



# Social Determinants of Health in Multnomah County



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## Neighborhood Context and Health

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### Summary

Neighborhood context—including the physical condition of buildings and streets, access to amenities such as grocery stores, and the social environment—can affect health significantly.

In some cases there are direct links between neighborhood context and the physical health of the residents, for example when there is poor garbage removal service that increases the presence of rodents and other disease vectors. In other instances, neighborhood conditions affect health by influencing psychological stress which in turn results in physical health problems. Neighborhoods can support healthy choices, physical activity or good nutrition through infrastructure such as bike paths, sidewalks, street lights, and with full service grocery stores.

This report summarizes the scientific literature that describes the links between neighborhood conditions and the health of residents. While there are limited data demonstrating these connections in Multnomah County we can rely on scientific evidence collected nationally and internationally to predict the effects of various neighborhood conditions on the health of Multnomah County residents. The report also provides options for policy directions that will strengthen neighborhood context with the ultimate goal of supporting health and quality of life for our residents.



## Introduction to social determinants of health

Health problems are often addressed with either medical treatment or by asking individuals to change their health-related behaviors. However, there is mounting evidence indicating that the root causes of poor health go beyond the choices made by an individual.

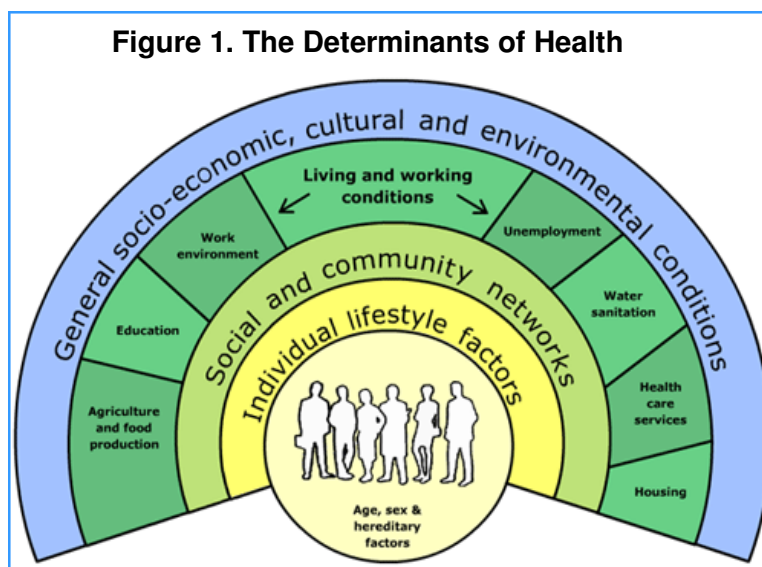
A person's health status is the result of the interaction between factors related to the physical and social environment, the individual's behavior and, to a lesser degree, inherited health characteristics. Such factors are called determinants of health. ***Social determinants of health*** are a subset of these health regulating factors and include income and social status, employment, education, housing, the built environment, social support networks and discrimination.

In recent decades, health researchers have found that social determinants exert a more significant influence on our health than individual behavior or genetics. By extension, public health strategies to improve our community's health must include efforts to support changes in our social environment. For example, people who attain higher levels of education enjoy better health outcomes relative to those who have less education. Therefore, dedicating more resources to

education is an important approach to fostering optimal health.

Social determinants of our health are typically influences that are the furthest away or "upstream" from health outcomes like disease or death. They set in motion a series of interconnected events and situations that ultimately shape our health status. These powerful upstream influences are typically not thought of as traditional public health concerns. Addressing these upstream or root causes of health status will require comprehensive, interdisciplinary strategies with old and new public health partners.

This report is part of a series that presents an overview of social determinants of health in Multnomah County including the economy, education, transportation and the built environment, and neighborhood and social conditions. The information in this series, together with data on birth, death and disease occurrence in the county, provide a fuller understanding of the broader public health concerns facing Multnomah County.



Source: Dahlgren G & Whitehead M. Policies and strategies to promote social equity in health. Stockholm: Institute of Future Studies, 1991.

## The effect of neighborhood context on health

We know that a person's health is influenced by their genetics, health-related choices, economic status, and educational attainment. More recently, public health researchers have found that a person's place of residence also affects health. Certain neighborhoods within a given city may support the health of their residents compared to others. For example, gaps in mortality rates between neighborhoods may be the result of differences in the average income of the individuals residing in each of these neighborhoods. However, we also know that neighborhood conditions like housing quality, access to sources of healthy food, or sanitation can affect health.

While we now know about the connection between a person's place of residence and their health we don't know how place influences health. One theory is that some neighborhood conditions can result in continuous psychological stress over long periods which in turn affects the health behavior of the individuals and ultimately results in physical health problems. For example, high crime rates in a neighborhood may dis-

courage businesses from establishing there and this in turn results in less access to employment opportunities within these areas. Consequently, residents of these neighborhoods may suffer economic deprivation and need to travel further to find employment opportunities. Poor economic status and longer commute times have both been linked to chronic stress and poorer health outcomes (see "The Economy and Health" and "Transportation and Health").

Solutions to the community's health problems must consider the characteristics of groups of people who are more likely to have poor health outcomes (such as income and educational levels of the individuals) as well as of the places in which these individuals live (such as the physical condition of houses).

In this report, neighborhood context will be examined in terms of physical characteristics, social characteristics and the availability of services in the area. Each of these aspects of neighborhood context has been shown to exert an influence on health either directly or indirectly.

## The health effects of neighborhood physical conditions

Neighborhood physical conditions include the state of houses and streets in the area, evidence of vandalism, litter, and the presence of parks or green space. Increasingly, social science researchers are finding connections between neighborhood physical conditions and health outcomes.



### Poor housing condition can be harmful to health

Substandard housing poses health risks to its residents through exposure to toxins, allergens, infectious disease, and increased risk of injury. Poor quality housing is more likely to be found among low-rent apartments and houses where many residents are not able to seek redress through their landlords. Examples of housing conditions that are hazardous to health include:

- Lead-based paint that was used in homes prior to 1978. Even in small quantities, lead exposure can

cause developmental delays in children.

- Mold and allergens including cockroaches that can lead to respiratory problems such as asthma.
- Infestation of rodents and other pests also increase the risk of infectious disease.
- Poor lighting in common areas, stairs in poor repair, or non-functioning smoke detectors are all hazards that put residents at risk for unintended injuries.

It is uncertain how much of the housing in Multnomah County is substandard and the degree of risk posed to the inhabitants. There is currently no countywide mechanism to systematically identify and record deficiencies in housing stock. In 2002 the U.S. Census Bureau conducted the American Housing Survey in the Portland metropolitan area. The survey revealed information on the condition of housing such as leakage (18% of units experienced leakage from interior or exterior sources), presence of rodents (approximately 7% of occupied units), or heating and plumbing problems (3% of occupied units with moderate to severe problems).<sup>1</sup> Most of the housing problems highlighted by this survey have the potential to affect health adversely. The survey also provides information on the quality of the neighborhood in which the respondents live (see next section on neighborhood physical conditions).

### **Neighborhood graffiti, litter, and vandalism can result in poor health for residents**

Litter, graffiti, and vandalism can adversely influence the level of physical activity among residents of low income neighborhoods.<sup>2</sup> In addition to affecting health-related behavior, neighborhood deterioration and physical disorder is associated with higher rates of premature death in general, cardiovascular mortality, homicide, and an increased rate of gonorrhea.<sup>3</sup>

Poorly maintained neighborhoods with litter, graffiti

and evidence of vandalism may send a message that the residents of the area don't care about the condition of the neighborhood or that laws are not enforced. Consequently, these deteriorating neighborhoods may invite drug use, high-risk sex or criminal activity which decreases the residents' sense of safety and discourages them from walking or other physical activity in the neighborhoods. Further, commercial operations may avoid such areas along with residents who can afford to live elsewhere. A potential consequence is the absence in poorly maintained neighborhoods of healthful grocery stores making it harder for residents to access nutritious food.

According to the American Housing Survey of 2002, among occupied housing units, approximately 11% of the survey respondents said that there was an accumulation of trash, litter or junk on streets or other properties within 300 feet of their own building.<sup>1</sup> Renters were more likely to report accumulated trash in the vicinity of their homes compared with owners. Nine percent of the owner occupied units surveyed compared with 17% of renter occupied units noted an accumulation of trash, litter or junk near their homes. The survey also found that persons living in housing units that had moderate to severe physical problems, renters, and African Americans were most likely to report vandalism and bars on windows of other buildings, and trash or junk accumulating in the vicinity of their homes. Due to budget constraints the U.S. Census Bureau has no further plans to conduct the Ameri-



can Housing Survey in the Portland metropolitan area.

The Multnomah County Citizen Survey conducted in 2006 offers some insight into the views of county residents by area of residence within the county.<sup>4</sup> Survey respondents were asked to describe how great a problem graffiti was in their neighborhoods. Residents of northeast Multnomah County were most likely to report that graffiti was either somewhat of a problem or a big problem (49% ) followed by residents in the southeast part of the county (46%) and mid county (43%). Across the county 39% of the residents found graffiti to be somewhat of a problem or a big problem in 2006. Residents’ beliefs that

graffiti is a problem appears to be increasing. In 2003, only 22% of county residents reported problems with graffiti.

Taken together, the information from the two surveys provide insight into the magnitude and location of neighborhood deterioration and disorder such as trash, graffiti and vandalism in Multnomah County as well as the areas of the county most likely to experience these problems. Based on the observations of the studies cited above, residents of areas experiencing the greatest neighborhood physical deterioration and disorder in our county may be at risk for lower levels of physical activity and higher levels of mortality and ill health due to various diseases.

**Table 1. Neighborhood Conditions of Occupied Units, American Housing Survey, Portland, OR-WA metropolitan Area: 2002**

|   | <i>Percent of respondents who were:</i> |  |                  |          |                     |                                   |  |
|---|---|--|------------------|----------|---------------------|-----------------------------------|--|
|   | Renters                                 | Living in houses that had moderate to severe physical problems | African American | Hispanic | Below poverty level | Residents of the City of Portland | Residents of parts of Multnomah County other than Portland |
| Buildings vandalized or with interior exposed within 300 feet | 5%                                      | 9%   | 5%               | 6%       | 4%                  | 5%                                | 3%   |
| Bars on windows of one or more buildings within 300 feet      | 6%                                      | 10%  | 9%               | 4%       | 8%                  | 16%                               | 6%   |
| Trash, litter, or junk on any properties within 300 feet      | 17%                                     | 21%  | 17%              | 13%      | 19%                 | 16%                               | 13%  |
| Neighborhood crime present                                    | 29%                                     | 35%  | 25%              | 24%      | 28%                 | 32%                               | 30%  |
| Streets within 300 feet need repair (minor and major)         | 28%                                     | 31%  | 35%              | 31%      | 33%                 | 32%                               | 30%  |

## **Tree canopy and green spaces improve health**

The presence of trees and grassy areas around residential buildings has been shown to increase use of outdoor space. According to studies, the greater the number of trees in an outdoor space and the closer they are to residential buildings the more likely it is that the space will be used by residents in the neighborhood.<sup>5</sup>

There are several benefits of increased use of green spaces through increased residential tree canopy and grass cover. Research shows increased interaction between adults and children in residential areas with more trees and grass compared with barren spaces. Social activities, visitors to the neighborhood, and the number of neighbors the residents knew were greater in areas with greener common spaces compared with buildings with barren outdoor spaces.

Greener surroundings have also been linked to a reduction in criminal activity ranging from graffiti and loitering to property and violent crimes. It is possible that the increase in safety occurs as a result of increased social connections and sense of community belonging.

In addition to the benefits of trees and greenery in the immediate vicinity of residential buildings, parks and open spaces also have a beneficial effect on children. Recent research indicates that easy access to parks increased physical activity among school-aged children regardless of family income or educational attainment.

An increase in positive social interaction and a reduction in isolation, particularly among elderly residents, have positive health impacts on mental and physical health. These health effects are discussed in greater detail in the section below on social conditions of neighborhoods.

## **The location of neighborhoods can contribute to air quality and risk of respiratory illness and chronic disease**

The physical condition of a neighborhood includes the air quality experienced in that community. Automobiles and certain types of industrial operations release particulate matter into the air along with other air toxics. Air particulates are known to cause or worsen existing respiratory conditions such as asthma. Some studies have also linked prolonged exposure to higher levels of air toxics such as benzene, formaldehyde, and 1, 3-butadiene to an increased risk of cancer.

The most significant types of health effects that result from living in neighborhoods sited near freeways and industrial areas are an increased risk of respiratory illness and of chronic diseases like cancer. In Portland, this includes the neighborhoods that flank I-5, I-205, and I-405. Historically, many of these neighborhoods (such as in north Portland) had a low median income, but in recent years, with the revitalization and conversion of former industrial zones in the city into mixed use neighborhoods the exposure to air toxics can effect a broad cross-section of our community. In some newer buildings, the increased risk of illness due to air pollution can be reduced by using air filtration systems. However, in many older homes and single family units in the more established neighborhoods near these freeways such measures may be too expensive or impractical for other reasons.

The Portland Air Toxic Assessment of 2006 from Oregon Department of Environmental Quality shows how air pollution varies by location in the city and, consequently, how the risk of illness due to these air toxics also varies. Maps of neighborhoods next to freeways and the dispersion of various air toxic substances from motor vehicles show an increased risk for many due to cancer-causing pollutants. These maps can be found at DEQs web site at <http://www.deq.state.or.us/aq/toxics/pata.htm>.

## Social conditions in neighborhoods

In addition to physical conditions of neighborhoods, the connections between people, or social conditions, within a neighborhood also have a positive impact on the health of individuals. It is more difficult to show the link between neighborhood social conditions and their health impacts among residents. However, more studies are documenting the benefits to health and wellbeing brought about by living in a community that encourages positive interaction among its residents.

### Neighborhood health status improves when residents work for the common good

When residents are willing to help out for the benefit of the neighborhood, the entire community is more likely to experience lower death rates specifically from cardiovascular disease, homicide, and lower premature death overall. However, this link was not seen in neighborhoods that were in poor physical condition (boarded up windows, vacant housing units, graffiti, and trash on streets).<sup>7</sup> One hypothesis proposed by researchers is that in run down neighborhoods the physical condition of the area suggests that the residents tolerate destructive behaviors from community members which in turn discourages residents from acting together for the common good.

### Higher social capital within a neighborhood may lead to better health

#### *The role of trust in community members*

Social capital refers to the characteristics of a community that encourage cooperative efforts for the good of all members of the community. These characteristics include trust between citizens, the exchange of benefits and support among citizens, and a

willingness to participate in community (civic) organizations. There is some evidence linking certain health outcomes to social capital such as lower smoking rates among people who are more engaged in community life.<sup>8</sup> There are also several promising hypotheses that try to explain how higher social capital is linked to better health.

First, it is thought that higher social capital is characterized by a higher level of general trust in other community members. With higher levels of trust, people are less likely to feel anxiety and fear about how others may behave and this leads to a reduction in chronic stress.<sup>9</sup> Exposure to continuous psychological stress has been linked to higher rates of heart disease, stroke, and other chronic diseases. It is likely that the opposite is also true: less exposure to chronic stress results in better physical health.

Another theory is that trust in other individuals may encourage people to create and maintain networks of friends which themselves have a positive effect on health. Established social networks reduce social isolation and therefore decrease the adverse health effects of isolation. Conversely, isolation and suspiciousness are thought to be associated with somewhat higher rates of chronic illness such as heart disease.

Having a network of friends is also thought to support good health by providing people with resources that can shield them from the worst consequences of poverty.<sup>10</sup> In communities with a higher degree of connectedness where members are more likely to work together for their mutual benefit, there may be greater ability or willingness to provide assistance and care to other community members in times of financial need.

*Volunteerism and other civic participation*

Higher social capital is characterized by altruism, community involvement, and as stated above, trust. Social capital can show up in the form of volunteerism and other civic participation such as engaging in the local political process in one's own community.

Volunteer activity among the elderly is associated with better health outcomes including better self-reported health status, lower depression, and lower

mortality.<sup>11</sup> The health benefits of volunteering can be seen across gender and race and even when the volunteer is not working within their own community of friends. Research also indicates that the health benefits decrease when people volunteer more than 100 hours per year. At this point, it is possible that the benefits of volunteering are outweighed by the stress of the responsibilities associated with volunteering.

**Table 2. Selected results from Multnomah County Citizen Survey, 2006**

|  | <i>Percent of respondents answering "somewhat agree" or "strongly agree"</i> |       |            |            |            |      |            |
|--|--|-------|------------|------------|------------|------|------------|
|  | West   | North | North-east | South-east | Mid-county | East | Overall    |
| Good place to live   | 98%  | 93%   | 95%        | 91%        | 83%        | 89%  | <b>92%</b> |
| People are willing to help   | 91%  | 87%   | 88%        | 89%        | 83%        | 89%  | <b>88%</b> |
| Adults watch out that children are safe                                      | 91%  | 87%   | 81%        | 86%        | 81%        | 83%  | <b>85%</b> |
| There is a sense of community  | 88%  | 82%   | 85%        | 84%        | 67%        | 69%  | <b>78%</b> |
| I regularly stop and talk with people  | 81%  | 75%   | 80%        | 73%        | 73%        | 71%  | <b>75%</b> |
| People move in and out a lot   | 28%  | 38%   | 32%        | 27%        | 37%        | 31%  | <b>31%</b> |
| If children were doing something wrong neighbors would do something about it | 86%  | 73%   | 77%        | 80%        | 74%        | 79%  | <b>79%</b> |
| Voted in Multnomah Co. within the last year ( <i>% responding "yes"</i> )    | 88%  | 84%   | 87%        | 86%        | 83%        | 79%  | <b>84%</b> |



## Access to services and amenities

Easy access to transit stops, shops within walking distance of homes, parks or other low-cost recreation facilities, sidewalks, and bike-related facilities can have a positive effect on health by increasing physical activity either for transportation or for recreation. A 2009 study demonstrated that the presence of these amenities increased the percent of residents who met standard physical activity guidelines for moderate to vigorous exercise.<sup>12</sup> Access to sidewalks was particularly effective in increasing the proportion of residents who met the physical activity guidelines. It is, of course, possible that active individuals in this study chose to move to neighborhoods with more services and amenities, however, the links between neighborhood environments that support walking/biking and increased overall physical activity are supported by findings in other studies.

The presence of parks close to one's home promotes exercise even when the park is smaller than one a few miles further away.<sup>13</sup> Even if visitors to the park did not engage in any physical activity while they were there, having to walk to the park and back home provided them with exercise. For some, the presence of tracks or trails increased the likelihood that they would engage in moderate exercise.

The RAND Corporation conducted a study that found that people living in areas of low neighborhood socioeconomic status ate fewer fruits and vegetables compared with those living in neighborhoods with a higher socioeconomic status.<sup>14</sup> The differences in nutritional habits of White residents and Mexican American or African American residents were also attributable partly to the differences in neighborhood-level socioeconomic status. The RAND report hypothesized that since African Americans and Mexican Americans tend to live in disadvantaged neighborhoods, it is probable that they have less access to stores selling nutritious food or to transit

stops. Lack of easy access to healthy foods may be an important factor in the amount of fruits and vegetables consumed.

A systematic review of the literature exploring the association between neighborhood conditions and obesity found that the presence of supermarkets (rather than smaller grocery/convenience stores), places to exercise, and safety were most likely to influence the proportion of residents who were obese.<sup>15</sup> By extension, the presence of these factors in a neighborhood affects the prevalence of various obesity-related illnesses such as cardiovascular disease and diabetes.



## How we choose where we live

As we have seen above, the health of residents of Multnomah County is greatly influenced by the physical conditions, the social conditions (economic status of residents, community connectedness, perceptions of safety etc.), and the level of amenities and municipal services available in their neighborhoods. However, other factors are likely to play a role in determining our neighborhoods of residence.

Where we live, and therefore the social, physical and service characteristics of our neighborhoods, is obviously not always a matter of choice. For example, the scarcity of affordable housing can force many residents to live in neighborhoods further away from

city centers or business districts and may determine the quality of the neighborhoods and the housing in which they live.

Race and ethnicity may also contribute to a resident's choice of neighborhood. New immigrants seeking social support from other members of their community may choose to live in close proximity to each other. Greater proportions of the African Americans and Hispanic communities are of lower socioeconomic status bringing race and ethnicity to bear in determining neighborhood of residence.

## Promising policy directions

Policies to improve health by enhancing neighborhood context have not been evaluated rigorously. However, experts in public health and urban planning are focusing their attention on certain policies and strategies that appear to hold promise. While research continues on the mechanism and degree of effectiveness of neighborhood-level interventions in improving health, policymakers can still set a course that has the potential to improve the health and well-being of residents.

### Increase the number of affordable, quality grocery stores

Providing incentives to encourage grocery stores to locate in underserved areas would improve access to healthy food choices in neighborhoods where residents currently resort to unhealthy food or car travel to quality food markets. Incentives include economic encouragements in the form of grants, loans or tax credits to build full service grocery stores in underserved areas. Also, parts of neighborhoods could be zoned so that grocery stores are given a priority in

specific locations within neighborhoods.

In addition to physically locating the grocery stores in neighborhoods, it is important to assure that the food is healthy and affordable to the residents in the surrounding communities. The proximity of grocery stores to residential areas would potentially improve dietary habits by providing better choices, encourage physical activity through walking or biking, and would reduce vehicle miles traveled.



Other options to increase access to fresh produce may include changes to zoning regulations or general plans to accommodate farmer's markets, community gardens, and school-based gardens that yield produce.

### **Improve neighborhood walkability**

Walking is one of the most popular forms of physical activity among Americans<sup>2</sup> and is also an inexpensive form of exercise. Modifying neighborhood-level street characteristics is a relatively easy way to encourage physical activity among residents. Adding sidewalks to neighborhood streets increases pedestrian safety and provides the space for residents to walk for exercise. Greater street connectivity within the neighborhood and access to physical activity resources like parks also encourage activity such as walking and biking.<sup>16</sup> The presence of neighborhood shopping destinations, as mentioned above, would also provide incentives to walk or bike. Changes to city/county general plans or zoning requirements to allow the addition of more sidewalks or bike paths can also clear the way for these health-enhancing modifications to urban design.

### **Increase contact with green space and nature**

Aside from incorporating parks into neighborhoods, planting trees and other greenery in residential areas will improve health. Most directly, trees and shrubs improve health by enhancing air quality. However, the indirect health effects of greenery occur by encouraging greater social interaction with fellow neighborhood residents. Greater social interaction leads to reduced isolation and a greater perception that one can rely on the assistance of other neighborhood residents.

### **Improve opportunities for community organizing, volunteerism, and other civic activity**

Improvements at the neighborhood level to existing physical and social conditions must include community organizing to bring together community residents to work collectively towards common goals. Not only does this involve revitalization of underserved communities, but it also contributes to a shared sense of purpose and responsibility within neighborhoods. As discussed earlier, civic activity and volunteerism are both linked to better health and well being for those who give their time to such activities. The health benefits are particularly valuable to older residents in the neighborhood who are vulnerable to isolation and mental and physical health issues associated with being disconnected from society. Of course, the success of community revitalization efforts depends greatly on the participation and support of community residents and leaders. Community organizing would marshal the necessary support and implement the desires of those who reside in the areas that are the focus of improvement efforts.

### **Incorporate health impact as a criterion for evaluating neighborhood improvement plans**

The systematic consideration of the health impact of changes to parks, roads, sidewalks, transit stops, zoning or other built environment changes is proving effective in avoiding unintended adverse health effects and improving neighborhoods in ways that enhance health, and therefore, quality of life. Toward this end, policy makers can encourage local urban and transportation planners to consider health indicators in selecting geographic areas that will benefit from improvements, or including health-related criteria in determining which alternatives are most beneficial to the community.

## The vision of a 20 minute community

*What would our daily reality be if everything we need to lead healthy lives were accessible by walking no more than 20 minutes in any direction from your home?*

*A “20-minute community” is a walker and biker friendly area with ample sidewalks and bike lanes and adequate on street bike parking. Various parts of the area would be interconnected easily with streets and walking paths. The streets, public and retail spaces would be designed to accommodate the needs of persons with disability. If you need to get somewhere outside of your 20-minute community you would have access to an efficient public transit system with conveniently located stops. Grocery stores, farmer’s markets, and community gardens within walking distance would be our sources for fresh, healthy food. In addition, restaurants, and public gathering spaces would allow us to stay socially connected with others in the area. Small retail outlets would create employment and encourage spending locally. Schools would be located so that children could walk there and back without the danger of fast moving motor vehicles near these routes. Child care facilities would be located near schools within these communities so that parents do not have to go far to drop off and pick up their kids. Parks would be in easy reach for recreation and exercise.*

*All of these elements of a 20-minute community would have a positive impact on the health of community members. When it is easier to get around by foot or bike rather than driving, people are more likely to be physically active. Children growing up in an environment where walking and biking are the most common modes of transportation are likely to develop a lifelong habit of physical activity. More frequent encounters with other residents in the area provide opportunities for developing social connections and establishing a sense of community. The local economy would enjoy the support of customers who can walk easily to stores from their homes.*

**References** (1) American Housing Survey, 2002—accessed at <http://www.census.gov/prod/2003pubs/h170-02-34.pdf>; (2) Ross CE and Mirowsky J: Neighborhood disadvantage, disorder, and health. *J Health Soc Behav* 2001, 43:258-276; (3) Cohen D, Mason K, Bedimo, A, Scribner R, Basolo V, and Farley, T: Neighborhood physical conditions and health. *Am J Public Health* 2003, 93:467-471; (4) Multnomah County Citizens’ Survey, 2006 available at <http://www.co.multnomah.or.us/auditor/Citizen%20Survey%202006.pdf>; (5) Coley RL, Kuo FE, Sullivan WC: Where does the community grow? The social context created by nature in urban public housing. *Environment and Behav* 2007, 29:468-494. (6) Portland Air Toxic Assessment of 2006 available at <http://www.deq.state.or.us/aq/toxics/pata.htm>; (7) RAND Health Research Highlights, 2005. Does neighborhood deterioration lead to poor health? Available at [http://www.rand.org/pubs/research\\_briefs/RB9074/index1.html](http://www.rand.org/pubs/research_briefs/RB9074/index1.html); (8) Cooper H, Arber S, Fee L and Ginn J. The influence of social support and social capital on health: a review and analysis of British data. London: Health Education Authority. 1999; (9) Wilkinson R and Marmot M. Social determinants of health: the solid facts. 2000. Accessed at <http://www.euro.who.int/DOCUMENT/E81384.pdf>; (10) Campbell, C. et al. (1999) Social capital and health. London: Health Education Authority; (11) Morrow-Howell N, Hinterlong J et al.: Effects of volunteering on the well-being of older adults. *J Gerontology*. 2003, 58B, S137-S145; (12) Sallis J, Bowles H, Bauman A et al.: Neighborhood environments and physical activity among adults in 11 countries. *Am J Prev Med* 2009, 36: 484-490; (13) Cohen D, Sehgal A et al.: Park use in physical activity in a sample of public parks in the city of los angeles. RAND Corp. 2006. Available at [www.rand.org/pubs/technical\\_reports/TR357/](http://www.rand.org/pubs/technical_reports/TR357/); (14) RAND Health Fact Sheet. Do neighborhood economic conditions influence the consumption of fruits and vegetables. 2008. Accessed at [http://www.rand.org/pubs/research\\_briefs/RB9375/index1.html](http://www.rand.org/pubs/research_briefs/RB9375/index1.html); (15) Lovasi G, Hutson M, et al.: Built environments and obesity in disadvantaged populations. *Epidemiologic Rev.* 2009, e-published; (16) Heinrich KM, Lee RE, Suminski RR et al.: Associations between the built environment and physical activity in public housing residents. *Int J Behav Nutrition and Physical Activity.* 2007, 4:56.



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