



Framing the Issues— the Positive Impacts of Affordable Housing on Health

By Jeffrey Lubell, Rosalyn Crain, and
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July 2007



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Introduction

Few would argue with the proposition that providing quality, affordable housing helps to meet families' fundamental need for shelter. Shelter is an important end, in and of itself, whose achievement warrants significant societal investment.

But many practitioners point to benefits from affordable housing that extend beyond shelter. For example, some emphasize the role of affordable housing in increasing residential stability, which may lead to improved educational outcomes for children and improved labor market outcomes for adults. Others focus on the community-wide impacts of affordable housing, arguing that affordable housing contributes to the economic development of distressed neighborhoods and to economically vibrant and successful communities. Still others focus on the benefits of affordable housing for particular populations, such as the elderly, the homeless, and people with HIV/AIDS.

Our review of the literature on the impact of housing on health, education, and economic development outcomes revealed a number of promising hypotheses that are consistent with the available research. While much of this research is still in preliminary stages, and not yet definitive, the findings help to illuminate some of the potential pathways through which housing may contribute positively to societal outcomes beyond shelter.

This series seeks to identify and clarify the more promising hypotheses on the societal impacts of housing and examine the growing body of research supporting these hypotheses. This paper focuses on the impact of housing on education. Other papers in this series will focus on the impact of housing on health and economic development.

* The Center for Housing Policy gratefully acknowledges the support of Enterprise Community Partners, the Fannie Mae Foundation, and the John D. and Catherine T. MacArthur Foundation for this literature review and the annotated bibliographies on which it is based. Please note, however, that the findings and conclusions presented in this review are those of the authors alone and do not necessarily reflect the opinions of the funders or sponsors.

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SUMMARY

This analysis focuses on the ways in which the production, rehabilitation, or other provision of affordable housing may lead to stronger health outcomes for residents. Our analysis revealed nine promising hypotheses:

- Affordable housing may improve health outcomes by freeing up family resources for nutritious food and health care expenditures.
- By providing families with greater residential stability, affordable housing can reduce stress and related adverse health outcomes.
- Homeownership may contribute to health improvements by fostering greater self-esteem, increased residential stability, and an increased sense of security and control over one's physical environment.
- Well-constructed and managed affordable housing developments can reduce health problems associated with poor quality housing by limiting exposure to allergens, neurotoxins, and other dangers.
- Stable, affordable housing may improve health outcomes for individuals with chronic illnesses and disabilities, and the elderly, by providing a stable and efficient platform for the ongoing delivery of health care and other necessary services.
- By providing families with access to neighborhoods of opportunity, certain affordable housing strategies can reduce stress, increase access to amenities, and generate important health benefits.
- By alleviating crowding, affordable housing can reduce exposure to stressors and infectious disease, leading to improvements in physical and mental health.
- By allowing victims of domestic violence to escape abusive homes, affordable housing can lead to improvements in mental health and physical safety.
- Use of "green building" and "transit-oriented development" strategies can lower exposure to pollutants by improving the energy efficiency of homes and reducing reliance on personal vehicles.

While research on certain aspects of the relationship between housing and health is very strong, the research base is more preliminary for other aspects. Our analysis notes the relative strength of the research base in each area.

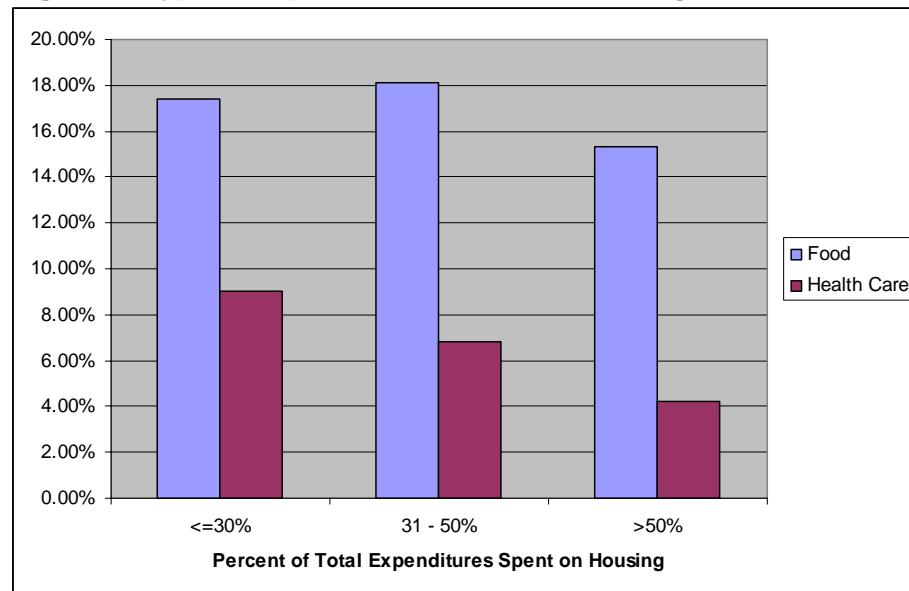
PROMISING HYPOTHESES ON THE IMPACT OF AFFORDABLE HOUSING ON HEALTH OUTCOMES

1. Affordable housing may improve health outcomes by freeing up family resources for nutritious food and health care expenditures.

Assessment. The data show that families in unaffordable housing tend to spend less on health care than families in affordable housing. A similar trend is apparent in some (but not all) data sources for food expenses. Studies also show a positive correlation between housing affordability and various child health outcomes; one potential explanation is that families in unaffordable housing do not have enough residual income after paying their housing expenses to afford adequate health care or nutrition. However, no study has yet documented the entire causal pathway.

Discussion: As compared with families living in unaffordable housing, families living in affordable housing tend to have more funds left over in their budgets to pay for food and health care expenditures. As shown in Figure 1, for example, working families² paying 30 percent or less of their income for housing were able to dedicate more than twice as much of their income to health care and insurance as those paying 50 percent or more for housing. A similar (though less pronounced and nonlinear) trend is apparent for food expenditures.

Figure 1: Typical Expenditure Shares of Working Families, 2002

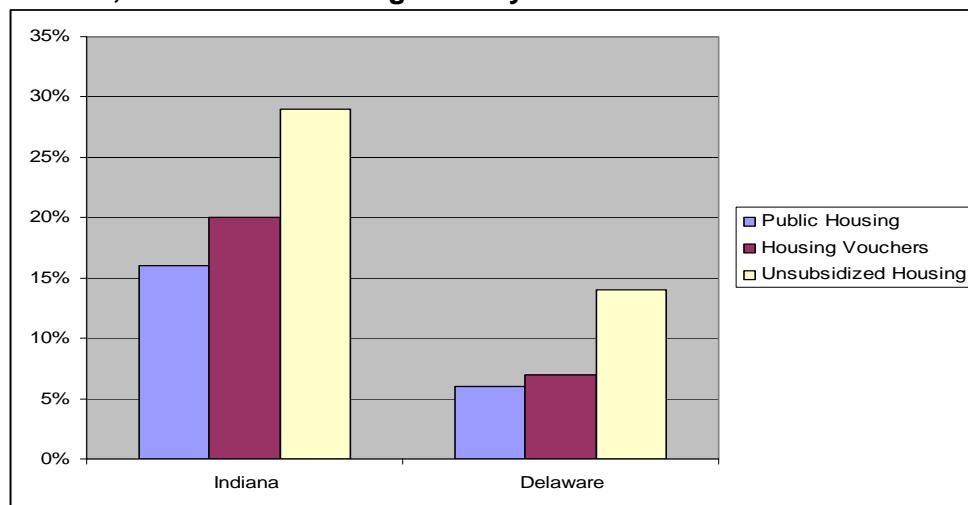


Source: Lipman 2005, based on data compiled by The Economic Policy Institute

² In this analysis, “working families” are families with incomes between full-time minimum wage work and 120 percent of the area median.

Similarly, as shown in Figure 2, a survey of families receiving welfare assistance in Indiana and Delaware (at baseline) found that households living in unsubsidized housing were much more likely to say that they needed to see a doctor but did not, due to lack of money, than households receiving housing assistance through the public housing and housing voucher programs.³

Figure 2: Percent with Someone Needing to See a Doctor, But Did Not Go, Because Not Enough Money



Source: Lee 2003, Exhibits 4.12 and 4.14

When confronted with high housing costs, low-income households also may make tradeoffs related to spending on health insurance. In a working paper on the expenditures of insured and uninsured households, Levy and DeLeire (2003) found evidence that “the prices of other goods – most notably housing – may be additional important factors causing some households not to purchase health insurance.” Using data from the Consumer Expenditure Survey, the authors found that among households with the lowest levels of spending, the uninsured spent \$88 more per quarter on housing than the insured. The authors emphasize that further research is needed to better understand the relationship between high housing prices and a lack of insurance coverage. It is also important to note that improved access to health *insurance* does not always lead to improved health *outcomes* and that different forms of insurance may lead to differences in families’ utilization of needed health care services. (See, generally, RAND Corporation 2006; Levy and Meltzer 2001.)

³ In both cases, the differences across housing subgroups were significant at the 1 percent level. Differences in the percentages saying they went hungry in the last month were not statistically significant across housing subgroups.

While no single study has documented the entire causal pathway from unaffordable housing to lower food and health care expenditures to poorer health outcomes, a number of studies are consistent with this hypothesis. For example, doctors in Boston found that children of low-income families that lacked housing subsidies were 50 percent more likely to be iron deficient than children in comparable families that received housing subsidies (Meyers et al. 1993).

Another study, based on a large convenience sentinel sample, found that, among food-insecure households, the children of households that lacked housing subsidies were 2.11 times more likely than children in households with housing subsidies to have extremely low weight-for-age scores (defined as more than 2 standard deviations below the mean for the age) (Meyers et al. 2005). Using the same sample, similar results were found among families that receive assistance through the Low Income Home Energy Assistance Program (LIHEAP), which helps low-income households pay utility costs to heat or cool their homes – one of the major housing-related expenditures. Children in LIHEAP families had significantly greater weight-for-age scores and a lower likelihood of physical underdevelopment because of malnutrition than children in qualifying families that did not receive benefits (Frank et al. 2006).

More broadly, an analysis of data from the 1997 National Survey of America's Families (NSAF) found a positive correlation between housing affordability and favorable health outcomes among children aged 6 to 17 whose families had incomes below the poverty line. Positive outcomes were especially large for children aged 12 to 17, suggesting that the health impacts of housing affordability on children might be cumulative (Harkness and Newman 2005). "Consistent with studies of the pathways through which poverty exerts negative effects on children," the authors found evidence that "the deleterious effects of unaffordable housing on children's well-being operate mostly through material hardship in early childhood."

As Harkness and Newman stress in their article, their findings are preliminary and require additional testing – ideally through a data-rich longitudinal study.

A separate study of the 1997 and 1999 NSAF found a statistically significant association between "food and housing hardship" (defined as having difficulty paying for food or housing, or living in crowded conditions) and health insurance coverage; in other words, low-income adults who had difficulty meeting their food or housing needs were more likely to be uninsured than low-income adults without food or housing hardship (Long 2003). Again, a potential explanation for this finding is the lack of residual funds available to families in unaffordable housing to meet basic health-related expenditures.

2. By providing families with greater residential stability, affordable housing can reduce stress and related adverse health outcomes.

Assessment: The strongest evidence for this hypothesis is among those with the least stability—people experiencing homelessness, a condition that clearly contributes to increased stress levels and related mental health problems. Nevertheless, growing evidence suggests that this hypothesis may also apply to housing instability short of outright homelessness. Specifically, a range of preliminary evidence suggests that an inability to pay basic bills – including rent or mortgage and utilities – and the resulting housing instability – including evictions, foreclosures, and frequent unplanned moves – may cause prolonged stress, exacting a negative mental health toll that could be alleviated through stable, affordable housing.

Discussion: At the extremes, there is little question that housing instability leads to high levels of stress that have adverse health consequences, especially for mental health. As a recent policy brief on homelessness and mental health (Haber and Toro 2004) concluded:

[C]hildren who are homeless experience rates of mental health problems and developmental delay that far exceed those among children generally, and even exceed those found among similarly impoverished, but housed children (Rabideau & Toro, 1997, Rafferty & Shinn, 1991). Also, these problems have been shown to be more frequent and/or more severe among children who are homeless for longer periods of time (Buckner, Bassuk, Weinreb, & Brooks, 1999). Adults who are homeless show higher levels of self-rated psychological distress than impoverished, housed adults, and are subject to many stressors due to their condition, such as disruption of social and family ties and difficulties obtaining or maintaining employment (Goodman, Saxe, & Harvey, 1991).

Findings from another report indicate that school-age children living in Los Angeles County homeless shelters were nearly 20 times more likely to exhibit depressive symptoms than children in the general population (Zima et al. 1994). Similarly, in a review of research on the effects of homelessness on children, Rafferty and Shinn (1991) find evidence that the “chaotic, unpredictable shelter placements are not conducive to normal psychological development” in children. The negative impact of homelessness on physical health has also been well-documented. One study found that homeless children in New York City had a 50 percent greater chance of developing ear infections than their peers, and that 61 percent had not been immunized and 38 percent had asthma (Redlener and Johnson 1999). (See also Bassuk and Rosenberg 1990; Wood et al. 1990.)

While less intensively researched, a growing body of preliminary evidence suggests that other manifestations of housing instability that stop short of on-the-street homelessness, such as

eviction, loss of a home due to foreclosure, or otherwise being forced to move frequently, also lead to mental health problems. For example, Guzman et al. (2005) found high levels of stress among families that had been evicted. In one study of women experiencing both visible homelessness and “hidden” homelessness—described as living at risk of eviction, in an overcrowded household or unsafe structure, being doubled-up with family or friends, or in an otherwise precarious housing situation—93 percent of the 126 interviewees indicated that their living situation caused emotional or mental health issues, including stress and anxiety, depression, and hopelessness (Kappel Ramji Consulting Group 2002).

Bartlett (1997) paints a compelling picture of the negative mental health toll of frequent moves and the importance of affordable housing in interrupting this pattern and providing stability:

Research for the most part has emphasized the stress associated with moving. Leff and her colleagues, examining the life events preceding depressive illness, found that 45 per cent of depressive patients had moved in the preceding year. Of the 20 stressful events uncovered, relocation was among those most frequently experienced, along with serious physical illness and changes in marital relationship. ...

The pattern of frequent relocation can only be destructive in the end for these families. It is not only expensive, draining and damaging for children. It is also a vicious cycle. Emotional investment in a place or a group of people is almost impossible for these families, knowing as they do that they are more likely than not to be gone in less than a year. It is not possible to build community when people have no long-term vested interest in their place of residence. Instead, this pattern fosters the tendency towards suspicion, defensiveness and hostility with neighbours that so often precipitates the next move.

The only event in Hope's life that has been capable so far of interrupting her persistent mobility has been the availability of adequate and affordable housing. The same has been true for the other families in this study. As long as such housing has been available, these families have remained in one place and have made an effort to cope constructively with other difficulties in their lives. Beyond all the other obvious advantages offered by good housing, it makes it more difficult to pick up and go. It adjusts the equation to the point where staying is more attractive than leaving and where dealing with problems is more realistic than escaping from them. When life becomes complicated and restlessness starts to build, moving can no longer be a default response.

Consistent with Bartlett's conclusions, a rigorous experimental study found that welfare-eligible families that also received housing vouchers had a reduced number of moves over a 5-year period, as compared with families that did not receive housing vouchers (Mills et al. 2006).

While similar experimental studies have not been conducted for other assisted housing programs, it is likely that these programs are also associated with increased residential stability. Newman and Harkness (2002), for example, suggest that public housing may result in more

stable housing because families are likely to have less difficulty paying rent, and administrative law provisions make eviction of families in public housing more difficult.

There is some evidence to suggest that the stress associated with unaffordable housing can have significant adverse health consequences even if it does not lead to actual eviction, foreclosure, or a forced move. In a multisite longitudinal study of 3,800 young adults, Matthews et al. (2002) found that individuals who reported difficulties paying for basic expenses had a greater likelihood of developing hypertension over a 10-year period. A major study in England found that individuals experiencing difficulty making their mortgage payments experienced lower levels of psychological well-being and were more likely to see a doctor (Nettleton and Burrows 1998).

Indeed, even the very presence of a mortgage, with all the responsibilities associated with this significant debt, may be a cause of stress. One study found that homeowners that have paid off their mortgages have lower stress levels than those that have not. Both groups had lower stress than renters, however, perhaps because of the sense of security and residential stability conferred by homeownership (Cairney and Boyle 2004). (See below for more discussion on the potential health impacts of homeownership.)

It is important to note that the potential health benefits associated with residential stability may be moderated or even negated by the negative impacts on health of adverse housing quality or neighborhood conditions. For example, to the extent that homeownership limits families' ability to escape poor environmental conditions, the associated residential stability may actually negatively impact health. In their study of neighborhood characteristics in Chicago, Browning and Cagney (2003) found that residential stability may have increased the likelihood of poor health among residents of neighborhoods with low levels of affluence.

Similarly, as Rohe et al. (2001, citing Doling and Stafford 1989 and Hoffmann and Heistler 1988) suggest, the stability provided by homeownership may become a source of stress when families are faced with the threat of foreclosure or maintenance costs they are unable to afford. In another study of homeowners with an array of physical and mental health problems, a significant number indicated that as their diseases or disabilities progressed, the added stress of repairing and maintaining a home, as well as keeping up with mortgage payments, outweighed the benefits of ownership, and in some cases resulted in hazardous housing situations and worsening health (Smith et al. 2003). (See also Taylor et al. 2006; Ford et al. 2001; Weich and Lewis 1998.)

Additional research is needed to document more fully the causal relationship between unaffordable housing and stress, and to clarify the extent to which different housing strategies provide the type of stable, affordable housing that leads to positive mental health improvements.

3. Homeownership may contribute to health improvements by fostering greater self-esteem, increased residential stability, and an increased sense of security and control over one's physical environment.

Assessment: Homeownership appears to be correlated with a number of positive physical and mental health outcomes, but it is not clear why. One potential explanation is that homeownership increases self-esteem among owners, which in turn generates positive mental and physical health outcomes. Another potential explanation is that homeowners have a greater ability to control their physical environment, leading to both reduced stress and increased life satisfaction. Alternatively, the benefits may be due to other housing attributes strongly associated with homeownership, such as larger and higher quality homes or increased residential stability, rather than homeownership per se.

Discussion: A number of studies have found that there are both direct and indirect health benefits associated with homeownership. These include an improved sense of self-efficacy and self-esteem, which may indirectly confer health benefits, as well as more direct outcomes, such as better mental health and lower blood pressure among homeowners, as compared with renters. While the health benefits associated with homeownership are well-documented, it is not entirely clear how tenure status is related to such advantages.

Balfour and Smith (1996) found that the opportunity to work toward homeownership led to increased personal security and self-esteem among low-income clients of a lease-purchase program. Other researchers have found evidence that owners are more likely than renters to believe that they can do things as well as others and that their lives will work out for the better (Rossi and Weber 1996). In a critique of these and other studies, however, Rohe et al. (2001) found that many employed very small samples and lacked adequate controls for other influences. In one of the stronger studies, 85 percent of homebuyers reported that homeownership made them feel better about themselves, but no statistically significant difference in self-esteem was found between the homebuyers and a comparison group of families continuing to rent; this may be because of the small sample size. (See also Clark 1997.)

Other studies suggest that homeownership may have positive impacts on health for reasons that go beyond self-esteem. In a community-level study of pediatric injury in Illinois, Shenassa et al. (2004) found that owner-occupancy mediated the association between higher rates of

unintentional injury and residence in areas with high concentrations of poverty and minorities. The authors hypothesize that low-income rental housing is more likely to suffer from inadequate or deferred maintenance, and higher tenant turnover rates mean more people are exposed to the risks associated with poor housing quality. In a Scottish study, Macintyre et al. (1998) found positive correlations between homeownership and physical health outcomes, even after controlling for income and self-esteem. These positive outcomes included better recent mental health, better respiratory function, smaller waist/hip ratio, fewer longstanding illness conditions, fewer symptoms in the previous month, and lower blood pressure. While personal characteristics such as income and self-esteem explained some of this relationship, follow-up research found that other factors—including the superior condition of owner-occupied housing and the increased privacy that it affords—also accounted for better mental health outcomes among owners (Hiscock et al. 2003).

Similarly, in a study of blue-collar factory workers in two Midwestern car manufacturing plants, one of which had closed 2 months prior to beginning the analysis, Page-Adams and Vosler (1997) found that homeowners were significantly less likely to experience economic strain, depression, and problematic alcohol use. Relying on some of the emerging work on the multiple benefits of owning financial assets, such as Sherraden (1991), the authors suggest that ownership of a home confers more than just a stored economic resource or marker of self-esteem; it has an independent effect on an owner's health and well-being.

Another potential explanation is that homeowners have a greater ability to adapt their physical environment to their needs, reducing stress and improving overall satisfaction. As suggested above, owner-occupied homes also tend to be larger and of higher quality, so the apparent benefits of homeownership may in fact be related to other aspects of housing that are strongly correlated with homeownership. In either case, the relationship between homeownership and satisfaction is well-documented (see Elsinga and Hoekstra 2005; Rohe and Basolo 1997; Rohe and Stegman 1994).

Homeowners are also much less likely than renters to move frequently (National Association of Realtors Research Division 2006), so again, some of the apparent benefits of homeownership may be related to the stability it provides, rather than homeownership per se.

Other potential explanations focus on the economic returns from homeownership – especially the wealth effects of accumulating equity as well as the economic benefits from fixed mortgages, where costs stay the same over time, even as incomes rise. Both of these factors

could give homeowners more income to spend on nutritious foods or health care. Rasmussen et al. (1997), for example, argue that elderly homeowners remain healthier by using reverse mortgages to tap into home equity and pay for needed health care.

As indicated in the previous section, when households have difficulty sustaining their homeownership status – such as when they take on mortgages that they cannot afford – homeownership may also lead to increased stress and potentially negative health outcomes.

Further research is needed to determine the specific pathways through which homeownership influences health, and to better understand the impact of factors related to ownership, such as stability.

4. Well-constructed and managed affordable housing developments can reduce health problems associated with poor quality housing by limiting exposure to allergens, neurotoxins, and other dangers.

Assessment: Young children spend most of their time at home and are more vulnerable than adults to the many environmental health threats in the home. There is strong evidence that exposure to lead paint presents a substantial health hazard to children, which can be reduced significantly through the replacement of windows and other improvements associated with the rehabilitation of older homes, as well as construction of new affordable homes. Well-built and maintained affordable housing can also reduce families' exposure to allergens such as roaches and dust mites, which lead to asthma and other respiratory illnesses. Proper maintenance plays a role in mitigating risk factors for accidents in the home, including falls and burns.

Discussion: One way in which poor quality housing can impact health is through exposure to lead, a neurotoxin that is especially harmful to the developing nervous systems of fetuses and children. In children, lead has been linked to anemia, nerve and kidney damage, seizures, coma, and even death. Lead exposure also has been proven to negatively and irreversibly impact brain development, resulting in diminished linguistic and motor skills and social behavior (Committee on Environmental Health 2005; Bellinger et al. 1986). A follow-up study of young adults who had been exposed to low levels of lead as children found that deficits in the central nervous system persisted 11 years later (Needleman et al. 1990). Housing conditions are the most frequent cause of childhood lead poisoning, according to the United States Centers for Disease Control and Prevention (CDC).

During the early twentieth century, numerous houses and multifamily dwellings were constructed using lead-based paint. In 1978, the federal government banned its use because of

the associated health risks. Decades after the ban, however, many pre-1978 homes still exist with the original lead risks remaining—posing a threat to the health of the families that dwell in them, especially when the lead paint is peeling or flaking or when the raising and lowering of windows (or poorly conducted renovations) generate significant amounts of lead paint dust. According to the CDC, approximately 14 million children aged 0-6 years old still live in housing built before 1960. The Department of Housing and Urban Development estimates that 3.8 million homes in the United States contain some form of lead-based paint or high levels of lead in dust, with older rental housing often containing the highest level of lead hazards.

While a concerted public health and policy effort has achieved remarkable success in reducing lead exposure, recent estimates find that over 400,000 children aged 5 years and younger have a blood lead level above what the CDC considers a safe amount (Meyer et al. 2003). In a major national survey of lead paint prevalence, 35 percent of units occupied by low-income families (defined as earning below \$30,000 annually) were found to have lead-based paint hazards, as compared with 19 percent of middle- and upper-income housing units; older and poorly maintained units with deteriorated interior lead paint were also far more likely to present lead-based paint hazards (Jacobs et al. 2002).

According to a review commissioned by the National Center for Healthy Housing, studies typically report success in efforts to bring down elevated blood lead concentrations through remediation efforts in existing homes (Breysse et al. 2004). However, the review also found that there was not sufficient evidence to attribute this reduction to any single remediation strategy. Subsequent to release of this review, Nevin and Jacobs (2006) reported that window replacement had both strong results in remediating lead *and* positive energy savings that reduce utility costs.

While ongoing maintenance through rigorous dust control efforts has also been shown to bring about modest reductions in blood lead concentrations, other maintenance strategies may actually increase immediate lead exposure if not properly administered (Sandel et al. 2004; Jacobs et al. 2002). Moreover, one study detected elevated blood lead levels even in children whose housing had dust lead levels that met current postabatement standards (Lanphear et al. 1996). While obviously not cost effective as a solution to lead hazards for everyone, newly constructed affordable housing does have the added benefit of providing a lead-free environment, allowing children to avoid exposure altogether.

Poor quality housing can also impact health by exposing children to risk factors for asthma and other respiratory illnesses, and unintentional injuries (Krieger et al. 2002). In both of these areas, proper maintenance and building management have proven to be effective interventions. For example, researchers have found that most asthma is associated with exposure to allergens, including those often found in poor-quality housing, such as mold, dust mites, mice and rats, and cockroaches (nonallergic asthma represents only about 20 percent of cases) (Breysse et al. 2004). Exposure to these allergens, and other indoor air pollutants such as environmental tobacco smoke, can trigger asthma attacks and/or exacerbate symptoms.

Poor quality, or poorly maintained, housing can have cracks and crevices throughout the building, old carpeting, water damage, and excessive moisture—all of which create an environment susceptible to mold, mites, and pests. A recent study found that the highest prevalence of elevated levels of cockroach allergen was found in high-rise apartments, as well as in older homes, urban areas, and low-income households (defined here as those earning less than \$20,000 a year) (Cohn et al. 2006).

Studies indicate that integrated pest management (IPM) is one successful method for managing infestations that lead to asthma and other health concerns. This process includes the sealing of cracks and crevices to prevent pests' access to the housing unit, repairs of leaky plumbing, thorough cleaning of the unit, and education about improved housekeeping and sanitation habits. IPM also includes sparing application of the least toxic pesticides, to avoid exposing children to toxic substances that can negatively affect development. A study of East Harlem households that received IPM found a significant reduction in cockroach infestation after 6 months (from 80.5 percent to 39 percent of households), while a control group that did not receive the intervention had no reduction in the presence of cockroaches (Brenner et al. 2003).

Other sources of allergens may require similarly intensive remediation efforts. For example, studies evaluating the effectiveness of methods to remove dust mites found that dramatic interventions, such as the removal of old carpeting, were most effective in reducing dust mite levels (Sandel et al. 2004).

The increased attention to and adoption of “green building” strategies in affordable homes may represent one potential pathway for reducing residential exposure to allergens and toxic substances. While the green building movement began as an effort to “use key resources like energy, water, materials, and land more efficiently than buildings that are just built to code” (Kats 2003), the movement’s focus has expanded to include as well a focus on best practices

for ensuring occupants' health. In addition to environmental outcomes and associated community benefits that are primary goals (see Hypotheses 6 and 9), individual households also may benefit from the use of materials and construction techniques that limit exposure to contaminants and toxic substances, pest infestation, and other conditions shown to be detrimental to health (see Hood 2005 for more information on ongoing related research). To the extent that improved health leads to reduced time lost at work due to illness and lower spending on medical expenses, green building practices and other preventative techniques also may increase residents' income and as a result the affordability of homes (Morley 2006).

Unintentional injuries represent a third major area in which housing plays a role. According to the CDC, fires and burns are the third leading cause of fatal injury in the home (Centers for Disease Control and Prevention 2006, citing Runyan 2004). One study of house fires in Dallas found that the highest rates of fire-related injury were in low-income neighborhoods; homes in these neighborhoods were also significantly less likely to be equipped with functioning smoke alarms, which have proven to be effective at saving lives (Istre et al. 2001). Other studies have found evidence of burns resulting from exposure to uncovered or improperly insulated radiators. In some cases these burns are directly related to crowding, as children sleep in beds too close to radiators due to lack of space (Sandel and Sharfstein 1998). Finally, stair fences and window guards have proven effective in preventing injuries from falls (Breysse et al. 2004) – one of the leading sources of children's injury in the home.

Estimates of the direct and indirect costs associated with these health outcomes are substantial. One study of childhood health outcomes in North Carolina conservatively estimated the annual cost of illness, injury, disease, and disability attributable to substandard housing at \$95 million, with neurobehavioral conditions such as autism, cerebral palsy, and mental retardation responsible for nearly half of these costs (Chenoweth 2007).

Taken together, these and other studies suggest that the quality of management and maintenance of housing can make a big difference in the extent of, and costs related to, children's exposure to health hazards. Facilitating the transfer of older properties from neglectful owners to owners willing to maintain the property in a manner that minimizes health hazards is one way to improve health outcomes for young children.

As with lead-based paint exposure, the new construction of affordable homes can also be used to provide families with the option to relocate to a healthier environment, leading to reductions in asthma and other health ailments caused by substandard housing. Housing Choice Vouchers

and other programs that help families afford housing of their choice can also help families escape poor quality conditions.

5. Stable, affordable housing may improve health outcomes for individuals with chronic illnesses and disabilities, and the elderly, by providing a stable and efficient platform for the ongoing delivery of health care and other necessary services.

Assessment: In addition to limiting environmental exposure, there is strong evidence that stable, affordable housing can help individuals with HIV/AIDS maintain a stable treatment regime, which is critical to their health and well-being. It is reasonable to assume the same principle extends to other chronic illnesses and conditions, such as diabetes and hypertension, although less research has been done to confirm or refute this assumption. Some affordable housing models also may help elderly and disabled households achieve better health outcomes by facilitating the delivery of medical care and other services and accommodating physical disabilities.

Discussion: According to findings reported by the Center for Applied Public Health, 40-60 percent of all persons living with HIV/AIDS will experience homelessness or housing instability at some point during their illness (Aidala 2005). This can be a death sentence. One research summary reports that “[t]he all-cause death rate among homeless HIV positive persons is five times the rate of death among housed persons with HIV/AIDS: 5.3 to 8 deaths per 100 person years for HIV positive homeless persons, compared to 1 to 2 deaths per 100 person years for HIV positive persons who are housed” (National AIDS Housing Coalition 2005, citing Riley et al. 2005 and Ledergerber et al. 1999).

The New York C.H.A.I.N. Report is an ongoing longitudinal study following the experiences of over 700 New York City citizens living with HIV/AIDS. In its 2001 update report on housing and health outcomes, the data revealed a strong relationship between the participants' housing status and their ability to follow a treatment regime and access medical care. Using data from seven waves of the study over a period of 5 years, the report found several key results involving access to, and continuity of care:

- People with housing needs who get any kind of housing assistance, including rental assistance, housing placement assistance, or placement in AIDS housing, are almost four times more likely to enter into medical care than those who do not get housing assistance;
- People with housing needs who get housing assistance are twice as likely to enter into and continue to receive care that meets clinical standards for treatment of HIV/AIDS; and

- Homelessness or unstable housing is associated with lower rates of regular medical care and access to medical treatments, and poses special challenges for adherence to complex treatment regimes (Aidala et al. 2001).

HIV/AIDS patients frequently must take a variety of medications, many of which require refrigeration or must be taken with food. Bamberger et al. (2000) report that without a secure place to store medications safely, and only sporadic access to food, homeless persons with HIV/AIDS may find it difficult or impossible to adhere to instructions.

If stable, affordable housing can help people with HIV/AIDS maintain a consistent treatment regime, it is reasonable to expect it may have similar benefits for individuals with other chronic ailments. Homeless individuals with diabetes, for example, may have difficulty keeping their medication properly refrigerated. Without a secure storage place, syringes used to inject medication can be a target for thieves due to their street value, and may be difficult to use in shelters that do not allow residents to have needles (Hwang and Bugeja 2000; Brickner et al. 1986). A survey of clinicians treating homeless people with hypertension found similar obstacles, with 91 percent of respondents indicating that homeless hypertensives had more difficulty complying with treatment than housed patients (Kinchen and Wright 1991).

Many elderly and disabled households also have special health-related needs, which can be accommodated through various affordable housing strategies. Sometimes called “assisted living housing” or “affordable clustered housing-care” strategies, these arrangements combine affordable housing with varying levels of supportive services ranging from transportation and referrals to personal care and nursing services (Golant forthcoming; Fonda et al. 2002). This type of housing generally includes enhanced modifications such as nonskid floor surfaces, emergency call systems, and other features that increase accessibility and safety, and are associated with higher levels of independence among residents (Fonda et al. 2002, citing Moos and Lemke 1994). By allowing residents to live independently, but easily access services as needed, these models provide an affordable long-term care option for vulnerable populations. Even for individuals who do not need intensive services, housing subsidies can be helpful in paying for physical adaptations needed to accommodate physical disabilities.

One report, comparing the health outcomes of elderly, low-income residents of assisted-living housing (ALH) with a similar group of community-dwelling seniors, found that ALH residents were more likely to have maintained high functioning, and no more likely to experience death during the study period than community-dwelling counterparts, despite being at higher risk at the start of the study period (Fonda et al. 2002). It is important to note, however, that evaluation

of this housing model is still preliminary, lacking a “coherent and compelling body of scientific evidence regarding their residents’ quality of life and care” (Golant forthcoming, citing Pynoos et al. 2004).

Proponents also suggest that these congregate care models have the added benefit of increasing the financial efficiency of service delivery. As compared with in-home care arrangements, services are delivered to a group of individuals, allowing for a broad range of services offered at lower per-unit costs (Golant forthcoming; Washko et al. 2007). To the extent that it helps individuals postpone or avoid costly nursing homes, affordable assisted living also may save public funds. As mentioned above, research in this area is still emerging.

In some cases, the cost of subsidizing affordable housing has been shown to partially or even fully pay for itself through reduced reliance on acute care facilities and other public services. One study found that the cost of providing permanent supportive housing for homeless adults with disabilities in New York City exceeded by only a modest amount the estimated savings from reduced usage of homeless shelters, emergency rooms, hospitals, and prison or jails (Culhane et al. 2002). Another study tracked health outcomes among acutely ill homeless individuals in Chicago who had been admitted to a respite care facility following discharge from the public hospital. When compared with a similar group of patients that did not receive respite care, the respite care group used nearly 60 percent fewer inpatient days over the course of a 1-year period following discharge. The authors also demonstrate that respite care cost an average of \$706 per hospital-day avoided, less than half the estimated \$1,500 daily cost of hospitalization during that period (Buchanan et al. 2006).⁴ (See also Martinez and Burt 2006; Fenton et al. 2002.)

In general, it appears that a supportive housing environment may make it easier for formerly homeless or unstably housed individuals with chronic and acute illnesses to adhere to a medical regimen and attend follow-up appointments, leading to improved health outcomes and less intensive use of costly medical interventions. In some cases, the reductions in emergency service use achieved with stable housing have also proven to be cost-effective; however, some studies have found evidence of reduced in-patient costs among only a small segment of clients with unusually heavy hospital use (Rosenheck 2000).

⁴ According to the authors, respite services during the study period cost \$79 per day. The average stay in respite care lasted 42 days, costing a total of \$3,318. Participants in the respite care group had, on average, 4.7 fewer inpatient days than patients in the group that did not receive respite care (3.4 versus 8.1 inpatient days during the 12-month follow-up period), so the average cost per hospital day avoided (\$3,318/4.7) was estimated at \$706.

6. By providing families with access to neighborhoods of opportunity, certain affordable housing strategies can reduce stress, increase access to amenities, and generate important health benefits.

Assessment: A combination of housing vouchers and mobility counseling assistance to increase use of vouchers in lower poverty areas can help families access neighborhoods with more amenities and lower crime rates and poverty levels, leading to improvements in mental and physical health. This hypothesis is strongly supported by HUD's Moving to Opportunity demonstration. Similar benefits may be derived by helping families access neighborhoods of opportunity through project-based assistance. An alternative approach that merits further study is the use of community development strategies to build neighborhoods that offer amenities conducive to a healthy lifestyle, such as 'walkability' and ready access to fresh produce.

Discussion: The Moving to Opportunity demonstration is a major randomized demonstration intended to test the impact of moving to lower poverty neighborhoods on families living in public housing developments located in very high poverty census tracts. While the reductions in poverty levels achieved through the intervention were less dramatic than anticipated, and a significant number of families that moved to lower poverty levels chose to move back to areas with somewhat higher poverty rates, the demonstration nevertheless found significant improvements in mental health. As Kling et al. (2006) report:

In contrast to the results for physical health, the adult mental health results were quite consistent across specific measures (distress, depression, anxiety, calmness, sleep) in finding beneficial effects for the experimental group relative to the control group. This consistency led to the large mean (ITT) effect size estimate of .08 standard deviations for the adult mental health summary measure in Table II. The confidence level that the results are not due to chance is quite high under a method where the focus on mental health is determined exogenously (leading to per-comparison inference) or endogenously from the high t-statistic (leading to familywise inference). The magnitude of the mental health results – for example a 45 percent reduction in relative risk among compliers of scoring above the K6 screening cutpoint for serious mental illness . . . is comparable to that found in some of the most effective clinical and pharmacologic mental health interventions.

The Moving to Opportunity results suggest that housing strategies that help families move out of high poverty neighborhoods can lead to significant mental health improvements among movers. In the demonstration, this outcome was achieved by combining a portable, tenant-based rental housing assistance voucher with mobility counseling to help families find units in lower poverty neighborhoods and a requirement that those vouchers only be used in such areas.

Because few housing voucher programs today limit families choices only to low-poverty areas, and some have raised concerns with limiting family choice in this manner, one important question is whether mental health effects similar to those seen in Moving to Opportunity could be achieved by simply combining regular housing vouchers with mobility counseling assistance to assist voucher-holders in locating housing in opportunity-rich neighborhoods. This question requires further research.

While not tested in the Moving to Opportunity demonstration, it seems likely that positive mental health outcomes also could be achieved by locating new affordable housing developments in lower poverty neighborhoods (as opposed to using portable, tenant-based vouchers). In one study of scattered site public housing built in low-poverty areas in Yonkers, NY, families moving to lower poverty areas reported significantly less depression, problem drinking and marijuana use, and violent or traumatic events (Yonkers Family and Community Project 1997). Presumably, similar benefits also could be achieved through the increased production of new homes in areas of opportunity that include a portion that are made affordable to working families through inclusionary zoning or other techniques.

(For a thoughtful critique of the studies on the interrelationship of mobility and health through mid-2003, see Acevedo-Garcia et al. 2004.)

In addition to mental health improvements, neighborhood conditions also can influence physical health. For example, Flounoy and Treuhaft (2005) cite multiple studies showing that middle- and upper-income neighborhoods boast two to three times as many supermarkets as poor, minority neighborhoods, making access to fresh, nutritious food difficult for families in poor and minority areas. Additionally, research conducted in California indicated that having access to safe parks was associated with a 45 percent reduction in the percentage of urban teenagers engaging in no physical activity, with particularly strong effects among teenagers from low- and moderate-income families and those living in neighborhoods perceived as unsafe (Babey et al. 2005). Evaluation of the Moving to Opportunity demonstration showed that participants who moved to lower poverty areas experienced a statistically significant reduction in obesity. Authors of the MTO evaluation report hypothesize that this result could be linked in part to an “increase in exercise and nutrition...observed for the treatment groups” (Kling et al. 2006).

Quite apart from mobility strategies that help families move to areas of opportunity, another option is to use community development strategies to create more neighborhoods that offer affordable housing and exhibit features conducive to a healthy lifestyle – either by revitalizing

existing neighborhoods or by creating new neighborhoods with the desired characteristics. For example, to the extent that neighborhoods that are walkable benefit individuals by facilitating exercise or that neighborhoods with readily available fresh produce facilitate healthier eating, housing strategies to encourage these amenities could lead to valuable public health outcomes.

7. By alleviating crowding, affordable housing can reduce exposure to stressors and infectious disease, leading to improvements in physical and mental health.

Assessment: While much of the research on crowding is now somewhat dated, studies show several pathways through which this condition is related to poor mental and physical health. Ongoing residence in a crowded home interferes with individuals' capacity to manage stressors and maintain socially supportive relationships, leading to increased levels of psychological distress and other negative outcomes. Crowding also has been shown to increase opportunities for the transmittal of infectious disease among occupants.

Discussion: The most common definition of residential crowding is a person-per-room ratio of greater than 1.00 (Myers et al. 1996). Nevertheless, some researchers use a range of alternative measures, including persons per bedroom and number of children at home.⁵ In general, findings suggest that, by any metric, crowding is correlated with an array of adverse health outcomes, including impaired social relationships and overall mental health as well as increased vulnerability to acute lower respiratory infections and childhood pneumonia (Cardoso et al. 2004; Fonseca et al. 1996; Gove et al. 1979).

One explanation of these outcomes is that chronic residential crowding interferes with individuals' ability to adapt to other stressful life events, leading to an increased risk of psychological distress. A three-part study of men in urban India and college students in America revealed that, for all study groups, participants living in crowded homes were more vulnerable to the negative psychological effects of daily stressors than those living in low-density homes (Lepore et al. 1991). The authors suggest that responding to ongoing exposure to an environmental stressor, such as crowded housing, limits residents' capacity to manage otherwise minor daily disturbances.

Other studies suggest that chronic residential crowding strains relationships among residents, including parents and children, leading to adverse outcomes in psychological and physiological well-being. In a study of children in India, Evans et al. (1998) found that high residential density

⁵ For a lengthy discussion of the various standards used to measure crowding and rationale for choosing different measures, see Gray (2001).

was significantly associated with higher blood pressure among boys and that girls from crowded homes were significantly more likely to demonstrate learned helplessness than noncrowded girls. The authors also provide evidence that children in crowded homes tended to report higher levels of conflict with their parents, and suggest that this conflict is one mechanism through which the relationship between crowding and adverse child outcomes can be explained. Evans et al. emphasize that parent-child conflict explains only part of the relationship between crowding and adverse health outcomes, and that additional research is needed to clarify this relationship further.

Other research also demonstrates the relationship between crowded housing and deteriorated social relationships. One study of crowding among Chicago households, for example, found statistically significant relationships between crowding-related variables (including the ratio of persons-per-room as well as feeling obligated to fulfill excessive social demands and lacking privacy), and negative mental health outcomes, poor relationships within the home, and poor child care (Gove et al. 1979). (See also Baldassare 1978.)

Studies also suggest that household crowding may negatively impact physical health, primarily through increased exposure to infectious diseases. One Brazilian study found that crowding, as indicated by the number of persons sleeping in each bedroom, was significantly associated with a 2½-fold increase in the incidence of acute lower respiratory tract infections in children (Cardoso et al. 2004). This association is attributed to increased opportunity for cross infection among family members in crowded housing. Interestingly, the authors also found that crowding can have a protective effect against asthma, perhaps through exposure to infections from older siblings in early childhood. (For further evidence of the relationship between crowding and infectious diseases, see Baker et al. 2000; Fonseca et al. 1996; Victora et al. 1994.)

Lack of sleep and proper rest has also been presented as a possible way in which crowding leads to negative health outcomes (Gray 2001; Gove et al. 1979).

A major study on the effects of housing vouchers among families that also received welfare found a significant reduction in household size and the proportion of multigenerational households 5 years after enrollment in the voucher program (Mills et al. 2006). Notably, households that received vouchers experienced a statistically significant increase in the number of rooms per resident, and, accordingly, a reduction in household crowding.⁶ In-depth follow-up

⁶ Although similar experimental data are not available, it is likely that other programs that increase the availability of affordable housing may allow households to find appropriately sized units and avoid

interviews with program participants revealed that, among doubled-up households, “stress reduction [was] a major impact of the voucher.” While the study did not examine further health outcomes among those households, it is clear that when given access to increased affordable housing options, many families chose to pursue less-crowded living arrangements.⁷

It is important to note that several researchers call into question existing evidence of the adverse impacts of crowding, emphasizing the failure of earlier studies to isolate the effects of crowding from other confounding variables such as household income, housing quality and type, and access to health care (Gray 2001, citing Ambrose 1996, Kearns et al. 1992, Lowry 1989 and Martin 1976). (See also Newman 2006 for further discussion of the limitations of existing studies of crowding.)

8. By allowing victims of domestic violence to escape abusive homes, affordable housing can lead to improvements in mental health and physical safety.

Assessment: Domestic violence obviously can have serious negative health impacts on its victims, resulting both from direct physical injuries and long-term damage to psychological health and well-being. Children who are raised in households with domestic violence may also experience negative health outcomes related to the trauma they experience. Women fleeing abuse at home may have difficulty finding alternative housing arrangements; spousal abuse is acknowledged as one of the leading causes of homelessness. Affordable housing provides victims of domestic violence with a means to escape abusive situations and avoid the further disruption and negative health outcomes associated with homelessness.

Discussion: The health impacts associated with domestic violence are not limited to the injuries sustained during a physical attack. Studies have also shown evidence of strong links between domestic abuse and depression, post-traumatic stress disorder and other anxiety and panic disorders, eating disorders, and substance abuse among victims, although causation has not been established in all cases (Moracco et al. 2004; Eistenstat and Bancroft 1999; Bassuk et al. 1998). The association between exposure to domestic violence and negative psychological outcomes in children has also been well-documented. Increased incidence of behavioral problems, low self-esteem, depression, and post-traumatic stress disorder have all been shown

crowding.

⁷ Follow-up interviews indicate that many families enrolled in the voucher program misunderstood program requirements, and thought that the presence of an unrelated male in the house was prohibited. The authors point out that this misunderstanding may have led to underreporting of household members and/or involuntary establishment of separate households.

to be significantly associated with witnessing domestic violence (Carter 1999, citing Jouriles et al. 1996 and Margolin 1998; Edleson 1999). Others have shown that the negative repercussions of child exposure to family violence can be long-lasting, and that trauma-related symptoms may persist into adulthood (Edleson 1999). Children's health may also be at immediate risk if they try to intervene on behalf of a family member.

Victims of domestic violence stay in abusive relationships for a variety of reasons, one of which may be the lack of affordable housing options should they choose to leave. As articulated by Menard (2001):

The availability of safe, affordable, and stable housing can make a critical difference in a woman's ability to escape an abusive partner and remain safe and independent. Without viable housing options, many battered women, particularly those already living in poverty, are forced to remain in abusive relationships, accept inadequate or unsafe housing conditions, or become homeless and perhaps increase their risk of sexual and physical violence.

In statewide hearings on domestic violence conducted across Massachusetts, more than two of every five survivors testified that they were forced to choose between continued abuse and homelessness, as a result of the lack of affordable housing. As one woman stated, "I was in an abusive marriage for thirteen years.... I felt trapped, afraid to stay and more afraid to leave for fear of being homeless" (Economic Stability Working Group of the Transition Subcommittee of the Governor's Commission on Domestic Violence 2002).

In addition to the shortage of affordable housing, studies show that victims of domestic violence face unique obstacles when leaving an abusive situation. For example, perpetrators of domestic violence may restrict their partners' access to joint financial resources, or leave them with poor landlord references as a result of disturbances and property damage (Correia and Rubin 2001). Moreover, women escaping abusive situations may have a limited employment history, or difficulty maintaining long-term employment as a result of medical problems.

While there is anecdotal evidence that the lack of affordable housing causes women to remain in abusive situations, few studies examine this link explicitly.⁸ Rather, most research focuses on the connection between domestic violence and homelessness. Studies consistently show that

⁸ Notable exceptions include the Wilder Research Center's annual survey of homelessness in Minnesota, which found that 46 percent of homeless women had previously remained in an abusive relationship because they had no other option (Wilder Research Center 2004); as well as studies from Georgia (Dadunashvili 2003) and Russia (Horne 1999). In addition, there is some evidence that housing vouchers enable low-income individuals to stop living with abusive partners and establish their own households (Mills et al. 2006). Similar outcomes are likely for other forms of assisted housing.

domestic violence is one of the leading causes of homelessness, suggesting that—for those who make the choice to leave—stable, affordable housing may be very difficult to find (Gotbaum 2005; United States Conference of Mayors 2005; Correia and Rubin 2001; Menard 2001).

9. Use of “green building” and “transit-oriented development” strategies can lower exposure to pollutants by improving the energy efficiency of homes and reducing reliance on personal vehicles.

Assessment: When housing is designed and sited to promote environmental sustainability, the broader community may benefit from reduced exposure to air pollution and other toxic substances. The use of green building techniques in the construction of new homes and the renovation of existing units leads to lower levels of energy consumption, which may result in positive health outcomes by reducing emissions associated with burning fossil fuels — in addition to residents' savings on utility bills. Similarly, communities built in accordance with “transit-oriented development” and other smart growth principles may reduce residents' reliance on personal vehicles, thereby lowering automobile emissions, and facilitate greater use of alternative modes of transportation such as walking, bicycling and mass transit. While these hypotheses are fairly straightforward and individual components have been proven, the full causal connection between sound housing and transportation planning, reduced energy use, and corresponding health benefits has not yet been established through research.

Discussion: While most of the research linking environmentally sustainable development to health focuses on individual outcomes (see Hypothesis 4), there is reason to believe that adoption of “green” principles may lead to broader community health benefits. In 2005, nearly 40 percent of the nation’s energy was consumed by the buildings in which families live and the transportation they use to get to work and around town.⁹ Even without considering the impact of personal vehicles on the environment, the residential sector generated 18 percent of United States greenhouse gas emissions, primarily as a result of energy consumption and the production and transmission of electricity for homes (Emrath and Liu 2007). By incorporating green building techniques into affordable housing development and rehabilitation, homes can be made more energy-efficient, reducing reliance on fossil fuels and the resulting negative health

⁹ Estimate based on Davis and Diegel (2007). Energy Information Administration data indicate that in 2005, residential energy consumption accounted for 21.9 percent of overall energy consumption, and the transportation sector accounted for another 28.5 percent. Oak Ridge National Laboratory data indicate that of overall transportation energy consumption, light vehicles accounted for 58.4 percent, buses for 0.6 percent and passenger rail for 0.2 percent, for a total of 59.2 percent of transportation energy consumption, or 16.8% of the nation’s energy use. Adding the 21.9 percent for residential buildings and the 16.8 percent for residential transit yields a total of 38.7 percent of the nation’s energy.

impacts related to smog, acid rain, and air pollution (United States Environmental Protection Agency).

The harmful emissions associated with car use diminish air quality and can lead to poor respiratory and cardiovascular health. High rates of exposure to these pollutants have been linked to reduced lung capacity and increased incidence of severe asthma, as well as increased risk of heart failure, cancer, and stroke and higher rates of mortality (Ewing and Kreutzer 2006). Transit-oriented development (TOD) presents an alternative to sprawling, car-dependent communities and the associated environmental and public health threats. TODs are compact areas of higher-density development that are centered on public transit stations and feature a mix of residential, retail, and office uses. By providing an array of amenities within walking distance, TODs reduce the need to use personal vehicles to get to work or run errands, thereby reducing the extent of unhealthy automobile emissions and facilitating walking and biking. TODs can also enhance housing affordability by allowing residents to cut costs linked to car ownership. Similar benefits may also be achieved through the increased construction of housing within close proximity to job centers.

While green building and transit-oriented development policies may be pursued independently of affordable housing, a well-designed housing strategy for a community would link these strategies to ensure that working families benefit from the energy savings and health benefits associated with well-located and well-constructed homes.

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