lower risk of default and a higher risk of prepayment, because it reflects the underlying borrower's characteristics.

Energy Efficiency Is Associated With Lower Mortgage Risks

Overall, the findings are consistent with previous work and expectations. In the baseline model, we examine the relationship between the ENERGY STAR rating and the mortgage risks (exhibit 3); that is, when *C* is the indicator variable that represents whether a home has ENERGY STAR certification. To account for the distributional differences in age, we also restrict the sample to houses that were built in the past decade. The findings are similar in direction and significance as those presented here, and, therefore, the results are robust to the exclusion of older homes.[15] To further examine the effect of relative efficiency on mortgage risks, we examine the subsample of ENERGY STAR-certified houses for which we have a

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[14] Adjustable-rate mortgages, or ARMs, and other types of loans require panel data that track the payment schedule and time-varying attributes. Such data are not available and the models used in the study are not suitable to study such mortgages, but such a study should be considered in future work.

[15] In the following paragraphs, we discuss only the results that use the complete dataset, because post-research design restrictions of the sample (such as limiting to post-2000 homes) could lead to biased results. The results of the regressions for such subsamples are presented in exhibit 3 only for robustness check and should be interpreted with caution.

Exhibit 3

Base Model (ENERGY STAR versus non-ENERGY STAR)

Variable	All Data				Post-2000 Homes			
	Default		Prepay		Default		Prepay	
	Estimate	Odds Ratio	Estimate	Odds Ratio	Estimate	Odds Ratio	Estimate	Odds Ratio
Intercept	8.91***		1.94***		11.32***		3.21***	
	(0.37)		(0.26)		(0.45)		(0.32)	
FICO score (in 100s)	– 1.42***	0.24	0.09***	1.10	– 1.39***	0.25	0.14***	1.15
	(0.02)		(0.02)		(0.03)		(0.02)	
Loan origination after 2006	– 2.92***	0.05	– 3.03***	0.05	– 2.96***	0.05	– 3.06***	0.05
	(0.05)		(– 0.04)		(0.06)		(0.06)	
Original LTV ratio	0.79***	2.20	– 1.51***	0.22	0.29	1.34	– 1.72***	0.18
	(0.17)		(– 0.12)		(0.2)		(0.14)	
Loan type	1.31***	3.72	0.33***	1.39	1.25***	3.48	0.23***	1.26
	(0.04)		(– 0.03)		(0.04)		(0.03)	
ZIP Code average unemployment	0.03***	1.03	– 0.04***	0.96	0.02***	1.02	– 0.05***	0.95
	(0.01)		(0.00)		(0.01)		(0.01)	
ZIP Code average income	0.00***	1.00	0.00***	1.00	0.00***	1.00	0.00***	1.00
	(0.00)		(0.00)		(0.00)		(0.00)	
House price relative to ZIP Code sales price	– 0.13***	0.87	0.16***	1.18	– 0.26***	0.77	0.15***	1.16
	(0.03)		(0.02)		(0.04)		(0.02)	
Age of the house	– 0.01***	0.99	– 0.01***	0.99	– 0.24***	0.79	– 0.16***	0.85
	(0.00)		(0.00)		(0.01)		(0.01)	
ENERGY STAR certification	– 0.39***	0.68	– 0.32***	0.73	– 0.65***	0.52	– 0.52***	0.60
	(0.03)		(0.02)		(0.03)		(0.03)	
	N = 71,062. Log likelihood = – 52,007.6				N = 56,787. Log likelihood = – 40,447.8			

FICO = Fair Isaac Corporation (credit scoring model). LTV = loan-to-value.

*** p ≤ .001.

Note: Standard errors are in parentheses.

HERS rating (exhibit 4). In addition to including the variables from the baseline model, the HERS model incorporates additional variables that capture local energy-use characteristics. These characteristics include cooling degree-days, heating degree-days, electricity price, and square footage of the house.

ENERGY STAR certification is associated with substantial and significant reduction of the default and prepayment risks (exhibit 3). The odds of a mortgage default on an ENERGY STAR residence, ceteris paribus, are one-third less than those on a home in the control group. A mortgage on an ENERGY STAR residence is also one-fourth less likely to be prepaid. Regarding whether the extent of energy efficiency matters (HERS rating), the findings are consistent with expectations (exhibit 4). The degree of energy efficiency matters; a 1-point decrease in the HERS score is associated with a 4-percent decrease in the odds of default and a 2-percent decrease in the odds of prepayment. This finding suggests that mortgages on more efficient homes exhibit even lower mortgage risks than those on their less efficient but still ENERGY STAR-rated counterparts.

Exhibit 4

HERS Model (with only ENERGY STAR homes)

Variable	Default		Prepay	
	Estimate	Odds Ratio	Estimate	Odds Ratio
Intercept	10.25*** (1.19)		– 0.49 (0.74)	
FICO score (in 100s)	– 1.68*** (0.06)	0.19	0.24*** (0.04)	1.27
Loan origination after 2006	– 3.76*** (0.18)	0.02	– 2.29*** (0.15)	0.10
Original LTV ratio	0.30 (0.44)	1.35	– 1.19*** (0.25)	0.30
Loan type	0.58*** (0.09)	1.78	0.22*** (0.06)	1.24
ZIP Code average unemployment	0.02 (0.01)	1.02	– 0.05*** (0.01)	0.95
ZIP Code average income	0.00*** (0.00)	1.00	0.00* (0.00)	1.00
House price relative to ZIP Code sales price	– 0.18** (0.08)	0.83	0.10** (0.04)	1.11
Cooling degree-days	0.00 (0.02)	1.00	– 0.07*** (0.01)	0.93
Heating degree-days	– 0.04** (0.02)	0.96	0.00 (0.01)	1.00
Electricity price	0.01 (0.01)	1.01	– 0.02*** (0.01)	0.98
Area of the house	0.01** (0.00)	1.01	0.02*** (0.00)	1.02
Age of the house	– 0.01 (0.02)	0.99	– 0.07*** (0.01)	0.94
HERS score	0.04*** (0.01)	1.04	0.02*** (0)	1.02
	N = 21,094. Log likelihood = –12,822.26.			

FICO = Fair Isaac Corporation (credit scoring model). HERS = Home Energy Rating System. LTV = loan-to-value.

* p ≤ .10. ** p ≤ .05. *** p ≤ .001.

Note: Standard errors are in parentheses.

As a rule, the other predictors in both models exhibit the expected effects. The borrower's credit score (FICO) is significantly and positively associated with prepayment and negatively associated with default in the baseline and the HERS models. The original LTV ratio exhibits significant and positive effects on default and negative effects on prepayment. Controlling for the state-fixed effects, the effect of original LTV is insignificant in the HERS model for default, although increasing original LTV reduces the prepayment risk. In this dataset, conventional loans have higher default and prepayment risks compared with government-backed and non-profit loans, probably because the loans tend to carry more favorable terms and servicing. Local unemployment rates are positively associated with default risks in the baseline model and negatively associated with prepayment risks in both models. Although higher income

neighborhoods increase the default and prepayment rates, the effects are substantively small. This result is likely because of the coarseness of the neighborhood that evens out any spillover effects. Older houses are both less likely to default and prepay, possibly reflecting the underlying characteristics of borrowers who prefer these houses. Finally, houses with values higher than the neighborhood mean exhibit lower default and higher prepayment propensities, reflecting the underlying income effect.

Energy prices do not seem to have an effect on the default likelihood but do negatively affect prepayment risks within ENERGY STAR homes (exhibit 4); that is, higher energy costs reduce the risk of prepayment. Controlling for the relative price of the house, larger houses have higher prepayment and default risks. Age-of-loan data are included as a set of dummies in the models. The older the age of the loan, the more likely is the risk of default. Dummies for states, also used in the models to control for the state-fixed effects, are nearly all statistically insignificant in the baseline model.[16] These model results are qualitatively consistent with other specifications not presented here and, hence, the results appear robust.

Implications for Public Policy and Research

Interest in home energy efficiency is growing in academic and policy settings. For example, President Obama recently proposed incorporating home energy efficiency into the mortgage underwriting process in his Climate Action Plan. The empirical findings of this article offer strong support for this policy proposal. The models suggest that mortgages on energy-efficient homes have significantly lower risks than those on less efficient homes, yet mortgage-underwriting practices do not reflect this fact. We find that mortgages on energy-efficient homes are associated with lower mortgage risks. Default risks on these mortgages are about one-third lower than those in the control group. We also find that the extent of energy efficiency matters (as captured by the HERS rating): the more energy efficiency, the lower the risks.

Because the findings are consistent among different model specifications and different types of subsamples, we can derive a number of implications for policy and lending practices. First, lenders may want to require an energy audit or energy rating during the process of mortgage underwriting. In the same manner that appraisals calculate the value of the home, an energy-rating determination could define other important characteristics of the loan, including the debt-to-income ratio. Requiring energy audits as part of the mortgage underwriting process would help homeowners make informed decisions about energy-efficiency investments and likely promote long-term efficiency of the house rather than a single-time certification. This requirement alone is likely to increase the energy performance of the housing stock.

Second, lenders and secondary market investors should take into account the energy efficiency of the home used as collateral for the loan in the underwriting decisions. For instance, they may permit a higher debt-to-income ratio, lower FICO score, or reduction in the interest rate. This and similar approaches would enable borrowers to obtain larger loans. This approach

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[16] These results are not presented in the tables for the sake of brevity. A complete set of results is available from the authors.

would increase affordability for many borrowers, especially in high-cost areas. Loan-level price adjustments (LLPAs) could also be used to account for mortgages on energy-efficient homes. Moreover, when possible, lenders should consider a HERS or similar rating that accounts for degrees of energy efficiency in a unit as well.

According to a study by the Joint Center for Housing Studies at Harvard University (JCHS, 2013), two-fifths of home-remodeling spending is for building envelope replacements and system upgrades (including electrical and HVAC systems). Given that this market was valued at $275 billion in 2011, these upgrades represent about a $100 billion investment by consumers that can be geared toward energy efficiency. One way to promote these energy-efficiency investments is to consider the underwriting rules for the home-improvement loans by factoring in the de-creased risk associated with energy-efficient homes. Another way is to find mechanisms to encourage time-of-sale improvements on energy-efficiency measures. In particular, this effort is likely to help lower income borrowers, who tend to purchase older homes that are often less energy efficient than those built in more recent years. The EPA should encourage more lenders to join the ENERGY STAR program to broaden the consideration of energy efficiency in mortgage underwriting. The low numbers of lenders associated with the ENERGY STAR program should be addressed.

One criticism of the ENERGY STAR program[17] in the green building community is that the standards of the program are too low to merit incentives (Hassel, Blasnick, and Hannas, 2009). One way of promoting energy efficiency is to move toward performance-based metrics rather than design-based certifications (as the ENERGY STAR program does). Most of the narrowing gap between the utility savings of ENERGY STAR homes and those without that rating can be attributed to overall energy-efficiency improvements in more recently built housing. Further-more, energy efficiency is not synonymous with conservation, which is likely to reflect house-hold propensities. Although this article does not directly use the realized energy savings in mortgage performance, other studies show that standards for ENERGY STAR could be tight-ened, including moving toward more performance-based approaches. If the goal is to reduce energy consumption, encouraging energy efficiency may not be sufficient and should be complemented with incentives to increase conservation. It could very well be that households that have a propensity to conserve pose lower mortgage risks. Future studies could more thoroughly examine this effect.

Future work needs to address a number of issues associated with this research. It needs to address the endogeneity issue common in most mortgage-performance studies. Mortgage bor-rowers who reside in energy-efficient homes may simply be more financially able than those who own less efficient homes. Panel data that track the borrower's income and market condi-tions are not available; such data would enable us to tease out these effects. It is important to recognize that the energy savings of energy-efficient homes may not cause the reduction in risk. What we have demonstrated in this work is the association between reduction in risk and energy efficiency, which could very well be reflective of the underlying borrowers'

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[17] A recent Government Accountability Office report found that the ENERGY STAR certification process for products could also be strengthened (GAO, 2010).

characteristics. Many borrowers' characteristics, such as income and employment status, are not available in the dataset. We included a number of ZIP Code-level variables as proxies for individual variables. Cognizant of ecological fallacy risks, we do not derive implications from the inclusion of these variables. Future work needs to address these data limitations. Nevertheless, to our knowledge, this study is the first to demonstrate the association. Future studies should be designed to tease out the evidence for causal mechanisms.

Many important states, such as California, are missing for our analyses because of data availability. Furthermore, different states and local governments have different building standards that make ENERGY STAR certification more or less easier to achieve. Such differences may account for differential market penetration of the ENERGY STAR label for new homes and may affect the mortgage risks. Although we account for state-fixed effects in our models, more research should be done to address these limitations. We believe, however, that our results reflect the mortgage termination behavior in many parts of the country.

Future research also needs to examine additional measures of energy efficiency. Although HERS can predict average energy costs in general, individual ratings, especially for older houses, are largely uncorrelated with the energy costs (Stein and Meier, 2000). A difference exists between energy conservation and energy efficiency; while the former is primarily related to the behavioral response of the consumer, the latter is about the relative efficiency of equipment and built environment. If the main goal of public policy is to reduce energy consumption, rather than to promote energy efficiency, then alternative measures that more completely capture foregone demand from behavioral changes and changes in consumption patterns should be considered for their effects on mortgage risks. Future research could also use a broader sample to study the effect on risk, such as other rating systems that promote more comprehensive green building strategies. Overall, however, we believe the findings in this article are robust and consistent enough across different model specifications to warrant further examination.

In general, the findings suggest that discrete and continuous measures of energy efficiency each are related to loan performance risk, even though more research is necessary to firmly establish causal links. Low energy burden is potentially associated with lower risks for default. The lower risks associated with energy efficiency could be taken into consideration when underwriting mortgage risks. Contingent on confirmation by other studies, Congress could consider the findings in their deliberations of the SAVE Act, the bill proposed to improve the accuracy of mortgage underwriting used by federal mortgage agencies by ensuring that energy costs are included in the underwriting process. Similarly, market stakeholders, such as Fannie Mae and Freddie Mac, could encourage underwriting flexibility for mortgages on energy-efficient homes; for instance, by adjusting LLPAs or their equivalents accordingly. These measures have the potential to dramatically increase the adoption of efficiency, contribute to reduction of the energy burden, and increase the quality of life for households across the United States.

Acknowledgments

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Measuring Housing Affordability

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The views expressed in this article are those of the author and do not represent the official positions or policies of the Office of Policy Development and Research, the U.S. Department of Housing and Urban Development, or the U.S. government.

Abstract

This article discusses how the U.S. Department of Housing and Urban Development (HUD) measures housing affordability and presents an analysis of custom tabulations of the 2006–2010 American Community Survey (ACS), known as the "Comprehensive Housing Affordability Strategy (CHAS) data." The CHAS data combine ACS microdata with HUD-adjusted Median Family Incomes to create estimates of the number of households that would qualify for HUD assistance. Using these data, the author estimates the number of rental units and ownership units that would be affordable to prototypical households at specified income levels.

Introduction

In 1990, Congress passed the National Affordable Housing Act, which required that state and local governments participating in selected U.S. Department of Housing and Urban Development (HUD) grant programs prepare a Comprehensive Housing Affordability Strategy (CHAS). The CHAS was intended to serve as the strategic guide for housing and community development activities for low- and moderate-income households (Hoben and Richardson, 1992). To support this analysis, HUD and the U.S. Census Bureau produced custom tabulations of census data that provided grantees with information about the housing needs of low- and moderate-income households. As a planning document, the CHAS was superseded in 1995 by the Consolidated Plan, but the custom tabulations of census data continue to be known as the "CHAS data." The CHAS data were updated after the 2000 census and, in 2009, they were updated to rely on the American Community Survey (ACS), the Census Bureau's new annual survey that replaced the long form of the decennial census.[1]

The CHAS data combine ACS microdata with HUD-adjusted Median Family Incomes (HAMFIs) to create estimates of the number of households that would qualify for HUD assistance. The CHAS data also incorporate household characteristics (such as race and ethnicity, age, and family size) and housing unit characteristics (such as number of bedrooms and rent or owner costs). These characteristics are combined into a series of cross-tabulations, each of which has a particular focus. This article presents an analysis of one particular component of the 2006–2010 CHAS data: a series of tables that estimate the affordability of the housing stock and the extent to which affordable units are available to lower income households.

The remainder of this article explains how HUD calculates the income and affordability variables used in the CHAS, then presents resulting estimates of the stock of affordable housing during the 2006-through-2010 period.

Household Income

The essential characteristic of the CHAS data is the combination of ACS microdata and HAMFIs. The HAMFI estimates used in the CHAS are slightly different from the official income limits produced by HUD to govern program eligibility. Official income limits are adjusted so that the 80-percent income limit cannot exceed the U.S. median; the estimates are then adjusted further to reflect high housing costs in certain jurisdictions. The HAMFIs used for the CHAS data undergo these same adjustments. The main difference is that the official income limits are also trended forward to the fiscal year in which they are effective. The 2006–2010 ACS microdata are used to produce fiscal year (FY) 2013 income limits, so income data must be trended forward from 2010 to the middle of FY 2013. These adjustments are not necessary for the production of the CHAS data.

Like the official income limits, HAMFIs are computed for counties, county equivalents (also referred to as minor civil divisions, or MCDs), and Fair Market Rent, or FMR, areas, such that every area

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[1] The Census Bureau uses the ACS to produce three different sets of estimates: 1-year estimates, 3-year estimates, and 5-year estimates. The CHAS relies primarily on 5-year estimates, because they have the largest sample size and allow for the analysis of smaller geographies.

in the country has one—and only one—relevant HAMFI. Each household in the ACS microdata is matched with the appropriate HAMFI and classified based on how its income compares with specific HAMFI thresholds. The most relevant thresholds are 50 and 80 percent of HAMFI, because most HUD programs base eligibility on these thresholds (which are generally referred to as "very low income" and "low income," respectively).[2] HAMFI thresholds are calibrated for a four-person house-hold and are adjusted up (by 8 percent for each person above four) or down (by 10 percent for each person below four) based on the number of people in each household. For example, in Lexington-Fayette County, Kentucky, 80 percent of HAMFI for a four-person household is $48,000. For a three-person household, 80 percent of HAMFI is $43,200 ($48,000 * 0.9), so a three-person household with household income of $43,000 would be below the 80-percent-of-HAMFI thresh-old and would be considered low income. Exhibit 1 presents nationwide totals for the number of households in various categories.

Other analyses of the number of households in HUD-specified income categories tend to focus specifically on renters. Collinson (2011) used ACS public use microsamples to estimate that the number of very low-income renter households in 2007 was 16.17 million, and that the number rose to 17.84 million in 2009. According to HUD's *Worst Case Housing Needs: A Report to Congress,* which relies on American Housing Survey (AHS) data (Hardiman et al., 2010; Steffen et al., 2011), the number of very low-income renter households was 15.94 million in 2007 and 17.12 million in 2009. The 2006–2010 CHAS data indicate an average of 16.58 million very low-income renter households during the 2006-through-2010 period; this estimate is consistent with other analyses.

Exhibit 1

Household Income As a Percentage of HAMFI, Nationwide, 2006–2010 CHAS Data

Income Category	Number of Households	Percent of Total Households
Extremely low income (≤ 30% of HAMFI)	14,579,845	12.63
Very low income (≤ 50% of HAMFI)	28,049,660	24.29
Low income (≤ 80% of HAMFI)	47,029,470	40.73
Low and middle income (≤ 100% of HAMFI)	58,909,235	51.02
Upper income (> 100% of HAMFI)	56,533,795	48.98
Total	**115,463,030**	**100.00**

CHAS = Comprehensive Housing Affordability Strategy. HAMFI = U.S. Department of Housing and Urban Development-adjusted Median Family Income.

Affordability

Housing practitioners generally agree that housing is "affordable" if the tenants pay no more than 30 percent of their household income toward housing costs. Many of the CHAS tables use this standard approach to affordability and provide estimates of the number of households with cost burden (paying more than 30 percent of income for housing) or severe cost burden (paying more than 50 percent of income for housing). Exhibit 2 presents CHAS estimates of the incidence of cost

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[2] "Very low income" and "low income" are the terms used by HUD's public housing and voucher program. Programs run through the Office of Community Planning and Development call the 50-percent income limit "low income" and the 80-percent income limit "moderate income." This article uses the terminology of the public housing and voucher programs.

Exhibit 2

Frequency of Cost Burden and Severe Cost Burden, by Income Category

Income Category	Number (and Percent) of Households That Are Cost Burdened	Number (and Percent) of Households That Are Severely Cost Burdened	Total
Extremely low income (household income ≤ 30% of HAMFI)	11,056,680 (76%)	9,070,700 (62%)	14,579,845
Very low income (30% of HAMFI < household income ≤ 50% of HAMFI)	9,161,440 (68%)	4,397,660 (33%)	13,469,815
Low income (50% of HAMFI < household income ≤ 80% of HAMFI)	8,585,190 (45%)	2,526,650 (19%)	18,979,810
Middle income (80% of HAMFI < household income ≤ 100% of HAMFI)	3,592,615 (30%)	780,525 (7%)	11,879,765
Upper income (100% of HAMFI < household income)	7,037,465 (12%)	978925 (2%)	56,553,795
Total	39,366,890 (34%)	17,754,460 (15%)	115,463,030

HAMFI = U.S. Department of Housing and Urban Development-adjusted Median Family Income.

burden and severe cost burden for households in different income categories. Among extremely low-income households, 76 percent pay more than 30 percent of their income for housing and 62 percent pay more than 50 percent of their income for housing. Cost burden is common even for households with incomes in the 80- to 100-percent range, but severe cost burden becomes much less common for middle-income and upper income households.

Cost burden is an important, simple, and intuitive measure of housing affordability. The CHAS data provide an alternative measure that is also worth considering. This alternate measure does not define affordability from the perspective of the current occupant of a home but considers whether a particular housing unit would be affordable to a generic household with an income at the HAMFI thresholds of interest.

To further clarify this concept of affordability, consider a hypothetical two-bedroom unit that is vacant and for rent in Lexington-Fayette County, Kentucky. The rental unit has an asking price (contract rent) of $1,000 and utility costs were estimated by the landlord (or imputed by the Census Bureau) to be $200, making the gross rent $1,200 per month. Is the unit affordable to a household with an income at 80 percent of HAMFI, assuming a 30-percent payment standard for affordability? In Lexington, the threshold for 80 percent of HAMFI is $48,000 for a four-person household; however, a two-bedroom unit might be considered overcrowded if occupied by four people.[3] To prevent a misalignment between household size and unit size, it is necessary to adjust the income of the generic household based on the number of bedrooms. This analysis assumes that a two-bedroom unit would be suitable for three people. As described previously, HUD adjusts HAMFIs for household

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[3] HUD's Housing Quality Standards allow as many as two people per bedroom, but under the Low-Income Housing Tax Credit (LIHTC), rents are based on an assumption of one and one-half persons per bedroom (Section 42(g)(2)(c), Internal Revenue Code). This analysis uses the LIHTC standard because it seems more appropriate for a mix of family and nonfamily households and households at a variety of income levels.

size by subtracting 10 percent for each person fewer than four and adding 8 percent for each person more than four. For a three-person household, the four-person HAMFI is multiplied by 90 percent, so the household income that should be used for this analysis is $43,200 (0.9 * $48,000), which could be understood as the annual income for a generic three-person household with an income at 80 percent of HAMFI. For this household, the vacant two-bedroom unit in question is not affordable—the rent of $1,200 is 33 percent of the $3,600 monthly income of an appropriately sized household. Exhibit 3 presents the full spectrum of household size adjustments used to match units with household-size-adjusted incomes.

This analysis must confront one further complication. For renter-occupied and vacant-for-rent units, the rent currently being charged should be close to the rent that would be charged if a new household were to move into the unit. For owner-occupied units, however, the monthly owner costs paid by the current resident may be far different from a household seeking to purchase the same unit. Consider a household that purchased a home in 2000 for $100,000, using a 30-year fixed-rate mortgage with a 20-percent downpayment and a 5-percent interest rate. That household would have a monthly payment of approximately $430. If another household purchased the same home in 2013 for $150,000 with the same mortgage terms, they would have a monthly payment of approximately $650. Clearly, a home might be affordable to its current occupant but not to another household with the same income attempting to purchase it today. Home values are not the only factor that changes over time. According to Freddie Mac, in April 2013, the prevailing rate for new fixed-rate mortgages was approximately 3.5 percent. In 2001, the equivalent rate hovered around 7 percent. If interest rates decline significantly, the current occupant will not experience a decreased cost burden (unless they refinance), but new buyers will find higher levels of affordability. Estimates of cost burden that focus on the rents and mortgage payments currently experienced by households may underreport or overreport the extent of affordability when the housing market undergoes significant changes in a short period of time. This analysis seeks to estimate the affordability of the housing stock independent of current occupants. As a result, affordability of owner-occupied units is based on current values and current mortgage market conditions. This analysis requires some assumptions; while a 30-percent payment standard (housing costs to income ratio) is widely used for rental housing affordability, there is not such a clear consensus of the appropriate ratio of home price to income. According to Zillow, a company that estimates home values and analyzes real estate trends, the ratio of home price to income hovered around 2.6 throughout most of the 1980s and 1990s. This ratio peaked at 4 in 2006 and has since dropped back to around 3.

Exhibit 3

Household Size Adjustment Factors for Estimating Affordability

Number of Bedrooms	Household Income Adjustment Factor
0	0.70
1	0.75
2	0.90
3	1.04
4	1.16
5 or more	1.04 + (0.12 * [number of bedrooms − 3])

The owner affordability estimates in the CHAS data use a ratio of 3.36—that is, a household could afford to purchase a home if the home's value is less than or equal to 3.36 times the household's income.[4]

Affordability Results

Based on the standards described in the previous section, exhibits 4 and 5 present estimates of the affordability of the housing stock from 2006 through 2010. Information is presented for the United States (the 50 states, plus Washington, D.C., and Puerto Rico) and three specific jurisdictions: Washington, D.C. (a large city with high housing prices); Lexington-Fayette County, Kentucky (a moderate-size urban county with moderate housing prices); and Harris County, Texas (a large urban county with moderate housing prices).

Exhibit 4

Rental Affordability Estimates for Selected Jurisdictions, 2006–2010 CHAS Data

Rental Housing Units	Number (and Percent) of Housing Units in the United States	Number (and Percent) of Housing Units in Washington, D.C.	Number (and Percent) of Housing Units in Lexington-Fayette County, Kentucky	Number (and Percent) of Housing Units in Harris County, Texas
Rental units affordable at 50% of HAMFI	15,387,330 (36.8%)	76,110 (48.9%)	25,720 (45.6%)	199,710 (29.9%)
Rental units affordable at 80% of HAMFI	33,224,725 (79.5%)	100,055 (64.3%)	50,755 (89.9%)	536,810 (80.4%)
Total renter-occupied or vacant-for-rent units	41,797,205	155,670	56,445	667,890

CHAS = Comprehensive Housing Affordability Strategy. HAMFI = U.S. Department of Housing and Urban Development-adjusted Median Family Income.

Exhibit 5

Owner Affordability Estimates for Selected Jurisdictions, 2006–2010 CHAS Data

Owner Housing Units	Number (and Percent) of Housing Units in the United States	Number (and Percent) of Housing Units in Washington, D.C.	Number (and Percent) of Housing Units in Lexington-Fayette County, Kentucky	Number (and Percent) of Housing Units in Harris County, Texas
Owner units affordable at 50% of HAMFI	17,201,375 (21.8%)	6,050 (5.2%)	10,760 (15.3%)	263,725 (32.4%)
Owner units affordable at 80% of HAMFI	34,686,410 (44.0%)	9,300 (8.0%)	50,755 (89.9%)	536,810 (80.4%)
Total owner-occupied or vacant-for-sale units	78,887,365	115,650	70,290	814,370

CHAS = Comprehensive Housing Affordability Strategy. HAMFI = U.S. Department of Housing and Urban Development-adjusted Median Family Income.

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[4] This factor is based on terms similar to those that might have been available for mortgages insured through the Federal Housing Administration, or FHA, during the 2006-through-2010 period: a 31-percent monthly payment standard, 96.5-percent loan-to-value ratio, 5.5-percent interest rate, 1.75-percent upfront insurance premium, 0.55-percent annual insurance premium, and 0.2-percent annual taxes and hazard insurance.

Nationwide, in the 2006-through-2010 period, a total of 41.8 million housing units were renter-occupied or vacant-for-rent units. Of these housing units, 36.8 percent were affordable to a household making 50 percent of HAMFI and 79.5 percent were affordable to a household making 80 percent of HAMFI. Collinson (2011) analyzed public use microsamples from the ACS (2007 and 2009) and AHS (2007 and 2009) and found similar levels of affordability for rental units.

In Washington, D.C., the 76,110 rental units that would be affordable to households making 50 percent of HAMFI constitute nearly one-half of the rental stock. Lexington-Fayette County is slightly less affordable to a very low-income household; 45.5 percent of its rental units would be affordable to a household making 50 percent of HAMFI. Bringing up the rear is Harris County at 29.9 percent, which is surprising, given that Harris County (at the center of the Houston metropolitan area) is generally thought to be a housing market with ample supply and relatively low prices. A different picture emerges when one looks at the low-income threshold (80 percent of HAMFI). Lexington-Fayette and Harris Counties both are slightly more affordable than the nation as a whole—89.9 and 80.4 percent, respectively, of their rental units would be affordable to a household making 80 percent of HAMFI. In Washington, D.C., however, only 64.3 percent of rental units are affordable to a household making 80 percent of HAMFI.

Exhibit 5 presents affordability of the stock of owner-occupied and vacant-for-sale housing. These results are more consistent with conventional wisdom about the housing markets in the three selected jurisdictions. Nationwide, 21.8 percent of owner units were affordable to households making 50 percent of HAMFI and 44 percent were affordable to households making 80 percent of HAMFI. In Washington, D.C., the corresponding figures are a paltry 5.2 and 8.0 percent, respectively. Lexington-Fayette County is relatively affordable to low-income households (56.4 percent of units), but it is less affordable to very low-income households (15.3 percent of units). In Harris County, 32.4 percent of owner units are affordable to very low-income households and a remarkable 71.7 percent of owner units are affordable to low-income households.

The preceding paragraphs discuss the affordability of the housing stock. It is also informative to analyze the extent to which affordable units are matched to the households that need them most. Exhibits 6 and 7 present estimates of the number of units that are both *affordable and available* to low- and very low-income households, with "available" defined as vacant or occupied by a household with income less than or equal to the income threshold in question.

As expected, the number of units that are both affordable and available is consistently lower than the number of affordable units. Nationwide, 5.6 million rental units would be affordable to very low-income households yet are occupied by households with higher incomes. Similarly, 9.5 million rental units would be affordable to low-income households but are occupied by higher income households. As a result, the percentage of rental units affordable and available to very low-income and low-income households is 23.3 and 56.8 percent, respectively.

When analyzing owner-occupied and vacant-for-sale units, one observes a more significant difference between "affordable" and "affordable and available." Of the 17.2 million owner housing units nationwide that are affordable to very low-income households, 71.0 percent of the units are occupied by households with incomes that are greater than 50 percent of HAMFI. Of the 34.7 million owner housing units nationwide that are affordable to low-income households, 59.0 percent of the units

Exhibit 6

Affordable and Available Rental Units, Selected Jurisdictions, 2006–2010 CHAS Data

Rental Housing Units	Number (and Percent) of Housing Units in the United States	Number (and Percent) of Housing Units in Washington, D.C.	Number (and Percent) of Housing Units in Lexington-Fayette County, Kentucky	Number (and Percent) of Housing Units in Harris County, Texas
Rental units affordable and available at 50% of HAMFI	9,738,650 (23.3%)	54,245 (34.8%)	15,920 (28.2%)	140,165 (21.0%)
Rental units affordable and available at 80% of HAMFI	23,741,185 (56.8%)	75,880 (48.7%)	36,225 (64.2%)	392,265 (58.7%)
Total renter-occupied or vacant-for-rent units	41,797,205	155,670	56,445	667,890

CHAS = Comprehensive Housing Affordability Strategy. HAMFI = U.S. Department of Housing and Urban Development-adjusted Median Family Income.

Exhibit 7

Affordable and Available Owner Units, Selected Jurisdictions, 2006–2010 CHAS Data

Owner Housing Units	Number (and Percent) of Housing Units in the United States	Number (and Percent) of Housing Units in Washington, D.C.	Number (and Percent) of Housing Units in Lexington-Fayette County, Kentucky	Number (and Percent) of Housing Units in Harris County, Texas
Owner units affordable and available at 50% of HAMFI	5,011,975 (6.4%)	2,825 (2.5%)	2,985 (4.2%)	73,435 (9.0%)
Owner units affordable and available at 80% of HAMFI	14,261,460 (18.1%)	5,175 (4.5%)	13,075 (18.6%)	209,415 (25.7%)
Total owner-occupied or vacant-for-sale units	78,887,365	115,650	70,290	814,370

CHAS = Comprehensive Housing Affordability Strategy. HAMFI = U.S. Department of Housing and Urban Development-adjusted Median Family Income.

are occupied by households with incomes that are greater than 80 percent of HAMFI. Only 6.4 and 18.1 percent of owner units are affordable and available to households at 50 and 80 percent of HAMFI, respectively. There are a number of possible explanations for the fact that so few owner units are affordable and available to low-income households. Foremost among them is that, in the 2006-through-2010 period, owner occupants had been living in their current units much longer than renter occupants; 55 percent of owners moved into their units before 2000 compared with only 16 percent for renters. These data indicate significantly less turnover of the owner-occupied housing stock. If household incomes and home values change significantly but households do not "re-sort" (move) to units that better fit their income level, affordability mismatches will result.

Conclusion

This article describes the process by which HUD and the Census Bureau produce the CHAS data and provides a sample analysis of rental and owner affordability. These data and the rest of the CHAS data are available on the website of HUD's Office of Policy Development and Research

(http://www.huduser.org/portal/datasets/cp.html). The data can be downloaded as text files or accessed by a new interactive query tool that produces tables for selected indicators. HUD has also created extracts of the CHAS data tailored to support the Consolidated Planning process; these data extracts have been loaded into HUD's enterprise Geospatial Information System, or eGIS, and support several recently developed analytic tools, including CPD Maps (http://egis.hud.gov/cpdmaps/) and the eCon Planning Suite. Local jurisdictions can use these resources to analyze the affordability of their housing market and to identify potential policy solutions.

Acknowledgments

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The Outlines and Extents of Segregation

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The views expressed in this article are those of the author and do not represent the official positions or policies of the Office of Policy Development and Research, the U.S. Department of Housing and Urban Development, or the U.S. government.

Maps of segregation often highlight concentration patterns of racial or ethnic groups. Patterns at the edges of the segregated areas are not typically shown or discussed in many of these maps. The lack of attention to the edges—transition areas—may be because it is assumed that segregated areas change abruptly from one racial group to another. Exhibit 1, however, as an example, reveals patterns of racial integration that form at the edges and outline the boundaries of the segregated areas in Chicago.

I created a racial diversity index[1] using 2010 census data to depict levels of segregation and integration between the White and African-American populations—the predominant population groups—in the Chicago metropolitan area. The index situates one racial group in a direct relationship with another to create a population context indicating how segregated or integrated the two groups are within a census tract. Values closer to 0 represent segregation. Larger values indicate higher levels of racial integration between the two groups. The index does not reveal which group is the dominant group in a tract. In exhibit 1, African-American segregation is identified with a thick black boundary for each tract in which at least 75 percent of the population is African American. White segregation is identified by census tracts that are white or the lightest gray in color.

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[1] For details on the mechanics of the racial diversity index, see Wilson (2011).

I mapped the diversity index to reveal a series of census tracts that form bands of racial integration that radiate outward from Chicago city center, as seen in exhibit 1. To the immediate east and south of the city center, these bands are split by the areas of high African-American segregation, circumscribe these areas, and then reconverge to form a buffer of diversified neighborhoods between the African-American and White populations. Although more diverse, pockets of African-American segregation are centered on Maywood to the west, on the southern suburbs, and on the Gary, Indiana, area to the southwest. To the extreme north, a pocket of diversity surrounds Evanston and extends southward toward Chicago, but that extension is broken apart by a highly segregated area.

Exhibit 1 reveals that African-American segregation is not confined to the inner city or White segregation to the suburbs. Rather, the patterns of both African-American and White segregation are extensive in center city Chicago, and both extend into the suburbs. Trends of racial integration appear to form along the boundaries where the two population groups meet rather than in the pockets themselves.

Exhibit 1

Census Tract Levels of Racial Diversity by Comparison With the Concentration of African-American Populations—Equal Interval Classification of the Racial Diversity Index
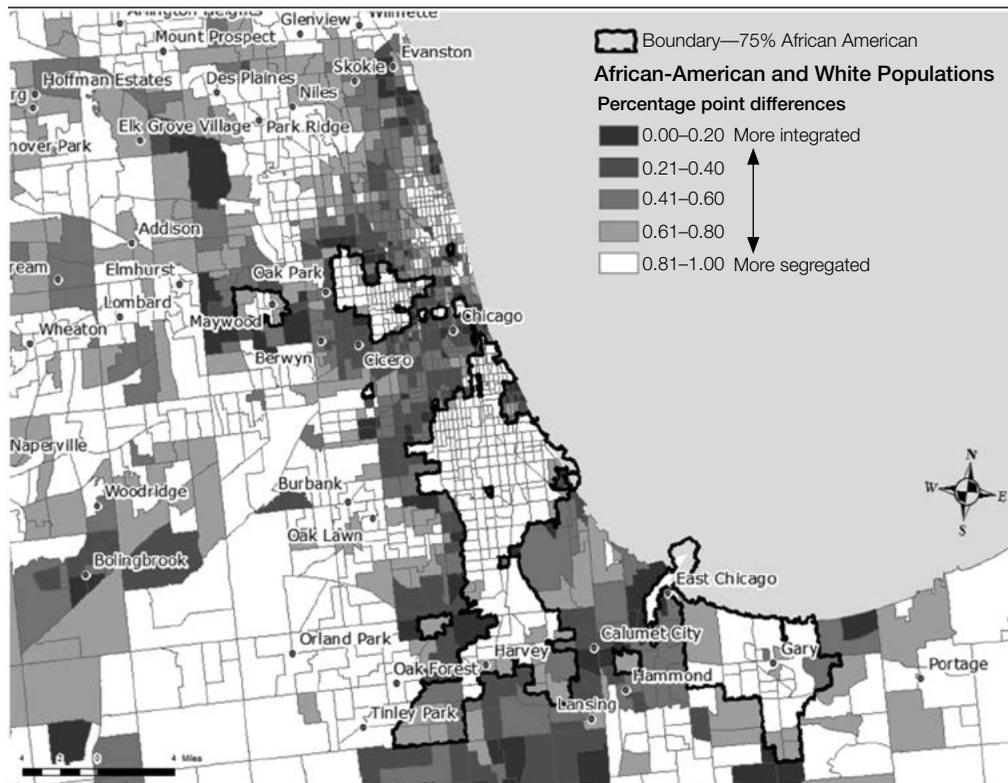
Acknowledgments

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Industrial Revolution

Every home makes compromises among different and often competing goals: comfort, convenience, durability, energy consumption, maintenance, construction costs, appearance, strength, community acceptance, and resale value. Often consumers and developers making the tradeoffs among these goals do so with incomplete information, increasing the risks and slowing the adoption of innovative products and processes. This slow diffusion negatively affects productivity, quality, performance, and value. This department of Cityscape *presents, in graphic form, a few promising technological improvements to the U.S. housing stock. If you have an idea for a future department feature, please send your diagram or photograph, along with a few, well-chosen words, to* elizabeth.a.cocke@hud.gov.

Waste Management at the Residential Construction Site

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Abstract

Construction and demolition (C&D) debris is produced during the construction, rehabilitation, and demolition of buildings, roads, and other structures (Clark, Jambeck, and Townsend, 2006). According to the U.S. Environmental Protection Agency (EPA, 2003), C&D debris amounts to 170 million tons per year, or 40 percent of the solid waste stream in the United States. Although efforts to reduce this debris through reduction, recycling, reuse, or rebuying continue to expand through government mandates, green building incentives, and education, much work remains.

Status Quo

The construction of a single-family home typically produces more than 2 tons of construction and demolition (C&D) debris material that is becoming increasingly difficult and expensive to discard. Some waste disposal facilities are refusing to accept C&D debris. In fact, a survey of home builders indicated that high C&D waste disposal costs negatively affect the economic health of their companies. In response to this situation, progressive and successful builders across the United States are implementing waste management programs as a critical cost-reducing component of the construction process.

Sustainability means that a community or society can continue to do what it is doing forever. But current rates of raw material inputs and energy consumption required to construct, maintain, and then dispose of buildings in the United States are certainly not sustainable for any extended period of time. In addition, the widespread practice of simply burying C&D materials instead of using those materials to reduce the amounts of raw materials extracted from the environment is a strategy that cannot be sustained indefinitely.

Federal Regulations and C&D Debris

Although C&D debris is not explicitly regulated at the federal level in the United States, the Resource Conservation and Recovery Act (RCRA) of 1976, which amended the Solid Waste Disposal Act of 1965, covers the disposal of solid and hazardous waste. RCRA set the following national goals (EPA, 2010).

- Protect human health and the environment from the potential hazards of waste disposal.
- Conserve energy and natural resources.
- Reduce the amount of waste generated.
- Ensure wastes are managed in an environmentally sound manner.

State Regulations and C&D Debris

Through the state authorization rulemaking process, the U.S. Environmental Protection Agency has delegated RCRA implementation responsibility to individual states. Clark, Jambeck, and Townsend (2006) effectively documented the wide variation among states in their regulations concerning the disposal of C&D debris. The authors noted differences regarding definitions, specifically whether states defined C&D debris as one or two categories for regulatory purposes, whether they categorized inert debris, and whether they applied other definitions to C&D debris. They noted which states did and did not have landfill liner requirements and which had specifications for leachate collection. Permitting issues they noted were those pertaining to financial assurance and training for operators and landfill spotters. They also reported on state regulations that are specific to C&D landfills, C&D recycling facilities, and groundwater monitoring requirements, and they reported which states were updating regulations for disposal of C&D debris.

Local Municipal Programs and C&D Debris

Many local governments have instituted programs and issued regulations as a method to reduce the amount of C&D waste flowing to local landfills. Three examples of specific local programs—in Portland, Oregon; Austin, Texas; and Seattle, Washington—are described in this section.

The city of Portland, Oregon, provides an example of a local municipality that has set regulations that require the general contractor of all building projects costing more than $50,000 to make certain that 75 percent of the waste produced on the jobsite be recycled. The general contractor is responsible for setting up a recycling program, including containers or storage areas separate from garbage for materials being recycled. The general contractor must complete a preconstruction recycling plan that details precisely how and where the following materials will be recycled (Portland BPS, 2011).

- Rubble (concrete and asphalt).
- Land-clearing debris.
- Corrugated cardboard.
- Metals.
- Wood.

The city of Austin, Texas, provides an example of a municipality that uses a green building program to provide incentives to reduce construction wastes. The program sets minimum recycling and reuse levels for construction waste if buildings are to qualify for the Austin Energy Green Building designation. Waste reduction and recycling requirements set forth in the program are designed to help the city meet the goal of a 90-percent reduction in materials sent to landfills by 2040 (Austin Energy, 2010).

As part of the requirements that builders and developers must meet to obtain the Austin Energy Green Building designation, they must set aside space on the construction site for sorting and temporary storage of reusable and recyclable materials. Builders also may be allowed to reuse many of the waste materials on site. For example, waste wood and cleared brush can be chipped and used for onsite landscaping purposes (exhibit 1). During a case study of this issue, a builder proposed that chipped wood be available as a value-added item for each homebuyer: a pile of free mulch for any landscaping the buyer planned to do (Laquatra and Pierce, 2004). Also for the Austin program, gypsum drywall scraps can be ground on site and used as a soil amendment. Concrete can be crushed and used as fill or drainage under garden beds or driveway areas. The program requires that a minimum of 50 percent of the waste generated by the construction project must be recycled or reused (Austin Energy, 2010).

The city of Seattle, Washington, has also set very ambitious targets for reducing waste materials. The goal is to recycle 70 percent of all waste by 2025. As a method to reduce construction waste, the city provides educational materials to contractors and developers on methods to reduce construction waste. The city has an online checklist that describes basic steps in setting up a jobsite reuse and recycling strategy. In addition, the following online resources are also provided: (1) a searchable database for recycling C&D waste, and (2) a recycling directory to identify which materials are easiest to recycle in the region (Seattle DPD, 2010).

Exhibit 1

Producing Mulch on Site by Chipping Wood Waste

Photo by Mark Pierce

Lean construction techniques offer increased value to homebuyers while decreasing waste (Bayer, 2013). Nahmens (2010) reported that lean construction techniques overall reduce material waste by 64 percent and production hours by 31 percent. Thus, waste management techniques, which are an important subset of lean construction, should in principle result in cost savings. These cost savings to the builder can be passed along to the homebuyer. A case study that examined the construction of two houses for which the builder recycled 8.7 tons of waste materials and landfilled 0.9 tons found that the cost of recycling waste was $710. Standard hauling and landfilling fees if waste was not recycled would have amounted to $1,403 (U.S. Air Force, n.d.). To our knowledge, no formal studies have been conducted to indicate whether builders are passing along these savings to homebuyers.

Green Building Programs and C&D Debris

Besides regulation, incentives exist for managing C&D debris in ways other than disposal in landfills. A number of green building programs are in effect at the national, state, and local levels throughout the United States. The most well known of these programs is Leadership in Energy and Environmental Design (LEED), which is administered by the U.S. Green Building Council. Through the LEED program, buildings are certified as meeting sustainability standards. LEED focuses on specific areas of environmental health, including resource efficiency. Points are awarded to a development project for minimizing the amount of C&D debris that is sent to landfills. LEED is applicable to all buildings, including homes.

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Recovery Ratios in the Savings and Loan Crisis: Evidence From the Resolution Trust Corporation's Sale of Bank-Owned Real Estate

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Abstract

The sale of bank-owned real estate (REO, or Real Estate Owned) by the Resolution Trust Corporation (RTC) following the savings and loan crisis in the late 1980s presents lessons for sales of REO following the Great Recession of 2007 to 2009. This article examines the sales counts and recovery ratios by property type and by census division in the country for all REO properties sold by the RTC, which assumed control of failed institutions and liquidated assets during the period 1989 to 2005. Recovery ratios (asset sales prices divided by the gross loan balance at foreclosure) reached a nadir of 46 percent in 1990 and 1991. It then quickly stabilized to the mid-70-percent range. We find that sales of single-family residential, industrial, and retail properties enjoyed higher recovery ratios than sales of raw land and office buildings. Nearly one-half of the sales were in the West South Central census division of the United States. Although we are cautious about overstating the results, this study offers support for policies that promote more rapid liquidation of REO portfolios as a means of raising recovery ratios, thereby reducing losses from the sale of REO properties.

Introduction

A persistent question during the recent economic crisis has been the appropriate pace at which to liquidate bank-owned real estate. Risks exist on both sides: rapid liquidation can force down real estate prices, but an overhang of unresolved properties can also hold down prices as potential buyers anticipate further increases in inventory coming onto the market.

This article uses data from the earlier financial crisis and examines sales of bank-owned real estate (REO, or Real Estate Owned) by the Resolution Trust Corporation (RTC) after the savings and loan (S&L) crisis of the 1980s.[1] Our data cover all sales of bank-owned real estate by the RTC, which assumed control of failed institutions and liquidated assets during the 1989-through-2005 period.

These rich data enable us to examine sales counts and recovery ratios by year, by property type, and by U.S. Census Bureau divisions of the country.[2] The data show that recovery ratios—which we define as the ratio of the sales price to the gross loan balance amount of the asset—reached a nadir of 46 percent in 1990 and 1991. Average recovery ratios quickly stabilized to the mid-70-percent range.

Single-family residential, industrial, and retail property sales enjoyed higher recovery ratios than sales of undeveloped land and sales of office buildings. Nearly one-half of the sales were in the West South Central division of the United States. Although the absence of an appropriate counterfactual leaves us careful about drawing a strong conclusion, this case study does suggest that it is possible for recovery ratios to increase rapidly after a rapid liquidation of bank-owned real estate portfolios.

The RTC sales experience generally is regarded as a successful response to dealing with the fallout from the S&L crisis (Wang and Peiser, 2007). William Seidman, chairman of the RTC, made early projections of losses on bad loans taken over by the RTC that were estimated at more than $200 billion, not including interest, which could run the bill up to $500 billion (Cope, 1990). The ultimate loss to the U.S. Treasury was $161 billion. Although the RTC in its early days received considerable criticism—with particular focus on charges that the RTC was selling assets too cheaply and too quickly—the evidence in this article suggests that recovery ratios on sales of REO properties recovered rapidly from the 1990-through-1991 nadir. The absence of an appropriately compelling counterfactual forces us to be somewhat humble concerning the strength of our conclusions about policy, but we think it is important to rigorously document the facts about this case study: rapid sales of real estate by the RTC were followed by an initial drop in sales prices in 1990 through 1991 and a rapid recovery as more capital came to the market.

Although our sample is comprehensive in the sense that it covers every sale of REO properties by the RTC, we unfortunately lack critical information about the quality of the assets being sold by the RTC. We do know the state in which the asset is located, its property type, and the method of disposition, but we do not have detailed location data or any information about the physical

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[1] Throughout the article, we refer to this real estate as "REO." This convention is based on the term "Other Real Estate Owned," which the Office of the Comptroller of Currency uses for real estate that a bank has come to own by foreclosure on a loan or in satisfaction of debts owed to the bank.

[2] This article follows the Census Bureau's nine-division categorization. The West South Central division includes Arkansas, Louisiana, Oklahoma, and Texas. These states were significantly affected by the S&L crisis.

condition of the asset. We believe the analysis of recovery ratios presented in this article provides useful insight into the RTC's experience and sheds light on deficiencies in how banks handled nonperforming loans (NPLs) and REO property sales during the Great Recession of December 2007 through June 2009. The implications are important because they bear directly on the speed of the recovery. The extent to which banks sit on bad real estate assets may be slowing down the speed of recovery because property sales prices may remain lower than they would otherwise be.

Background and Literature Review

The S&L crisis of the 1980s and 1990s was responsible for the failure of hundreds of thrift institutions that had book-value assets worth hundreds of billions of dollars.[3] The Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) of 1989 created the RTC to acquire, manage, and dispose of the assets of failed institutions. The RTC existed from August 1989 through December 1995. FIRREA gave the RTC responsibility for managing and resolving all failed S&Ls previously insured by the Federal Savings and Loan Insurance Corporation (FSLIC). Congress established the RTC as a temporary federal agency to clean up the S&L crisis after the FSLIC became insolvent. One of the RTC's objectives was to maximize the value of the disposition of the failed thrift institutions and their assets while minimizing the effect on local real estate and financial markets. Another objective was to maximize the availability and affordability of residential property for low- and moderate-income families (FDIC, 1998). The Federal Deposit Insurance Corporation (FDIC) typically dealt with ongoing franchises and emphasized the sale of the maximum amount of assets to the acquiring institution. The RTC, by contrast, focused on selling the assets directly to purchasers—most of whom specialized in buying pools of performing loans and NPLs and REO properties.

Several papers from the 1990s examine the disposition of assets in the context of the S&L crisis. Ely and Varaiya (1997) examined whether bidders overpaid for thrift institutions purchased from the RTC. They predicted the expected purchase price based on the number of participating bidders and the uncertainty of the thrift's franchise value. In their sample of sales, they did not find evidence that the RTC underpriced the thrift institutions. Balbirer, Jud, and Lindahl (1992) investigated the monetary returns to stockholders who acquired thrift institutions in federally assisted mergers. They found that shareholders of acquiring firms earned significant positive returns, suggesting that—in contrast to the Ely and Varaiya result—some underpricing of the acquired assets may have occurred. Gosnell, Hodgins, and MacDonald (1993) also investigated whether acquirers benefited from significant positive returns in federally assisted mergers of thrift institutions. Although they studied sales from a slightly earlier period—1989 through 1991—than Balbirer, Jud, and Lindahl (1992), they did not find evidence of positive abnormal returns. Where they did find wealth transfers, they attributed it to the implicit guarantee of continued operation granted by the regulator to the acquirer.

Nanda, Owers, and Rogers (1997) also investigated whether purchasers of assets from the RTC experienced extraordinary gains. To the contrary, Nanda, Owers, and Rogers (1997) found that most subsets of winning bidders—notably those who acquired former mutual institutions and properties

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[3] http://www.gao.gov/archive/1996/ai96123.pdf.

in the RTC's West category—had experienced persistently negative and abnormal returns. The only subset of transactions in which the acquirers earned significant gains was transfers of insured deposits. Nanda, Owers, and Rogers (1997) focused on the auctions of whole institutions, branch sales, and the transfer of insured deposits. In these transactions, the winning bidder acquired the assets and the liabilities of the institution or branch. Some of the sales included options from the RTC that "materially reduce the risk for the acquirers" (Nanda, Owers, and Rogers, 1997: 286). Their paper provides a good description of the RTC's resolution process using auctions. Their focus on the sale by auction, merger, and acquisition of whole and partial institutions by the RTC differs from our article, which focuses specifically on the sales prices of REO properties by the RTC. Another difference is that they analyzed only publicly traded acquirers in RTC transactions in 1989 and 1990, while we analyze all sales of REO properties for RTC's entire existence. In our sample, the final property dispositions occurred in 2005, which was 16 years after the RTC was established.

Nearly from the beginning of the RTC, politicians expressed concern that the RTC was selling assets too cheaply. The *Economist* (1991) reported on the political difficulties that the RTC faced in its early days to obtain government funding after its initial sales of failed institutions were at cents on the dollar. Lincoln, the savings and loan institution owned by Charles Keating, which had assets of \$5 billion at its peak, sold for only \$12 million.[4] The sale of assets at very low prices caused an outcry for more careful oversight of future RTC sales.

In an examination of distressed commercial real estate assets that the FSLIC sold in the late 1980s, Curry, Blalock, and Cole (1991) determined that the average rate of recovery was 64 percent. They found that local market conditions, the difficulty of management, and disposition and write-downs before the FSLIC was declared insolvent were the primary determinants of the recovery rate.

In a related strand of literature, Lea and Thygerson (1994) and Benveniste et al. (1994) developed models for maximizing asset recovery in the context of RTC-style resolution. Lea and Thygerson created a set of optimal disposition rules based on multiperiod cash flow maximization. They concluded that liquid assets and retail deposit franchises needed to be sold as quickly as possible; performing illiquid assets needed to be securitized with seller financing from the RTC, and nonperforming illiquid assets needed to be sold with equity-participating loans from the RTC (Lea and Thygerson, 1994). Benveniste et al. (1994) concluded that the RTC would maximize its returns by retaining full or partial ownership of the assets for risk-sharing purposes while placing managerial control of distressed assets in the private sector.

The most comprehensive study of RTC recovery rates, *Managing the Crisis: The FDIC and RTC Experience, 1980–1994* (FDIC, 1998), was published by the FDIC in an inhouse analysis of its experience selling the assets of the institutions it acquired from 1980 through 1994. The study addressed several of the areas we focus on in the present article. In particular, the RTC was concerned about

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[4] Charles Keating served 5 years in prison for his mismanagement of the Lincoln Savings and Loan Association. Five senators—Alan Cranston (D-Calif.), Dennis DeConcini (D-Ariz.), John Glenn (D-Ohio), John McCain (R-Ariz.), and Donald Riegle (D-Mich.)—were accused of corruption in 1989 after their intervention into an investigation of Lincoln by the Federal Home Loan Bank Board (FHLBB). The FHLBB subsequently backed off taking action against Lincoln.

public perception of a fire-sale mentality or "dumping" of assets from the start. As a result, the FIRREA legislation that established the RTC precluded the sale of real estate assets for less than 95 percent of market value, which was defined as appraised value. This requirement caused initial sales to be very slow, but FIRREA was amended in 1991 to lower the bar for sales to be not less than 70 percent of the appraised value (FDIC, 1998). The RTC had to dispose of all of the assets held by the institutions it acquired. These assets included not only real estate but also collateral for loans that included everything from wine cellars to bull sperm.[5] In the present article, we focus on REO properties or "owned real estate" (ORE).

> Although ORE sales represented a small percentage of total assets for both the FDIC and the RTC, their disposition was highly visible and attracted much public attention. The FDIC and the RTC were criticized for holding properties too long or selling below market value and adversely affecting real estate markets. (FDIC, 1998: 305)

The FDIC's *Managing the Crisis* (1998) reports the sales price as a percentage of book value for sealed bid loan sales by the FDIC from 1986 through 1994 (FDIC, 1998).

Exhibit 1 shows recovery ratios ranging from 31.5 percent in 1988 to 79.5 percent in 1992 for loan sales that include both performing loans and NPLs.

> The RTC, more so than the FDIC, found itself with an extraordinary volume of assets. As a result, unlike the FDIC, which up to a point was able to take the assets in, manage them for a short period, clean them up, and then sell them, the RTC generally did not have the luxury of time and would market assets without much prior due diligence. For that reason and because the assets held by the RTC were, on the whole, of a lesser quality, the FDIC was generally able to receive a better sales price. (FDIC, 1998: 331)

Exhibit 1

FDIC Sealed Bid Loan Sales, by Year

Year	Loans Sold (N)	Book Value ($ thousands)	Estimated Value ($ thousands)	Sales Price ($ thousands)	Sales Price As a Percentage of Book Value (%)
1986	128,779	341,983	156,606	177,993	52.1
1987	91,123	860,360	331,061	303,338	35.3
1988	71,865	875,419	315,490	276,061	31.5
1989	28,284	493,132	213,597	210,778	42.7
1990	106,668	1,341,397	673,515	645,596	48.1
1991	143,462	2,119,000	1,413,000	1,452,000	68.5
1992	96,529	4,094,093	3,157,408	3,253,847	79.5
1993	136,347	5,386,787	3,338,579	3,332,402	61.9
1994	63,780	4,562,358	2,608,154	2,654,237	58.2
Total/average	**866,837**	**20,074,529**	**12,207,420**	**12,306,252**	**61.3**

FDIC = Federal Deposit Insurance Corporation.

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[5] To be fair, it was actually a bull sperm bank. See Gravino (1993).

The RTC structured transactions with input from investors in which they pooled packages of loans by specific products, such as office buildings, nursing homes, and hotels and motels, or by geographic location. These packages were offered for competitive bidding in pools with book values ranging from $100 million to $150 million. The RTC also offered financing from 2-year bridge loans to 7-year fixed-payment loans. The values recovered from these transactions ranged from 46.6 percent in 1992 to 62.4 percent in 1991.[6]

Although we focus on sales of REO properties, most of the RTC's sales were loans (both performing loans and NPLs) rather than directly owned real estate. The RTC extended its representations and warranties to conform with those stipulations customarily granted in the secondary mortgage market, including coverage for loan documentation deficiencies that authorized repurchase or substitution of another qualified loan if a defect was found that was adverse to the buyer. In general, REO property sales carried less risk for potential buyers than loan sales, because title to the property was already vested in the RTC. Nevertheless, our investigation of sales price ratios reveals that the market still had considerable real estate risk, as evidenced by the sizable discounts that purchasers paid relative to the gross loan balances.

Data and Results

Our data include all the REO dispositions from financial institutions acquired by the RTC. Data were acquired through Freedom of Information Act (FOIA) requests (FOIA requests #09-1094 and 09-1537) and cover 4,117 liquidated institutions and 26,079 individual properties. We received administrative data from the RTC's internal systems; any errors reflect errors in its system.

The data from the RTC include a number of characteristics of the asset being liquidated. For 25,423 of the individual properties we observe the type of property (variable aset_prop_typ_cde in the RTC's system). We create bucket categories 'Single Family Residential' (SFRT), 'Apartment' (APTT), 'Industrial' (IND), 'Land' (L), 'Office' (OFF), and 'Retail' (RE).

We also observe the eventual asset sale price ('aset_sale_prc_amt') and the liquidation date of the asset. Our liquidation ratio is based on the ratio of the asset sale price to the Asset Gross Balance Amount ('aset_gros_bal_amt'), which is taken from the RTC's 'ORE_CollateralAppraisal' dataset within its ORE master file. The Asset Gross Balance Amount is the total balance as carried on the servicer's books for the FDIC and other participating parties. This amount creates a ratio of sale price to the total loan balance, which we truncate at 5. We also drop properties for which the eventual sale price is not observed or is listed as being less than zero, and we drop properties for which the Asset Gross Balance Amount is less than $10,100.[7] These property drops leave 18,967 properties in our sample.

Although we do not observe the location of the property, we observe the location of the financial institution that was taken over and liquidated through the RTC. We assume that the properties are in the same census division as the liquidated financial institution. We apply the nine-group

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[6] Recovery ratios were 100.2 percent in 1994 and 71.6 percent in 1990, but these years had only 1 and 2 transactions, respectively, whereas the number of transactions from 1991 through 1993 ranged from 28 to 32 per year (FDIC, 1998).

[7] A number of properties have Asset Gross Balances, which were coded with very low numbers.

census divisions. Of the 18,967 properties for which we observe the liquidation price, 9,256 (49 percent) are mapped to financial institutions located in the West South Central division: Arkansas, Louisiana, Oklahoma, and Texas.

Exhibit 2 shows the count of properties liquidated, by type of property, for the primary property types. The sample is dominated by two categories: Land and Single-Family Residential properties. The Land category includes improved and unimproved land, and the Single-Family Residential category includes one-family and two-unit structures. Structures with three or more units are included in the Apartment category. Of the 17,771 properties in these primary categories, 6,120 are land and 7,125 are single-family residential. The remainder includes 2,015 office buildings, 1,173 apartment buildings, 728 retail buildings, and 610 industrial buildings.

Exhibit 2 shows that office sales occur somewhat sooner than average, while industrial and apartment sales occur a little later in the RTC's operating years. Single-family residential and land sales dominate and tend to follow the total sales trend.

Exhibit 3 shows the average recovery ratio, by type of property and year. Across the entire sample, the average recovery ratio is 77.4 percent. The Land category has an average recovery ratio of 63.6 percent, which is the outlier among the categories of property. The recovery ratio for the other categories of property range from 74.0 percent for Office to 94 percent for Industrial.

Exhibit 2

Count of Properties Liquidated, by Year of Disposition and Type

Year	Apartment (APTT)	Industrial (IND)	Land (L)	Office (OFF)	Retail (RE)	Single-Family Residential (SFRT)	Total
1988	10	3	69	59	0	80	221
1989	15	2	102	49	0	75	243
1990	17	2	238	84	1	241	583
1991	29	4	502	174	16	535	1,260
1992	145	61	903	382	132	1,045	2,668
1993	268	199	1,777	547	205	1,704	4,700
1994	177	141	974	254	157	1,203	2,906
1995	181	105	527	192	94	827	1,926
1996	148	44	334	96	61	583	1,266
1997	98	27	311	92	31	378	937
1998	49	10	224	34	8	210	535
1999	30	6	104	8	9	108	265
2000	2	2	26	16	4	52	102
2001	1	2	6	7	1	22	39
2002	0	1	8	9	3	34	55
2003	2	1	6	4	1	16	30
2004	1	0	8	6	3	5	23
2005	0	0	1	2	2	7	12
Total	**1,173**	**610**	**6,120**	**2,015**	**728**	**7,125**	**17,771**

Notes: Apartment includes properties with at least three units. Land includes both improved and unimproved land. Single-family residential includes single-family and two-family properties. Data are taken from the Resolution Trust Corporation's internal systems and include only bank-owned real estate for which the eventual liquidation price is observed and present in its systems.

Exhibit 3

Average Recovery Ratio of Properties Liquidated, by Year of Disposition and Type

Year	Apartment (APTT)	Industrial (IND)	Land (L)	Office (OFF)	Retail (RE)	Single-Family Residential (SFRT)	Total
1988	0.785	—	0.471	0.685	—	0.856	0.681
1989	0.695	—	0.620	0.615	—	0.900	0.709
1990	0.792	—	0.323	0.440	—	0.592	0.467
1991	0.988	0.400	0.290	0.366	0.639	0.619	0.461
1992	1.143	1.346	0.663	0.830	1.106	1.124	0.931
1993	0.791	0.999	0.700	0.859	0.899	0.894	0.815
1994	0.731	0.831	0.677	0.802	0.753	0.861	0.779
1995	0.749	0.802	0.679	0.663	0.774	0.843	0.766
1996	0.627	1.059	0.713	0.734	0.795	0.923	0.817
1997	0.524	0.685	0.646	0.724	1.160	0.704	0.683
1998	0.605	0.701	0.734	0.779	0.488	0.777	0.738
1999	0.701	1.221	0.699	0.893	1.058	0.827	0.782
2000	—	0.649	0.556	0.522	1.183	1.143	0.899
2001	—	—	0.683	0.348	—	1.132	0.905
2002	—	—	0.946	1.277	—	1.129	1.075
2003	—	—	0.875	0.950	—	0.696	0.780
2004	—	—	0.745	0.730	—	0.824	0.723
2005	—	—	—	—	—	0.993	1.240
Total:							
Mean ratio	0.771	0.937	0.636	0.742	0.880	0.876	0.774
SD of ratio	0.736	0.826	0.686	0.761	0.761	0.695	0.719
Count	1,173	610	6,120	2,015	728	7,125	17,771
SE of mean	0.021	0.033	0.009	0.017	0.028	0.008	0.005

SD = standard deviation. SE = standard error.

Notes: Apartment includes properties with at least three units. Land includes both improved and unimproved land. Single-family residential includes single-family and two-family properties. Data are taken from the Resolution Trust Corporation's internal systems and include only bank-owned real estate for which the eventual liquidation price is observed and present in its systems.

From 1990 through 1991, the RTC had the lowest recovery ratios (46.0 percent) overall. Land and office recovery ratios were especially low in 1991, at 29.0 and 36.6 percent, respectively, and apartment and retail recovery ratios were 98.8 and 63.9 percent, respectively. After increasing to 93.1 percent in 1992, recovery ratios peaked again in 1996 at 81.7 percent. In the latter part of the 1990s, the nationwide economic recovery was well under way. Average recovery ratios were generally 80.0 percent or higher. Sales toward the end of the RTC's operations were fewer in number and included some particularly distressed properties that no buyers had wanted previously.[8]

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[8] The office recovery ratio in 1999 dropped to 46 percent, but the ratios in 1998 and 2000 were 97 and 111 percent, respectively. One large sale of distressed property (possibly vacant or partially completed) can significantly affect the average recovery ratio for the year.

It is important to note that the average ratios for a number of property types are more than 1.0 in several years, especially for the Single-Family Residential and Retail categories. This result is not surprising because many of the REO assets were of high quality and, as real estate markets improved, the RTC was able to sell the assets for more than their loan balances (Asset Gross Balance Amounts) before foreclosure.

Exhibit 4 shows the divisional distribution of the asset dispositions in the sample. Nearly one-half of the asset sales are in the West South Central census division, which includes the hard-hit states of Arkansas, Louisiana, Oklahoma, and Texas. The New England division accounts for more than one-fourth of the sample, and the Pacific division accounts for about 8 percent.

Through the first 3 years of the sales in our sample (1988 through 1990), nearly all of the sales are properties acquired in the liquidation of financial institutions in the West South Central census division. One-fourth of the asset sales occur in 1993, and sales tail off until the end of the RTC's dispositions in 2005.

Sales in the New England division lag slightly behind sales in the West South Central division, and sales in the Pacific and South Atlantic divisions occur even later, with a higher proportion occurring between 1997 and 1999.

Exhibit 5 shows the average recovery ratios by time period and by division. The West South Central and East South Central divisions see much lower recovery ratios (71.2 and 75.5 percent, respectively) than the other divisions in the sample. The highest recovery ratios occur in the Middle Atlantic and Mountain divisions, where they exceed the loan values: 1.05 and 1.0. After the West South Central division, the New England division has the second highest number of sales (5,265) and its asset recovery ratio is 79.6 percent. It appears to benefit from selling assets later in the 1990s, with recovery ratios well more than 1.0 from 2000 through 2002.

Exhibit 6 shows the average recovery ratios by division and by type of property. The lower observed recovery ratios in the West South Central division reflect two factors: (1) the properties liquidated in that division are disproportionately in the Land category, with a recovery ratio of only 58.8 percent; and (2) recovery ratios in the Office and residential categories, which have the next highest counts, were lower than in the other divisions.

Exhibit 7 shows the distribution of liquidations by time period and by method of disposal. One-half of the sales use brokers, and the remainder use open auctions, sealed auctions, and liquidators.

Exhibit 8 shows recovery ratios by method of disposal. Ratios are highest for the broker-sold properties (88.9 percent) and lowest for properties sold at auction (63.7 percent).

Exhibit 4

Count of Properties Liquidated, by Year of Disposition and Location

Year	EASTNC	EASTSC	MIDATL	MOUNTAIN	NEWENG	PACIFIC	SOUTHATL	WESTNC	WESTSC	TOTAL
1988	0	0	0	0	0	0	0	0	243	243
1989	0	0	1	0	0	0	0	0	258	259
1990	0	0	32	1	2	0	0	0	606	641
1991	0	0	43	0	160	0	0	0	1,188	1,391
1992	71	31	74	8	632	8	35	85	1,843	2,787
1993	74	25	162	47	1,578	230	240	91	2,612	5,059
1994	22	4	245	51	1,079	274	98	72	1,202	3,047
1995	15	9	159	25	863	359	94	81	456	2,061
1996	4	1	75	71	437	380	59	34	261	1,322
1997	15	13	119	16	263	179	114	29	252	1,000
1998	9	7	51	8	125	88	88	15	170	561
1999	1	6	67	8	74	12	34	4	95	301
2000	2	1	8	1	26	21	24	4	28	115
2001	7	7	5	0	8	6	4	2	6	45
2002	26	0	1	0	16	0	0	0	23	66
2003	11	12	1	0	0	0	0	0	8	32
2004	3	5	1	3	2	0	7	0	3	24
2005	0	0	3	4	0	0	4	0	2	13
Total	**260**	**121**	**1,047**	**243**	**5,265**	**1,557**	**801**	**417**	**9,256**	**18,967**

EASTNC = East North Central division. EASTSC = East South Central division. MIDATL = Middle Atlantic division. MOUNTAIN = Mountain division. NEWENG = New England division. PACIFIC = Pacific division. SOUTHATL = South Atlantic division. WESTNC = West North Central division. WESTSC = West South Central division.

Notes: The four census regions and nine divisions are Region 1, Northeast (NEWENG and MIDATL); Region 2, Midwest (EASTNC and WESTNC); Region 3, South (SOUTHATL, EASTSC, and WESTSC); Region 4, West (MOUNTAIN and PACIFIC). Data are taken from the Resolution Trust Corporation's internal systems and include only bank-owned real estate for which the eventual liquidation price is observed and present in its systems.

Exhibit 5

Recovery Ratio of Properties Liquidated, by Year of Disposition and Location

Year	EASTNC	EASTSC	MIDATL	MOUNTAIN	NEWENG	PACIFIC	SOUTHATL	WESTNC	WESTSC	TOTAL
1988	—	—	—	—	—	—	—	—	0.676	0.676
1989	—	—	—	—	—	—	—	—	0.693	0.697
1990	—	—	1.607	—	—	—	—	—	0.435	0.492
1991	—	—	2.037	—	1.268	—	—	—	0.293	0.459
1992	0.873	0.776	1.953	1.409	1.196	0.944	0.650	0.603	0.825	0.933
1993	0.866	0.763	1.091	1.074	0.734	0.889	0.775	0.699	0.848	0.818
1994	1.281	2.048	1.043	1.002	0.679	0.863	0.904	1.237	0.734	0.778
1995	0.707	0.837	0.792	1.058	0.671	0.785	0.862	1.115	0.847	0.771
1996	0.679	—	0.796	1.109	0.740	0.793	0.969	0.959	0.854	0.816
1997	0.359	0.398	0.693	0.764	0.713	0.691	0.683	0.754	0.654	0.681
1998	0.376	0.516	0.749	0.472	0.811	0.805	0.702	0.680	0.686	0.731
1999	—	1.066	0.852	0.585	0.841	0.561	0.683	0.152	0.755	0.775
2000	—	—	0.945	—	1.358	0.963	0.539	0.380	0.669	0.871
2001	0.426	0.312	0.583	—	1.846	0.933	0.606	—	1.289	0.905
2002	0.757	—	—	—	2.358	—	—	—	0.563	1.083
2003	0.735	0.841	—	—	—	—	—	—	0.684	0.790
2004	0.531	0.534	—	—	—	—	0.727	—	1.289	0.708
2005	—	—	—	0.623	—	—	0.246	—	1.781	1.211
Total:										
Mean ratio	0.811	0.755	1.053	1.007	0.796	0.808	0.774	0.871	0.712	0.774
SD of ratio	0.787	0.81	1.094	0.809	0.698	0.525	0.538	0.874	0.719	0.730
Count	260	121	1,047	243	5,265	1,557	801	417	9,256	18,967
SE of mean	0.049	0.074	0.034	0.052	0.010	0.013	0.019	0.043	0.007	0.005

EASTNC = East North Central division. EASTSC = East South Central division. MIDATL = Middle Atlantic division. MOUNTAIN = Mountain division. NEWENG = New England division. PACIFIC = Pacific division. SD = standard deviation. SE = standard error. SOUTHATL = South Atlantic division. WESTNC = West North Central division. WESTSC = West South Central division.

Notes: The four census regions and nine divisions are Region 1, Northeast (NEWENG and MIDATL); Region 2, Midwest (EASTNC and WESTNC); Region 3, South (SOUTHATL, EASTSC, and WESTSC); Region 4, West (MOUNTAIN and PACIFIC). Data are taken from the Resolution Trust Corporation's internal systems and include only bank-owned real estate for which the eventual liquidation price is observed and present in its systems.

Exhibit 6

Count and Average Recovery Ratio of Properties Liquidated, by Specific Divisions and Type of Property

Year	Apartment (APTT)	Industrial (IND)	Land (L)	Office (OFF)	Retail (RE)	Single-Family Residential (SFRT)	Total
West South Central division							
Count	231	353	4,118	936	418	2,656	8,712
Ratio	0.984	1.046	0.588	0.662	0.956	0.815	0.712
New England division							
Count	556	147	946	597	143	2,604	4,993
Ratio	0.649	0.727	0.685	0.812	0.671	0.885	0.801
Pacific division							
Count	191	49	358	115	66	694	1,526
Ratio	0.672	0.927	0.645	0.825	0.749	0.932	0.812
All other divisions							
Count	195	61	698	367	101	1,171	2,593
Ratio	0.965	0.823	0.851	0.807	0.951	0.962	0.907

Notes: The four census regions and nine divisions are Region 1, Northeast (New England and Middle Atlantic divisions); Region 2, Midwest (East North Central and West North Central divisions); Region 3, South (South Atlantic, East South Central, and West South Central divisions); Region 4, West (Mountain and Pacific divisions). Apartment includes properties with at least three units. Land includes both improved and unimproved land. Single-family residential includes single-family and two-family properties. Data are taken from the Resolution Trust Corporation's internal systems and include only bank-owned real estate for which the eventual liquidation price is observed and present in its systems.

Exhibit 7

Count of Properties Liquidated, by Year of Disposition and Liquidation Method

Year	Open Auction	Broker	Liquidator	Sealed Bid	Total
1988	63	81	53	24	221
1989	49	136	52	2	243
1990	116	253	49	11	583
1991	159	811	68	79	1,260
1992	357	1,962	177	127	2,668
1993	1,719	2,400	337	215	4,700
1994	1,029	1,409	242	216	2,906
1995	671	832	183	237	1,926
1996	140	781	112	229	1,266
1997	190	523	119	56	937
1998	169	260	61	41	535
1999	83	98	42	36	265
2000	3	45	25	23	102
2001	1	18	10	4	39
2002	0	13	40	1	55
2003	9	6	7	8	30
2004	0	10	12	0	22
2005	0	2	2	8	12
Total	4,758	9,640	1,591	1,317	17,770

Notes: Apartment includes properties with at least three units. Land includes both improved and unimproved land. Single-family residential includes single-family and two-family properties. Data are taken from the Resolution Trust Corporation's internal systems and include only bank-owned real estate for which the eventual liquidation price is observed and present in its systems.

Exhibit 8

Average Liquidation Ratio of Properties Liquidated, by Year of Disposition and Liquidation Method

Year	Open Auction	Broker	Liquidator	Sealed Bid	Total
1988	0.636	0.822	0.544	0.621	0.681
1989	0.533	0.803	0.621	—	0.709
1990	0.474	0.679	0.769	0.497	0.467
1991	0.293	0.569	0.681	0.299	0.461
1992	0.758	0.994	0.955	0.650	0.931
1993	0.666	0.934	0.832	0.759	0.815
1994	0.618	0.929	0.780	0.585	0.779
1995	0.636	0.868	0.863	0.707	0.766
1996	0.671	0.895	0.767	0.675	0.817
1997	0.630	0.798	0.525	0.372	0.683
1998	0.591	0.858	0.780	0.589	0.738
1999	0.725	0.909	0.644	0.849	0.782
2000	—	1.194	0.729	0.824	0.899
2001	—	1.239	0.920	0.675	0.905
2002	—	0.896	1.158	—	1.075
2003	0.800	1.057	0.384	0.895	0.780
2004	—	0.693	0.715	—	0.705
2005	—	—	—	1.171	1.240
Total:					
Mean ratio	0.637	0.889	0.787	0.648	0.774
SD of ratio	0.560	0.768	0.790	0.628	0.719
Count	4,758	9,640	1,591	1,317	17,770
SE of mean	0.008	0.008	0.020	0.017	0.005

SD = standard deviation. SE = standard error.

Notes: Apartment includes properties with at least three units. Land includes both improved and unimproved land. Single-family residential includes single-family and two-family properties. Data are taken from the Resolution Trust Corporation's internal systems and include only bank-owned real estate for which the eventual liquidation price is observed and present in its systems.

Discussion and Conclusion

Exhibits 9 and 10 summarize the recovery ratio trends over the life of the RTC. Exhibit 9 shows the mean recovery ratios by year for all REO property sales. The darker line is the mean, and the lighter lines represent the ± 2 standard error boundaries. Overall, the chart suggests that after a drop to less than 50 percent in 1990 and 1991, recovery ratios increase to 90 percent in 1992 and gradually fall back to 70 percent in 1997. The ratios increase again to a peak in 2002. The sales at the very end demonstrate a lot of variance but represent only a small number of sales.

The early asset sales in 1988 are the low-hanging fruit—sales of assets that were prime or for which buyers appear to be willing to pay high prices. The RTC initially was precluded from selling assets more than 5 percent less than the appraised value. The removal of this constraint in 1990 enabled a more rapid sales cycle and ushered major investors into the market. The recovery ratios rebounded

Exhibit 9

Recovery Ratios, by Year
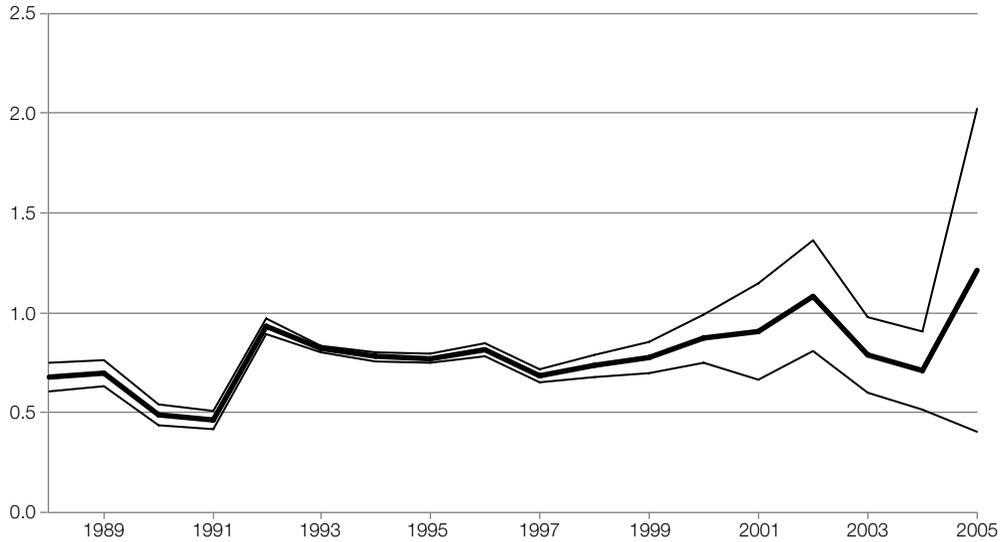
Note: Lighter lines show ± 2 standard deviations.

Exhibit 10

Recovery Ratios for Total Sample and West South Central Division, by Year
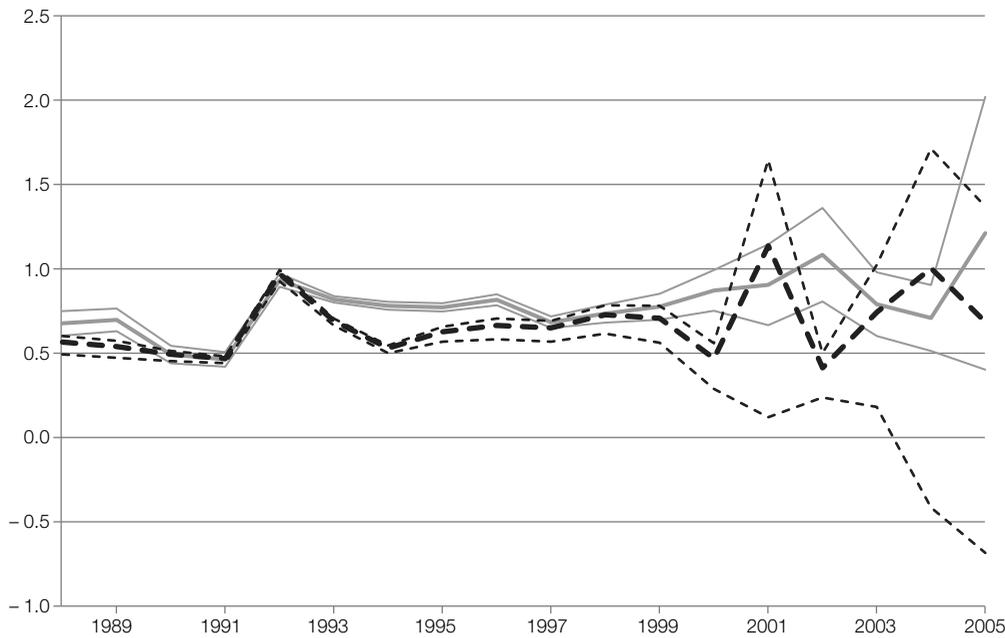
Notes: Lighter lines show ± 2 standard error bands. Solid lines indicate the total sample. Dashed lines indicate the West South Central division.

quickly to the mid-range of 70 to 90 percent, where they remained until 2002. The lighter lines show ± 2 standard deviations for the recovery ratios, which increase toward the end as the RTC was selling fewer assets.

Exhibit 10 compares the recovery ratios by year for the total sample with those of the West South Central division. This division had the largest number of asset sales and was the location of the earliest asset sales by the RTC.

In the rolling recession that characterized the S&L crisis, the West South Central division also experienced the earliest wave of the economic downturn and the collapse of the real estate market. Thus, the chart shows that the recovery ratios in the West South Central division virtually match the total sample ratios in the early years up until 1992. Ratios in the West South Central division were well below average from 1993 through 1996. After that, the ratios in this division bounce around, but the wider standard deviations of the means indicate that the number of asset sales also drops.

Exhibits 11a and 11b show the average house prices by division published as house price indexes (HPI) by the Office of Federal Housing Enterprise Oversight (OFHEO).[9] The exhibits show how the recession of the late 1980s through the early 1990s affected different divisions in different time periods. Although cycles among different property types, and especially between commercial and residential property, vary within the same division based on different economic forces, house prices indicate the state of the economic cycle in different divisions. The West South Central division suffered its collapse in the mid-1980s, but the downturn did not hit the coasts—the Pacific and New England divisions—until the early 1990s. House prices in the New England and Pacific divisions bottomed out in 1994, well after the hardest hit West South Central division was in recovery. Although recovery ratios depend entirely on the quality of individual assets, rising house prices in a division contribute to higher recovery ratios over time, especially for housing and land. This contribution is evident in the New England and Pacific divisions, where house prices increased dramatically after 1999.

In conclusion, the tables and graphs presented here provide a detailed picture of the RTC's experience in disposing of assets during its years of operation from 1988 to 2005. Our database focuses on REO properties of S&L institutions that the RTC took over in the aftermath of the S&L crisis in the mid-1980s. The REO properties represent a small part of the more than 490,000 real estate-related assets that the RTC acquired. Nevertheless, the RTC experience in disposing of the assets provides useful insight into the recent financial crisis and how best to deal with the mountain of NPLs and other assets clogging the banks.

The critical dilemma facing banks today is whether to unload their real estate assets at bargain prices or to hold on to them in hopes that future recoveries from asset sales will be higher. Unlike the S&L crisis, the banks have not been forced to take action by the government.[10] In fact, the

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[9] The HPI is a broad measure of the movement of single-family house prices. The HPI is a weighted, repeat-sales index, meaning that it measures average price changes in repeat sales or refinancing on the same properties. This information is obtained by reviewing repeat mortgage transactions on single-family properties in which mortgages have been purchased or securitized by Fannie Mae or Freddie Mac since January 1975 (http://www.fhfa.gov/Default.aspx?Page=81).

[10] The government has a variety of means to put pressure on banks to sell bad loans and REO, such as increasing the capital requirements for such assets or requiring banks to respond to negative audits by the Office of the Inspector General of the FDIC.

Exhibit 11a

Average House Prices, by Year and Census Division, Published by the OFHEO

Year	EASTNC	EASTSC	MIDATL	MOUNTAIN	NEWENG	PACIFIC	SOUTHATL	WESTNC	WESTSC
1988	137.95	138.20	232.89	123.45	290.33	176.81	160.04	128.55	110.46
1989	146.36	142.36	238.32	126.83	292.18	211.47	168.20	132.47	113.41
1990	151.85	143.18	231.36	129.18	269.70	217.50	168.34	133.22	113.81
1991	158.74	149.13	234.73	135.27	263.65	220.37	173.49	138.22	118.06
1992	164.89	153.98	238.80	142.45	260.66	217.32	177.15	142.36	122.08
1993	170.96	160.27	241.91	153.58	261.28	213.00	180.51	147.83	127.00
1994	179.37	167.75	233.85	167.33	252.85	205.92	180.71	155.58	128.90
1995	190.21	177.08	241.07	179.96	263.14	211.79	188.48	163.64	134.38
1996	199.69	184.07	241.84	187.62	267.42	214.15	192.73	170.32	137.49
1997	210.01	192.75	249.69	196.91	279.68	225.74	201.43	178.69	142.78
1998	218.77	202.13	259.85	205.04	297.68	241.96	210.70	187.31	149.94
1999	229.24	207.15	272.97	213.09	326.16	256.03	219.44	198.56	156.44
2000	243.01	215.14	294.46	227.63	366.52	284.43	233.92	212.95	164.48
2001	255.61	225.92	320.74	242.15	406.51	310.75	252.83	228.27	174.07
2002	266.62	233.33	354.42	252.42	454.46	344.84	271.24	242.37	181.14
2003	279.16	241.11	391.01	263.89	499.86	386.10	292.84	256.67	186.37
2004	294.71	253.10	441.05	293.51	559.46	465.61	332.35	273.47	194.76
2005	309.38	270.10	497.95	343.49	608.40	550.95	388.29	289.59	206.73

EASTNC = East North Central division. EASTSC = East South Central division. MIDATL = Middle Atlantic division. MOUNTAIN = Mountain division. NEWENG = New England division. OFHEO = Office of Federal Housing Enterprise Oversight. PACIFIC = Pacific division. SOUTHATL = South Atlantic division. WESTNC = West North Central division. WESTSC = West South Central division.

Notes: The four census regions and nine divisions are Region 1, Northeast (NEWENG and MIDATL); Region 2, Midwest (EASTNC and WESTNC); Region 3, South (SOUTHATL, EASTSC, and WESTSC); Region 4, West (MOUNTAIN and PACIFIC). Data are taken from the Resolution Trust Corporation's internal systems and include only bank-owned real estate for which the eventual liquidation price is observed and present in its systems.

Source: OFHEO (2013)

Exhibit 11b

Index of OFHEO House Prices, With 1988 = 100

Year	EASTNC	EASTSC	MIDATL	MOUNTAIN	NEWENG	PACIFIC	SOUTHATL	WESTNC	WESTSC
1988	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1989	106.10	103.01	102.33	102.74	100.64	119.60	105.10	103.05	102.67
1990	110.08	103.60	99.34	104.64	92.89	123.01	105.19	103.63	103.03
1991	115.07	107.91	100.79	109.57	90.81	124.64	108.40	107.52	106.88
1992	119.53	111.42	102.54	115.39	89.78	122.91	110.69	110.74	110.52
1993	123.93	115.97	103.87	124.41	89.99	120.47	112.79	115.00	114.97
1994	130.03	121.38	100.41	135.54	87.09	116.46	112.92	121.03	116.69
1995	137.88	128.13	103.51	145.78	90.63	119.78	117.77	127.30	121.65
1996	144.76	133.19	103.84	151.98	92.11	121.12	120.43	132.49	124.47
1997	152.24	139.47	107.21	159.51	96.33	127.67	125.86	139.00	129.26
1998	158.59	146.26	111.58	166.09	102.53	136.85	131.65	145.71	135.74
1999	166.18	149.89	117.21	172.61	112.34	144.81	137.12	154.46	141.63
2000	176.16	155.67	126.44	184.39	126.24	160.87	146.16	165.66	148.90
2001	185.29	163.47	137.72	196.15	140.02	175.75	157.98	177.57	157.59
2002	193.27	168.84	152.18	204.47	156.53	195.03	169.48	188.54	163.99
2003	202.36	174.46	167.89	213.76	172.17	218.37	182.98	199.67	168.72
2004	213.64	183.14	189.38	237.76	192.70	263.34	207.67	212.73	176.32
2005	224.27	195.44	213.81	278.24	209.55	311.61	242.62	225.27	187.15

EASTNC = East North Central division. EASTSC = East South Central division. MIDATL = Middle Atlantic division. MOUNTAIN = Mountain division. NEWENG = New England division. OFHEO = Office of Federal Housing Enterprise Oversight. PACIFIC = Pacific division. SOUTHATL = South Atlantic division. WESTNC = West North Central division. WESTSC = West South Central division.

Notes: The four census regions and nine divisions are Region 1, Northeast (NEWENG and MIDATL); Region 2, Midwest (EASTNC and WESTNC); Region 3, South (SOUTHATL, EASTSC, and WESTSC); Region 4, West (MOUNTAIN and PACIFIC). Data are taken from the Resolution Trust Corporation's internal systems and include only bank-owned real estate for which the eventual liquidation price is observed and present in its systems.

government stimulus funds under the Troubled Asset Relief Program, or TARP, rather than leading to an increase in lending by the banks, have been used to bolster the banks' balance sheets and have enabled the banks to defer selling off their troubled real estate assets. One key trend we hoped to understand from the RTC database was whether recovery ratios increased significantly over time. The data do show a significant positive trend in the recovery ratios between the low points of 1991 and 2000, which marked the end of the bulk of the sales.[11] Although we do not have information about the condition or quality of the REOs being sold, the data do support the theory that, after the sale of REO assets began in earnest in 1991, recovery ratios quickly recovered and continued to increase over time. We conclude that, although more research is needed that takes into account the condition of the assets, our article provides evidence in support of speeding up sales of troubled assets. As long as the properties remain sitting idly on the books of the banks, they impede the banks' ability to make new loans and continue to depress real estate prices as potential investors remain on the sidelines waiting for the surge of distressed asset sales that have yet to come to market.

Acknowledgments

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[11] The regression coefficient is significant and positive for the recovery ratio over time when we perform a median regression.

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Measuring Spatial Mismatch Between Homelessness and Homeless Resources With a Theil Index and Statistical Inference

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The views expressed in this article are those of the author and do not represent the official positions or policies of the Office of Policy Development and Research, the U.S. Department of Housing and Urban Development, or the U.S. government.

Abstract

In this article, I employ a Theil (1972) index to measure the spatial mismatch of beds available to shelter the homeless and homeless populations across Continuum of Care regions. I demonstrate a method for statistical inference using the Theil index based on asymptotic results, focusing mainly on testing for across-state differences. Estimates reveal large differences across states in the spatial mismatch between homeless resources and homeless populations. Simulations indicated that state inferences are better for states that have a relatively larger estimated spatial mismatch and relatively larger total count of beds available to shelter the homeless.

The purpose of this article is to demonstrate a method for measuring the spatial mismatch between homelessness and resources for the homeless. Widely used to measure economic inequality (for example, see Conceição and Galbraith, 2000), Theil indices (Theil, 1972, 1967) have also been used extensively to measure racial segregation (for example, see Wong, 2003) and other inequalities such as disparities in health measures (Borell and Talih, 2011). Wilson (2011a, 2011b) previously introduced *Cityscape* readers to a Theil index.

The superiority of Theil indices compared with other inequality measures, such as the Gini coefficient, is well established based on their mathematical properties (for example, see Reardon and Firebaugh, 2002), yet no consensus exists regarding their use for statistical inference (for one approach, see Cowell and Victoria-Feser, 2003).

This article demonstrates statistical inference with a Theil index based on asymptotic results using a data example to measure the spatial mismatch between resources available to shelter the homeless and homeless populations.

The geographic units on which the spatial mismatch measure is based are 421 Continuum of Care (CoC) regions in the 50 states and Washington, D.C. CoCs are a consortium of providers within defined areas (within states) that provide a broad range of housing and services to homeless populations. Maps of CoC regions are available on the U.S. Department of Housing and Urban Development's (HUD's) CoC Maps website (HUD, 2013a). For example, exhibit 1 is a map of the 12 CoCs in North Carolina for 2012.

Exhibit 1

North Carolina CoC Regions
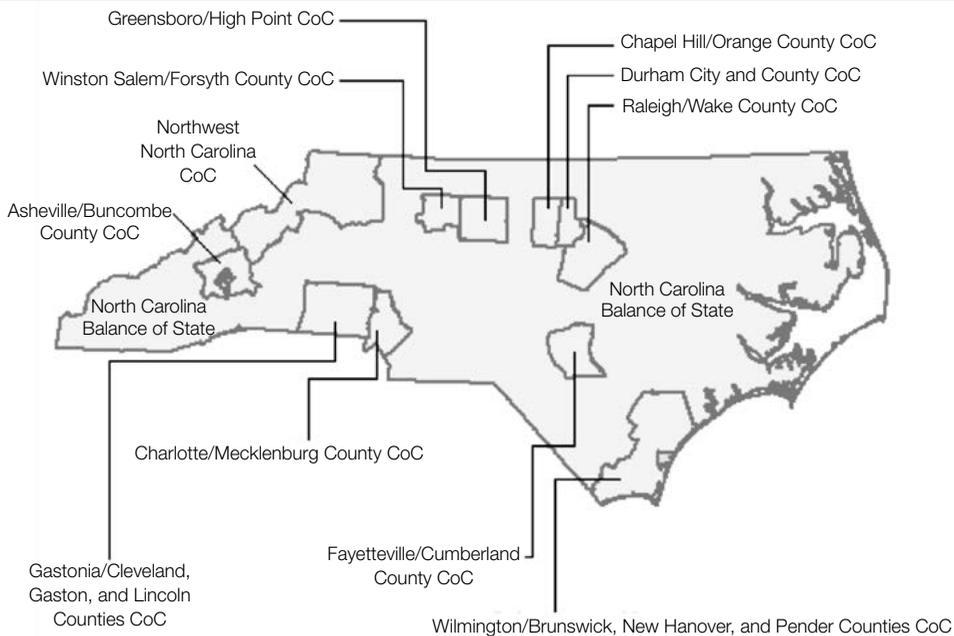
CoC = Continuum of Care.

Source: http://www.hudhre.info/index.cfm?do=viewCocMaps&stateAbbreviation=NC&yr=2012#tab

HUD's CoC Program is the largest single source of federal funding used to reduce U.S. homelessness.[1] HUD's CoC Program provides assistance to local CoCs through homeless assistance programs. In 2012, HUD awarded $1.7 billion to local CoCs in the United States, Puerto Rico, and other U.S. territories. The corresponding estimated homeless population in 2012 was 633,782, of which 390,155 were estimated to be sheltered. I use bed counts by CoC as a measure of available resources. In 2012, an estimated 476,119 beds were available to shelter the homeless in the United States, Puerto Rico, and other U.S. territories.

The main focus of this analysis is to test for differences in spatial mismatch of homeless resources and homeless populations across states. Estimates reveal large spatial mismatch differences across states. Simulations indicate inferences based on asymptotic approximations are more accurate for states with (1) greater estimated spatial mismatch, (2) greater total counts of beds available to shelter the homeless, and (3) greater bed counts per CoC. I also demonstrate how the technique can be adapted to test for significant differences within a single state.

Homelessness and Homeless Resources

I measure spatial mismatch by examining total beds and total homeless populations by CoC. My measure could be extended to model the spatial mismatch of categories of homeless resources with categories of homeless populations.[2]

Data Sources

Data on homeless population estimates by CoC for this analysis are from HUD's 2012 CoC Homeless Populations and Subpopulations Reports (HUD, 2013c). These reports use Point-in-Time (PIT) data provided to HUD by CoCs when they apply to HUD for housing assistance. PIT data provide count estimates of homeless populations (sheltered and unsheltered) and homeless subpopulations (for example, number of individuals, number of people in families, number of chronically homeless, and number of veterans) on a single night within the last 10 days in January.

Data on the number of beds available to shelter the homeless population by CoC for this analysis are from HUD's 2012 CoC Housing Inventory Count (HIC) Reports (HUD, 2013d). HUD's HIC Reports are based on data provided to HUD by CoCs. HIC data collection is also conducted on a single night within the last 10 days in January. The HIC data contain information on the number of available beds and housing units dedicated to homeless populations. The HIC data also capture information on housing categories (for example, emergency shelter, transitional housing, number of beds for households without children, number of beds for households with children, and number of permanent beds for the chronically homeless), along with a measure of unmet housing needs.

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[1] See HUD (2013b) for information about CoCs and HUD's CoC Program. See Burt et al. (2002) for an evaluation of HUD's CoC Program.

[2] Performing a cluster analysis using New York City and Philadelphia administrative data, Kuhn and Culhane (1998) categorized homeless populations into three groups: transitional, episodic, and chronic. They found large demographic differences and differences in rates of mental health, substance abuse, or medical problems across the groups. They also found large differences across groups in how homeless resources were used. The chronically homeless accounted for 10 percent of shelter users but consumed one-half of total shelter days.

Data Limitations

Although HUD provides guidance for collecting PIT and HIC data (HUD, 2013e), compliance among CoCs may vary. Therefore, the reliability and consistency of these data may also vary among CoCs.

Another limitation of the data is that no national source of data on the distribution of homeless populations and homeless resources within CoCs exists. Six low-population states (Delaware, Montana, North Dakota, Rhode Island, South Dakota, and Wyoming) and Washington, D.C., comprise a single CoC region. As such, it is not possible to accurately measure the spatial mismatch of homeless resources and homeless populations within these jurisdictions.

Further, in rural areas, large distances can exist between homeless populations and homeless resources.[3] Hence, spatial mismatch may be greater within rural CoCs, such as Wyoming, compared with more urban CoCs, such as Washington, D.C.

Spatial mismatch measurements in the 44 states that have multiple CoCs are limited to measurements made across CoCs. In general, measurement should be more accurate as total homeless resources or total homeless populations decrease relative to the number of CoCs within a state. Among the 44 states that had multiple CoCs in 2012, the ratio of the estimated homeless population to the number of CoCs varied from 443 homeless people in Virginia, which had 19 CoCs, to 5,589 homeless people in Colorado, which had 3 CoCs.

Spatial Mismatch

John Kain's pioneering research (1968, 1964) focused heavily on the spatial mismatch of job seekers and available jobs. (For a recent example, see Li, Campbell, and Fernandez, 2013. For reviews, see Kain, 2004; Ihlanfeldt and Sjoquist, 1998; and Kain, 1992.) Kain's (1968) spatial mismatch hypothesis posited that—

> … the suburbanization of jobs and involuntary housing market segregation have acted together to create a surplus of workers relative to the number of available jobs in submetropolitan areas where blacks are concentrated. (Ihlanfeldt and Sjoquist, 1998: 849)

Studies of labor market spatial mismatch have used various measures. Andersson et al.'s (2011) analysis was based on counts of accessible jobs and job searchers by census tract and travel time. Li, Campbell, and Fernandez (2013) used racial and skill-based dissimilarity indices computed by census tract.

Theil Indices

Theil (1972, 1967) proposed various related inequality indices (for a discussion, see Frenken, 2007). Reardon and Firebaugh (2002) compared numerous measures of multigroup disproportionality (including a Theil [1972] index, the dissimilarity index, and the Gini index) and found a Theil (1972) index was "the most conceptually and mathematically satisfactory" (Reardon and Firebaugh, 2002: 33).

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[3] For a discussion of rural homelessness, see Robertson et al. (2007).

In a spatial context, a Theil index can be used to measure disproportionality across geographic units. Novotný (2007) examined the use of a Theil index to measure income inequality in spatially defined subgroups.

My index is based on Theil's (1972: 59) index, commonly referred to as Theil's T index, or simply "the Theil index" (Conceição and Ferreira, 2000). Let π_i represent the share of beds available to shelter the homeless in CoC i, w_i represent the share of the homeless population in CoC i, w_{min} represent the minimum of the w_is, and let J represent the total number of CoCs. I will define a normalized Theil index Tn by the following equation:

$$Tn = \frac{\sum_1^J \pi_i \log\left(\frac{\pi_i}{w_i}\right)}{\log\left(\frac{1}{w_{min}}\right)}, \tag{1}$$

where log denotes the natural logarithm. The numerator of equation (1) is Theil's T, which is the weighted summation of the logarithms of the bed share to homeless share ratios; weights are the bed shares. The denominator is a normalizing constant to constrain the index's maximum value to 1.

Thus, if the bed share equals the homeless share in each CoC, then the index equals 0 and indicates no spatial mismatch. That is, the geographic location of beds and the homeless population are matched perfectly. If all beds are in the CoC with the smallest share of the homeless population, then the index equals 1. In other words, maximum spatial mismatch exists between resources for combating homelessness and homeless populations.

Statistical Inference With a Theil Index

Exact inference with a Theil index requires derivation of its probability distribution, which presents statistical challenges. Cowell and Victoria-Feser (2003) presented distribution-free (nonparametric) approaches. Martinez-Camblor (2007) suggested approximate inference, treating a Theil income inequality index as asymptotically normal. Biewen and Jenkins (2006) derived variance estimators for Theil-type indices with complex survey data.

Results for Theil indices based on random variables with continuous distributions, such as income (Martinez-Camblor, 2007) or large population counts with distributions that can safely be treated as continuous, may not hold for Theil indices based on discrete random variables such as bed counts.

The following method is used for approximate inference based on asymptotic results assuming the distribution of the number of beds among CoCs follows a multinomial distribution. Let $X = (X_1, X_2, \ldots, X_J)$ represent a vector of cell counts following a multinomial (n, π) distribution, where $\pi = (\pi_1, \pi_2, \ldots, \pi_J)$ is a vector of cell probability parameters summing to 1. Also let $p = (p_1, p_2, \ldots, p_J)$ represent a vector of sample cell proportions where $p_i = X_i / \sum_i^J X_i$. Based on the multivariate central limit theorem (Rao, 1973: 128), Agresti (2013: 590) proved the asymptotic normality of p.

Let $g(p)$ be a differentiable function of the sample cell proportions, and let $\varphi_i = \partial g / \partial \pi_i$ denote $\partial g / \partial p_i$ (the partial derivative of g with respect to p_i) evaluated at $p = \pi$. Using the delta method (for example, see Casella and Berger, 2002: 243–245), Agresti (2013: 590) derived the asymptotic variance of $g(p)$ to be

$$\sum_1^J \pi_i \varphi_i^2 - \left[\sum_1^J \pi_i \varphi_i\right]^2. \tag{2}$$

From (1),

$$\partial Tn / \partial \pi_i = \frac{\log \left(1 + \frac{\pi_i}{w_i}\right)}{\log \left(\frac{1}{w_{min}}\right)} \ . \tag{3}$$

Substituting (3) for φ_i in (2) (and defining cells as CoCs) results in an asymptotic variance formula for *Tn*:

$$V = \frac{\sum_i^J \pi_i \left[\log \left(1 + \frac{\pi_i}{w_i}\right)\right]^2 - \left[\sum_i^J \pi_i \log \left(1 + \frac{\pi_i}{w_i}\right)\right]^2}{\left[\log \left(\frac{1}{w_{min}}\right)\right]^2} \ . \tag{4}$$

The model treats the homeless population shares (w_is) as known constants and the bed shares (π_is) as unknown parameters. We can obtain a Theil index estimate $\widehat{Tn}$ by substituting the sample bed shares for the π_is into (1). We can obtain an asymptotic variance estimate $\widehat{V}$ by substituting the sample bed shares for the π_is into (4).

An approximate 95-percent confidence interval for *Tn* is

$$\widehat{Tn} \pm 1.96 \sqrt{\frac{\widehat{V}}{n}} \ , \tag{5}$$

where *n* is the total sample bed count. We set any estimated lower confidence limits less than 0 to 0.

We can test whether the difference between two independent estimates of *Tn* are statistically significant at the .05 level by checking whether their 95-percent confidence intervals overlap. We can perform a more general *Z* test using the following formula:

$$Z = \frac{(\widehat{Tn_1} - \widehat{Tn_2}) - D_0}{\sqrt{\frac{\widehat{V_1}}{n_1} + \frac{\widehat{V_2}}{n_2}}} \ , \tag{6}$$

where 1 and 2 denote the independent samples and D_0 denotes the difference under the null hypothesis.

Estimates

Measured across 421 CoCs in the 50 states and Washington, D.C., the national estimated *Tn* equals .0108 with a 95-percent confidence interval of (.0107, .0110). The 95-percent confidence interval excludes 0; thus, we can reject the null hypothesis that beds and homeless populations are distributed evenly across all CoCs. The fact that the lower confidence limit is close to 0 suggests that the total amount of mismatch across CoCs in the United States is quite modest.

Exhibit 2 reports a linked micromap (for example, see Carr and Pickle, 2010) with Theil indices computed by state. Mast (2013) previously introduced *Cityscape* readers to linked micromaps. The first column of data in exhibit 2 contains state Theil index estimates reported in descending order, with 95-percent confidence intervals. The second column of data in exhibit 2 reports the number of CoCs per state.

The seven observations with only one CoC have an estimated Theil index equal to 0 and an estimated variance of 0. This variance estimate does not imply that no spatial mismatch exists within these six states and Washington, D.C. Rather the 0 estimates reflect a lack of data on the distribution of beds and homeless counts within CoCs.

Exhibit 2

State Theil Index Estimates
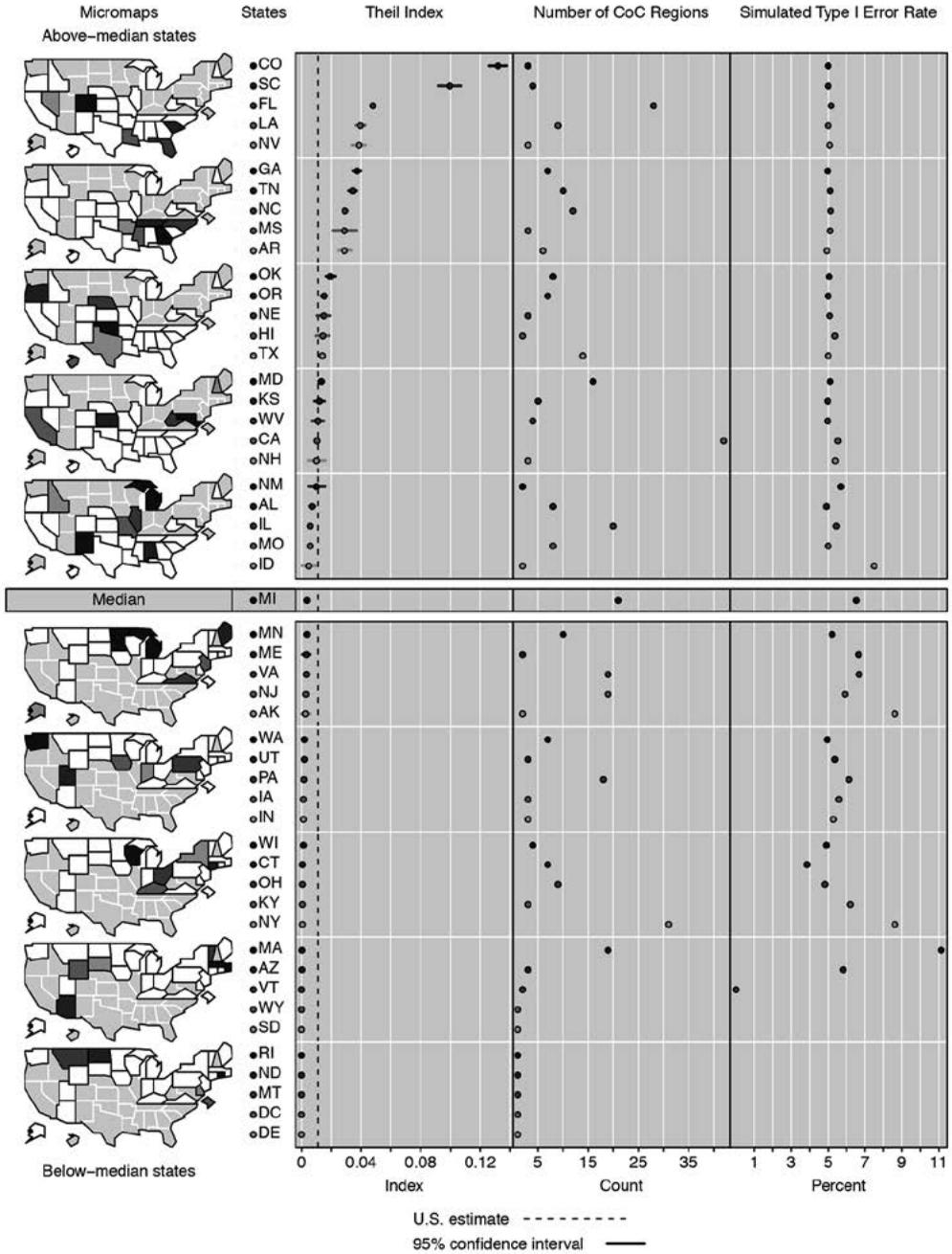
Source: HUD Point-in-Time and Housing Inventory Count data, 2012

The first quartile estimate is .0006 in Ohio with a 95-percent confidence interval of (.0003, .0009); Ohio has 9 CoCs. The median estimate is .0035 in Michigan with a 95-percent confidence interval of (.0029, .0041); Michigan has 21 CoCs. The third quartile estimate of .0147 is in Nebraska with a 95-percent confidence interval of (.0103, .0191); Nebraska has three CoCs. The maximum estimated mismatch is in Colorado, where the estimated index is .1320 with a 95-percent confidence interval of (.1261, .1378); Colorado has 3 CoCs.

Maryland has an estimated Theil index of .0131 and a 95-percent confidence interval of (.0115, .0146). Hawaii's estimated Theil index is .0141, with a 95-percent confidence interval of (.0097, .0185), which overlaps with Maryland's. Thus, we cannot reject the null hypothesis that Maryland and Hawaii have the same Theil index at the .05 significance level. The Z test statistic under a null hypothesis of no difference in the Theil indices in Maryland and Hawaii is -.42; the p-value for a two-tailed test is .67.

Illinois has an estimated Theil index of .0059, with a 95-percent confidence interval of (.0050, .0067). Because Maryland's and Illinois' confidence intervals do not overlap, we can reject the null hypothesis that Maryland and Illinois have equal Theil indices at the .05 significance level. The Z test statistic under a null hypothesis of no difference is 8.05, with a two-sided p-value less than .0001.

Simulations

I conducted simulations to test the reliability of state asymptotic inferences. For each state with multiple CoCs, I generated 1 million random samples from a multinomial (n, p) distribution, where n is the state's sample bed count and $p = (p_1, p_2, \ldots, p_J)$ is a vector of the state's sample bed shares across the J CoCs. For each iteration of the simulation, I computed a 95-percent confidence interval for the state's Theil index.

The percentage of a state's simulated confidence intervals that excludes the state's estimated Theil index approximates a type I error rate (referred to as the α level, or size of the test). A type I error is an incorrect rejection of a true null hypothesis. For my simulation, I treat the state's estimated Theil index as the true value under the null hypothesis. If the asymptotic inferences are accurate, the type I error rate associated with 95-percent confidence intervals should be 5 percent.

The simulated type I error rates are reported in the third column of data in exhibit 2. These error rates are closer to 5 percent for estimated Theil indices farther from 0. Among the 44 states with multiple CoCs, 18 have estimated Theil indices below Michigan's (the median) estimate. Of these 18 states, 9 have simulated type I error rates between 4 and 6 percent. Of the 25 states with estimated Theil indices above Michigan's, 24 have simulated type I error rates between 4 and 6 percent. The exception is Idaho, with an estimated Theil index of .0048, ranked 25th, and a simulated α level of 7.5 percent.

The inferences are based on an assumption of asymptotic normality, which is more likely to hold with higher bed counts. Among the 44 states with multiple CoCs, 19 have bed counts below Louisiana's count of 5,256 (the median). Of these 19 states, 13 have simulated type I error rates between 4 and 6 percent. Among the 44 states with multiple CoCs, 24 have state bed counts above Louisiana's. Of these 24 states, 19 have simulated type I error rates between 4 and 6 percent.

Among the 44 states with multiple CoCs, 23 have mean bed counts per CoC below Utah's mean of 1,158.3 beds (the median). Of these 23 states, 15 have simulated type I error rates between 4 and 6 percent. Among the 44 states with multiple CoCs, 20 have mean bed counts per CoC above Utah's. Of these 20 states, 17 have simulated type I error rates between 4 and 6 percent.

Within-State Inference

For states with at least four CoCs, we can test for differences between subgroups of CoCs within states. For example, consider North Carolina, which has a state Theil index estimate of .0292 with a confidence interval of (.0276, .0308) and 12 CoCs (see exhibit 1). Let group one consist of the 3 CoCs in the Research Triangle area of the state: the city of Chapel Hill and Orange County; the city of Durham and Durham County; and the city of Raleigh and Wake County. Let group two consist of the remaining 9 CoCs. The estimated Theil index for group one is .0016, with a 95-percent confidence interval of (.0001, .0032). The estimate for group two is .0514, with a 95-percent confidence interval of (.0485, .0543).

Because the two groups' confidence intervals do not overlap, we can reject the null hypothesis of equal Theil indices at the .05 significance level. The Z test statistic under a null hypothesis of no difference is -29.83, with a two-sided p-value less than .0001. Very strong evidence suggests that beds are distributed more proportionately to the homeless population in the 3 CoCs in the Research Triangle area of the state compared with the remaining 9 CoCs.

Conclusion

In this study, I used a Theil index to measure the spatial mismatch of beds available to shelter homeless (homeless resources) and homeless populations across CoC regions. I demonstrated statistical inference using the Theil index based on asymptotic results. I focused mainly on testing for differences in spatial mismatch across states. I find large differences across states in the spatial mismatch between homeless resources and homeless populations.

I also performed simulations to assess the reliability of the asymptotic inferences. Simulations revealed that state inferences are better for states that have a relatively larger estimated spatial mismatch and relatively larger total count of beds available to shelter the homeless.

I also demonstrated how this asymptotic inference method can be adapted to test for significant differences in spatial mismatch within states.

Policy Implications

Using the technique described in this article can further the efficient and effective allocation of scarce resources for serving homeless populations. This type of analysis can help inform decision-makers who can ensure that beds are available in the areas that have the greatest need. The practical application of this method is that it can suggest more optimal alternatives for deploying beds and other resources for the homeless within and among jurisdictions.

Acknowledgments

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Using Location Quotients To Test for Negative Secondary Effects of Sexually Oriented Businesses

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Abstract

A frequent complaint made by community residents is that sexually oriented businesses (SOBs; that is, strip clubs, adult book stores, and XXX theaters) produce negative secondary effects in the form of additional crime and disorder. Local governments respond by writing often strict ordinances that regulate the location and practices associated with these businesses, but that may threaten the balance between the adult businesses' First Amendment freedom of expression with the municipalities' exercise of power in safeguarding the public's health and welfare. To defend these regulatory attempts, courts, including the U.S. Supreme Court, require municipalities to justify their ordinances by presenting empirical evidence that SOBs do, in fact, produce additional crime and disorder. This article explains the spatial analysis technique of buffered location quotients, a method suitable for measuring whether and to what degree the presence of SOBs in a community are associated with increased rates of crime and disorder.

Introduction

Community residents often complain that sexually oriented businesses (SOBs; that is, strip clubs, adult book stores, and XXX theaters) reduce neighborhood safety and quality of life. Local government authorities respond to these complaints by writing ordinances that regulate the location and business practices associated with these businesses, thus seeking to reduce the negative secondary effects of ambient noise, disorder, and especially crime these businesses are reported as causing and spreading into the surrounding neighborhoods. Courts, including the U.S. Supreme Court, have taken a critical look at these regulations ensuring that the laws meet constitutional scrutiny

and balance the businesses' First Amendment freedom of expression with the municipalities' exercise of power in safeguarding the public's health and welfare (Nolon and Salkin, 2006). To defend regulatory attempts, courts require municipalities to justify their ordinances by presenting empirical evidence that SOBs do in fact produce negative secondary effects (Linz et al., 2004; Nolon and Salkin, 2006). This article explains the spatial analysis technique of buffered location quotients (LQs), a method suitable for measuring whether and to what degree the presence of SOBs in a community are associated with increased rates of crime and disorder. It uses data and mirrors methods from an SOB study recently completed in Jefferson County (Louisville), Kentucky (hereafter, Louisville Metro) (McCord and Tewksbury, 2013).[1]

Location Quotients

The LQ is a statistical method used extensively in regional studies since the 1940s (Miller, Gibson, and Wright, 1991). It is a ratio value that compares the characteristics of a subarea under study with the characteristics of the larger, surrounding region or city and is calculated as

$$LQ = \frac{c_i/a_i}{c_R/a_R},$$ (1)

where

LQ = location quotient;

C_i = total number of crimes in study area i

(where i is a subarea of the larger region R);

a_i = the area of study area i;

C_R = total number of crimes in the larger region R;

a_R = the area of the larger region R.

LQs have been adopted by SOB researchers to test for the clustering of crime surrounding adult businesses as an indication of negative secondary effects. The process uses a Geographic Information System (GIS) to draw buffers of some meaningful radius around the SOBs. Crime density in the set of buffers is then compared with the crime density of the entire city via LQ values. LQs are simple ratio values, thus an LQ of 3.00 would indicate the crime density around the SOBs is 3 times that of the city or region, and an LQ of 0.75 would indicate a density 25 percent less than the city average. Because municipalities often contain land area where crime is less likely to occur (airport runways, rivers, and undevelopable land), a conservative approach is to consider only LQ values greater than 2.00 as significant evidence of secondary effects (Rengert, Ratcliffe, and Chakravorty, 2005).

The determination of the width of buffers used in SOB analysis is based on the goals of the research. Buffers that measure 500 and 1,000 feet are common, because they are based on the restrictive distances for SOBs to other land uses (residential areas, schools, and so on) as found in many local

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[1] Access to other research and legal documents on the secondary effects of SOBs is available at secondaryeffectsresearch.com, a website sponsored by a group of university-affiliated research scientists.

ordinances. Other researchers have used a series of smaller concentric buffers (50 to 250 feet) around SOBs to show the reduction in crime density as distance increases from the business sites, thus indicating that it is the SOB itself and not some other characteristic of the neighborhood that is causing the increase in crime (McCleary, 2007). This method is also useful for showing the approximate distance from the SOBs at which secondary effects affect the surrounding neighborhood.

Testing for Negative Secondary Effects of SOBs in Louisville Metro, Kentucky

The following case study demonstrates several methods using LQs to test for the presence of negative secondary effects around SOBs in Louisville Metro, Kentucky. The first technique examines the density of crime found in 500- and 1,000-foot buffers surrounding the SOBs and compares it with the crime density of the city overall. The next method compares the crime density in the 500- and 1,000-foot buffers with crime density in similar sized buffers surrounding 400 randomly selected street intersections. Because street intersections tend to be found in the more built-up areas of the city, this approach is more conservative than the first and adds to the robustness of the findings. The final technique examines crime density in a set of six concentric 250-foot buffers extending out from the SOBs to a distance of 1,500 feet.

In 2003, Jefferson County and its largest city, Louisville, merged and formed a single governmental agency, Louisville Metro (2010 population was 740,000). Several small communities within the county opted out of the agreement and continue to provide their own local governmental services, including police services. The Louisville Metro Police Department (LMPD) was formed at the time of the merger and polices approximately 90 percent of the county in both population and area.

In Louisville Metro, 30 SOBs were identified and were confirmed as being in business during the entire study period (October 2009 through September 2010). Of the 30 SOBs, 21 are strip clubs with live entertainment, all of which sell alcoholic beverages. The remaining 9 SOBs are adult book and toy stores, with all but 2 having private video viewing booths or an adult theater.

Crime data for the 1-year period were provided by the LMPD for the area under its jurisdiction. Of the 30 SOBs, 24 are located within the LMPD policing area. The remaining 6 SOBs are located on a 1.5-mile stretch of road in a small opted-out municipality, but directly across the street from the LMPD area of responsibility. Four SOBs are also located on the LMPD side of this stretch of roadway. The small city that opted out of the merger and contained the previously mentioned 6 SOBs was uncooperative with repeated attempts to obtain crime data. Because of the proximity of these 6 SOBs and their likely effect on crime in the LMPD area directly across the street (a distance of approximately 30 feet), they remain in the analysis, but their effect is measured only in truncated buffers that overlay the LMPD area. Exhibit 1 displays the location of the 30 SOBs in Louisville Metro. As is common in other jurisdictions, these businesses tend to cluster spatially.

Crime incidents are separated into the categories of violent crime (homicides, assaults, and robbery), property crime (burglaries, thefts, and vehicle theft), and disorder crime (sale/possession of drugs, prostitution, alcohol violations, criminal mischief, and littering). SOBs and crime incident addresses were geocoded (electronically applied) to the computerized street map. Geocoding hit rates were 100 and 96 percent, respectively.

Location of Sexually Oriented Businesses in Louisville Metro*
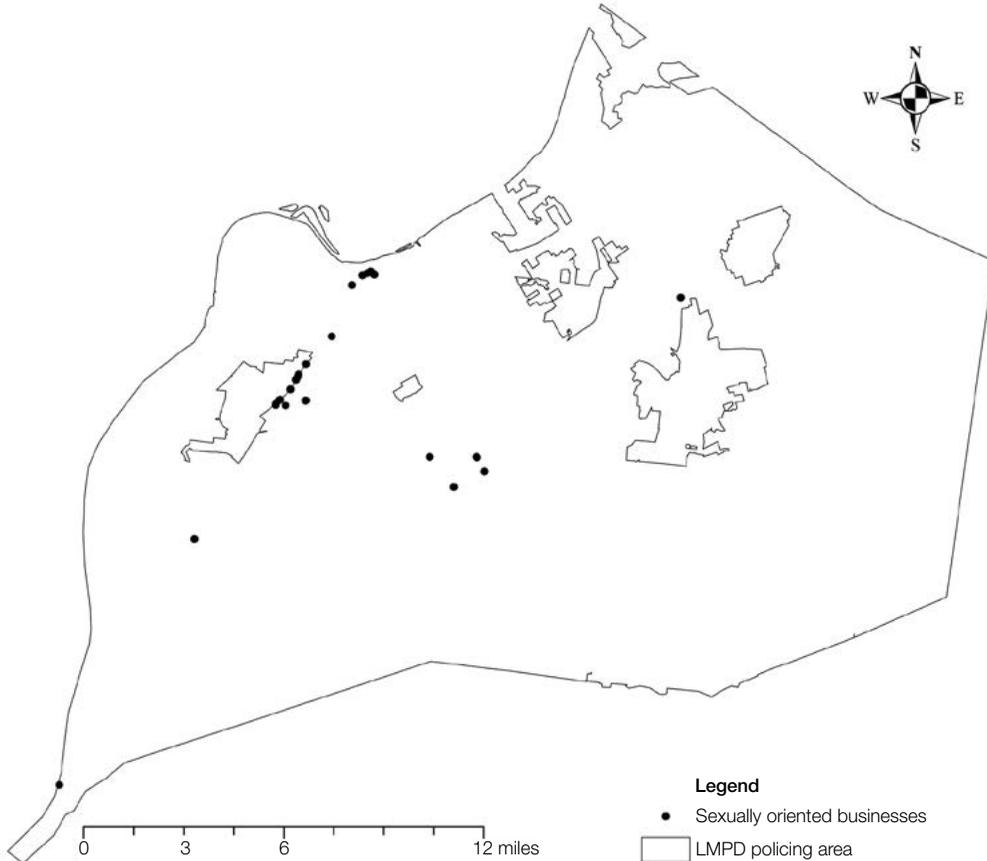
LMPD = Louisville Metro Police Department.
* Jefferson County (Louisville), Kentucky.
Note: "Islands" within the county's boundaries are incorporated cities not part of the LMPD's jurisdiction.

For the first set of analyses, two sets of buffers were drawn around the SOBs, 500 and 1,000 feet in radius, using the buffer function in the mapping software (ArcGIS 9.3). Overlapping buffers (because of other nearby SOBs) were dissolved into larger buffers to avoid counting the same area and crime incidents more than once. Buffers extending outside the LMPD area were truncated at jurisdictional lines (exhibit 2).

Using GIS software, the total area for each group of buffers (500 and 1,000 feet) and total count of crime incidents falling into the buffers were determined, and the density for each crime category was calculated. Crime density for the larger study area (LMPD jurisdiction) was also calculated for each crime category.

Exhibit 2

Buffers of 500 Feet Surrounding Sexually Oriented Businesses (some truncated at
jurisdictional boundaries) in Louisville Metro*


* Jefferson County (Louisville), Kentucky.

IBM SPSS statistical software was used to draw a random sample of 400 intersections from the
18,058 intersecting streets in the LMPD area.[2] Buffers that were 500 and 1,000 feet in radius were
drawn around each of the intersections, and the density for each crime category was determined,
as previously mentioned. Buffers that extended outside the LMPD area were moved to the closest
intersection that would allow for the entire buffer to fall within the study area. LQs were deter-
mined for all buffers and crime types using the statistical formula mentioned previously (that is,
crime density in buffer areas divided by crime density in city).

For the final analysis, a concentric series of six 250-foot buffers were drawn around each of the
30 SOBs. The 250-foot buffer is approximately equal to one-half the average city street length
in the study area. The inner buffer extended from 0 to 250 feet, the next 250 to 500 feet, and so
on, through to the last one at 1,250 to 1,500 feet out from the SOBs. Again, overlapping buffers

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[2] An online sample size calculator (http://www.surveysystem.com/sscale.htm) determined that a sample size of 376 intersec-
tions was necessary for a confidence level of 95 percent at a confidence interval of 5 percent. The sample size was rounded
to 400 cases.

(because of other nearby SOBs) were dissolved and buffers extending out of the LMPD area were truncated at jurisdictional boundaries (exhibit 3). A single crime density was determined for each buffer width (0 to 250, 250 to 500, and so on) and LQ values were calculated.

Exhibit 3

Sample of Concentric Series of 250-Foot Buffers Surrounding Sexually Oriented Businesses
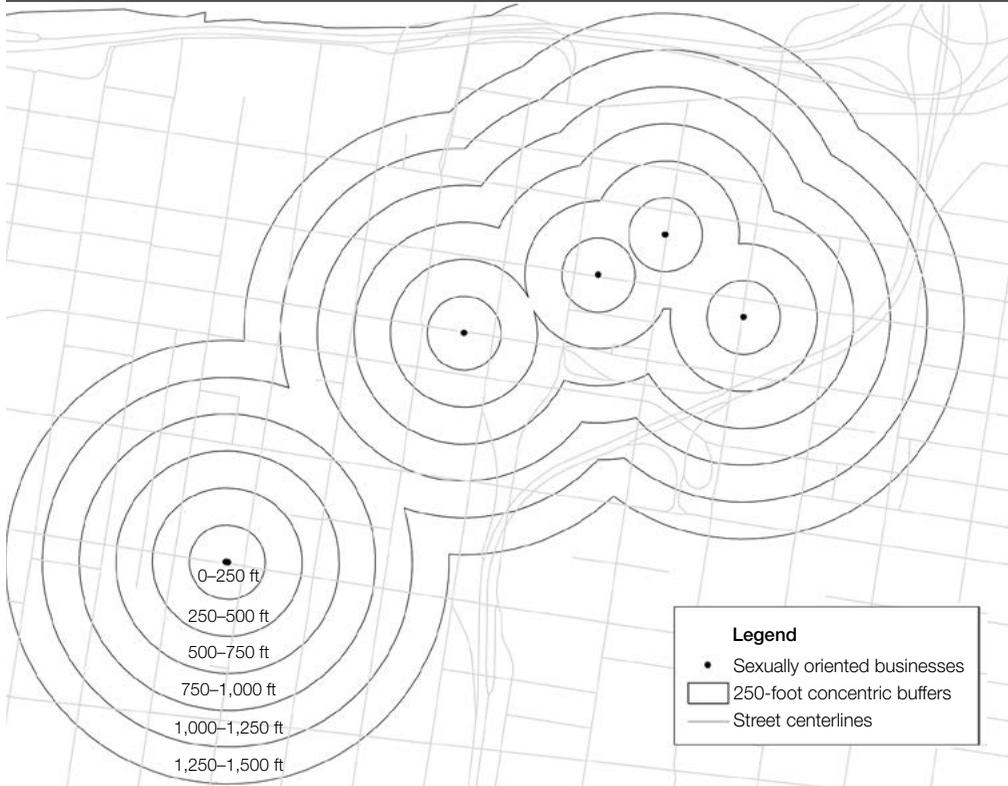
Results

Exhibit 4 presents the LQ values for each category of crime (violent, property, and disorder) and each set of buffers at 500 and 1,000 feet surrounding the 30 SOBs. As indicated by the LQ values in the upper portion of the table, the density of all three crime categories in the buffers is many times higher than that of the larger study area (Louisville Metro). For example, violent crime is 12.3 times higher in the 500-foot buffers surrounding the SOBs and 8.3 times higher in the 1,000-foot buffers than it is in the overall county density. This pattern of substantially higher crime density in the 500- and 1,000-foot buffers also appears for property and disorder crimes.

The lower portion of exhibit 4 displays the LQ values, comparing the crime density around the SOBs with that of the 400 random intersections. Although this portion of the analysis is far more conservative because the SOB crime density is compared only with the more built-up areas of

the county, the LQ values remain relatively high. As shown, crime densities in the SOB 500-foot buffers are at least 4 times higher than crime densities of the randomly selected intersections for all crime categories, while the densities in the 1,000-foot buffers are about 3 times higher for all crime categories.

Exhibit 5 presents the results of the concentric 250-foot buffer analysis. All crime categories have the highest LQ values in the buffers containing and immediately surrounding the 30 SOBs. LQ values then steadily decrease in the next two buffers out to a distance of 750 feet. Beginning with the 1,000-foot buffers and on out to the last buffers at 1,500 feet, the analysis indicates no discernible pattern.

The results from these analyses suggest that the criminogenic effect of the SOBs is observable out to a distance of at least 750 feet.[3] But more importantly, it is the monotonic decrease in the first three sets of buffers suggesting that the SOBs and not some unmeasured neighborhood characteristic, such as socioeconomic status or the presence of other problematic land uses, are promoting the higher crime levels (Rengert, Ratcliffe, and Chakravorty, 2005).

Exhibit 4

Location Quotient Values of Crime Density in Selected Buffers Surrounding 30 Sexually Oriented Businesses in Louisville Metro*

	Violent Crime	Property Crime	Disorder Crime
LQ values versus Louisville Metro*			
500-foot buffers	12.3	10.1	10.7
1,000-foot buffers	8.3	7.1	7.1
LQ values versus 400 random intersections			
500-foot buffers	4.8	4.2	4.2
1,000-foot buffers	3.3	3.1	2.9

LQ = location quotient.

* Jefferson County (Louisville), Kentucky.

Source: McCord and Tewksbury (2013)

Exhibit 5

Location Quotient Values of Crime Density in Concentric 250-Foot Buffers Surrounding 30 Sexually Oriented Businesses in Louisville Metro*

Buffer	Violent Crime	Property Crime	Disorder Crime
0–250 feet	23.7	18.3	24.4
250–500 feet	8.1	7.1	5.6
500–750 feet	5.2	5.6	4.8
750–1,000 feet	7.8	6.2	6.2
1,000–1,250 feet	5.8	4.4	4.9
1,250–1,500 feet	7.5	5.8	4.8

* Jefferson County (Louisville), Kentucky.

Source: McCord and Tewksbury (2013)

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[3] McCord and Tewksbury (2013) showed secondary effects of the SOBs to be statistically significant in a regression analysis using the 1,000-foot buffers and controlling for important socioeconomic factors.

Conclusion

The research methods used in this study generate strong evidence of the presence of negative secondary effects of crime and disorder around SOBs in Louisville Metro. Courts require municipalities to produce such empirical evidence to justify the stricter regulation local governments place on these often unpopular but constitutionally protected businesses. LQ analysis is a robust method for testing and presenting this evidence and one that is accepted by courts at all levels, including the U.S. Supreme Court.

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