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# Density and Health: Is Less Better?

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## **Abstract**

There are longstanding impressions that density is unhealthy. While this may have been true historically, advances in sanitation, health care and general living standards have resulted in cities' being healthier places than rural areas or suburban peripheries. Cities continue to have health concerns, but from communicable diseases to access to health care to the health effects of urban sprawl, denser is healthier. The American movement to the suburbs was motivated, at least in part, by a desire for healthier living. This change in the geography of health effects, whereby dense living is healthier, should be considered by those concerned about new development proposals.

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## Historical Perspectives and Prejudices

For most of the history of urban life, cities were dangerous places. Urbanization and the development of agriculture were associated with malnutrition, epidemics and crime.[1] Though the obvious social and economic advantages of cities continued to attract migrants, until recently, cities suffered from a net loss of population (an excess of deaths over births) only offset by new arrivals from rural areas.[2] The United States was not immune from these problems. Colonial America and the 19th century saw epidemic after epidemic kill thousands in urban areas with yellow fever afflicting Philadelphia[3], and New York City being ravaged by cholera.[4] Sanitation, clean water and waste disposal were ongoing issues. First the industrial revolution and then the arrival of the automobile added air pollution to the mix. Is it any wonder that our collective memory sees density as dangerous and unhealthy?

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But in an age of expensive medical care, widely available sanitation, reliable access to food, and declining crime rates, it is not certain that cities and the density that is central to urbanism are still dangerous. This paper examines the evidence on density and health in contemporary US cities.

But what is dense? Certainly no one is proposing new development that would lead to the approximately 500,000-persons-per-square-mile density achieved in the early 20th century on Manhattan's Lower East Side (over 300 units per gross acre at today's median household size). This paper considers neighborhoods to be dense or urban when they reach densities greater than 3,500 persons per square mile. This is the threshold at which non-automobile transportation begins to be an option, and it divides the 2000 US urban population into approximately two equal groups. Suburban densities range from 200 to 3,500 persons per square mile. Areas are considered rural if they have fewer than 200 persons per square mile.

First, conditions where denser is healthier are considered, then health factors where less density is better for health are evaluated. Next, health issues where the evidence on density is mixed are described. Finally, the total evidence for health and density is discussed. The findings might surprise those who consider cities to be unsafe, unhealthy places.

### Conditions Where Dense is Better

Sanitation, clean water and waste disposal. Better sanitation is possible in cities because economies of scale allow the construction of sewers and public water supplies while less dense suburbs and rural areas must rely on septic systems and well water. It is prohibitively expensive to pipe water to and sewage from sparsely distributed housing. While not without concerns—chlorination byproducts have been implicated as carcinogens[5]—urban water and sewage disposal is better for health and the

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environment. Public water supplies are regulated, while private well water often is not. Additionally, there is a growing concern that non-point pollution sources—such as contaminated aquifers, street runoff, and other land-based polluters, of which leaching septic systems are a major component—are responsible for a significant portion of water contamination.[6] Cities, with their urban runoff, are not immune from these problems, but rural areas probably have a greater share of this problem. Furthermore, once water sources are contaminated by sewage runoff, well water is more at risk. Cities, with their vast public water works, are not as likely to be affected.

**Health care.** For the most part, there is better access to health care in cities. A major problem in rural areas is that doctors and hospitals can be far away.[7] This is not to say that poor people in cities can necessarily afford to visit the nearby physician or have the insurance that is vital to pay for prescription drugs. But these problems confront the suburban and rural poor as well. Studies have found that people who live further from hospitals and doctors are less likely to use them and suffer from greater health consequences.[8] Tertiary care facilities and teaching hospitals, representing the cutting edge of US healthcare, are mainly in cities. Medical research is concentrated in dense metropolitan areas such as Boston, San Francisco, San Diego and Washington. Once you are ill, rural living is riskier.

**Reduced greenhouse gas production.** It is true that air pollution levels are higher in urban areas, but this must be balanced by the fact that people living in higher density areas drive less.[9, 10] Ultimately, this is healthier for the environment than rural and suburban living. Global warming, caused by carbon dioxide (and less density leads to more driving), has been implicated in the spread of disease and an increase in natural disasters such as floods and droughts.[11] If less dense areas are healthier because they export pollution, they must still accept the responsibility for the health effects they cause.

**Reduced pesticide use.** Lawn chemicals and antimosquito pesticides are major sources of environmental harm. These chemicals have been implicated as endocrine disrupters, carcinogens and as possible contributors to other diseases[12]. While people in cities also use these chemicals, their per capita usage is much less than in nonurban settings. Routinely used farm chemicals also pose major health concerns. Herbicides and pest-control chemicals are problematic, particularly where housing is near farmland. [13]

**Traffic accidents.** Rural areas have a much greater accident rate than that of urban areas because people drive more, at greater speeds, and roads are in poorer condition.[14, 15] Higher speeds increase the consequences of accidents. Traffic-related fatalities are a leading cause of death in the US, and their potential risk to health in suburban and rural areas may by themselves outweigh all the potential elevated health risks of denser urban areas.

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**Physical activity.** People who live in sprawled areas are less physically active than those in dense communities. It may be that a lack of sidewalks, poor roads, and more-distant destinations more than offset the availability of open space recreation activities. People who drive more also are less likely to exercise and low densities necessitate increased driving.[16] The fear of traffic accidents might also cause people in less dense areas to avoid roadways.[17]

**Obesity.** This increased risk of physical inactivity might contribute to the likelihood that people living in sprawled and rural areas are more likely to be obese.[18, 19] Another factor may be that the time constraints associated with a spread out environment leaves less time for all other activities, reducing physical activity and increasing the likelihood of eating fast food (with high levels of fats, salt, and calories).[20, 21] This effect is somewhat masked by the fact that nonwhite and poor people, who are often clustered in urban areas, are more likely to be obese. But when these and other risk factors are controlled for, people who live in more sprawled metropolitan areas are more likely to be obese. It should be noted that obesity is a risk factor for cardiovascular disease, cancer, and diabetes.

**Vector-borne diseases.** Lyme disease, West Nile virus and other tick- and mosquito-spread diseases are more likely to infect people in less dense areas, particularly in semirural communities on the urban fringe, where forests and grassland abut housing.[22] The effect is greatest for Lyme disease, which needs deer and other host animals to serve as reservoir for infections. While the West Nile Virus was first found in the US in Queens, New York, it has since been found throughout most of the US. Again, rural areas and low-density urban peripheries are most at risk.

### **Conditions Where Dense is Worse**

**Air Pollution.** While certain pollutants such as ozone are transported over large areas and may affect both rural and urban areas, air pollution is more of an urban problem. Perhaps the most problematic is diesel exhaust, with highest exposures occurring in the most densely populated portions of cities. Given that diesel exposure may be associated with thousands of annual excess deaths, this may be the greatest single contributor to excess mortality in cities, greater even than crime. The benefits associated with declining density, however, such as lower total concentrations of pollutants in ambient air are balanced by the fact that the air inside cars is usually much worse than the air outside. Air inside cars seems to concentrate carbon monoxide as well as other toxic air pollutants like benzene, toluene, and xylene.[23] Density and air pollution may ultimately turn out to be a wash or may even prove more problematic in rural/suburban areas.

**Crime.** Fear of crime has driven US settlement patterns for centuries. Certainly crime rates are higher in cities. However, rural areas are not immune from violent crime. In addition, the risk of dying by murder in an urban area may be less than the risk of dying

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in a car accident in a suburban area.[24] Part of the antidensity bias in the US arises from the experience with postwar high-rise housing for poor families. From Pruitt Igoe in St. Louis to the Robert Taylor Homes in Chicago, high-rise living has been associated with violent crime. But this is more a function of poor design and overconcentration of poor people than of density itself. Dense housing has not proven to be a problem for middle-income or wealthier people. It is interesting to note that people no longer behave as if suburbs were safe. Children are routinely chauffeured among home, school, and after-school activities. The suburbs have seen a large increase in the number and scale of gated communities. Where are the safety advantages of low density?

### **Health Issues Where the Relationship to Density Is Unknown or Mixed**

***Infectious diseases.*** Even though infectious diseases are not the threat they once were, they still kill thousands of Americans every year. HIV-AIDS, bacterial infections, Hepatitis and even tuberculosis continue to be major health concerns. HIV-AIDS was originally identified in Los Angeles, New York City, and San Francisco and first became known as a disease affecting urban gay men. Shortly afterward, it was found extensively among urban injection-drug users. While it might be comforting to think that it is still an urban problem, there is evidence that HIV-AIDS is increasing most rapidly in rural parts of the US.[25]

Other infectious diseases also do not spare rural areas, though population dispersion might reduce their obvious impact. While most tuberculosis cases in the United States are acquired in other countries, native cases of the disease cluster in the rural South.[26] While extremely overcrowded conditions, along with poor sanitation and ventilation, may foster epidemics, there is little evidence that infectious diseases favor dense areas over less dense areas at the range of density levels found in the US. Unless one manages to sever all contact with other persons, including in schools, workplaces, and stores (and isolation is also a health risk), everyone is at risk for communicable disease.

***Mental health.*** Arguments could be made either way between better mental health in low-density areas and better mental health in dense cities. Certainly the stereotype of living apart from noisy and nosy neighbors in a area of lush vegetation with only peaceful bird calls punctuating the silence—and perhaps a good view—is appealing when contrasted with the specter of alienation, squalor, and crowds thought to be common in cities. But this discounts the freedom that is seen to be central to urban living, the benefits of constant stimulation, and the ability to take advantage of diversity and opportunity. Perceptions aside, the evidence is mixed. Residents of rural areas are more likely to be depressed or show other signs of mental illness than urban dwellers, although these may be more a function of higher rates of poverty in rural America. Once people in rural areas identify a mental health issue, they are less likely to have access to professional health care.[27] While the homeless mentally ill certainly cluster

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in cities, they have not become mentally ill as a result of living in cities, and there are many reasons for their staying in denser areas, including access to social services, support networks, and jobs. Some well-known studies of density and mental health were carried out using rats in the 1960s, but none of them have been shown to hold for humans (who live at much lower densities than ever used in these studies).

**Occupational injuries.** Farming, mining, and food processing, three central rural economic activities, are major contributors to occupational illness and injury. However, the service industry is not immune, as any office worker with carpal tunnel syndrome could attest. Overall, it is not certain whether density affects occupational safety.

**Terrorism.** The September 11, 2001, terrorist attacks, following previous incidents at the World Trade Center and in the Tokyo subway, suggest that terrorists seeking high-profile targets select urban areas. However, it must be noted that despite the horrors of these events, terrorism is not a major health threat and rural areas—with their dams, power plants, and other potential infrastructure targets—may not always be immune from it. The attack in Bali in 2003 gives pause to those claiming one area is safer than another.

## Conclusion

Cities were historically unsafe places in which to live. But with modern sanitation and health care, the health benefits of dense over sparsely populated areas are clear. People moved to suburbs, at least in part, in order to enjoy a cleaner, safer, and healthier environment. At the height of 19th-century industrialization—before electricity, refrigeration and modern sanitation (running water, flushed toilets, garbage pick-up)—toxic fumes and waste spewed out of factories in the midst of urban neighborhoods; workers laboring in 10-hour shifts became deaf from the constant pounding of machines, were maimed in work accidents, or died early of lung disease from airborne cotton and wood dust in mills; fires were common; contagious diseases spread quickly through crowded tenements; living quarters lacked sun and ventilation; and daily diets lacked fresh fruit and vegetables. The list is long. Moving to the suburbs, then still in “the country,” was indeed moving to a cleaner and healthier environment.

The families most affected by industrial density, however and of course, were the least likely to move out of the city, both because they couldn’t afford property and because they needed to be close to the pool of factory, construction, and harbor jobs available to unskilled laborers at the center of cities. So the concept of moving to the suburbs in search of a healthier environment made sense at one time. But as suburbanization trickled down from the upper to the lower classes, the need for moving out of cities decreased. By the time large-scale suburbanization was affordable to the working class (but not to the very poor), after World War II, the location and type of available jobs had

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become more flexible (*i.e.*, no longer only in central cities), transportation had radically changed, mobility radically increased, and living conditions in cities had vastly improved while (but not because) densities dropped.

Today we face a seamless continuum between urban center and suburban sprawl, economically and physically. A postindustrial economic landscape undifferentiated by geography (all types of jobs can be anywhere, except for manufacturing jobs, which have been exported overseas) contributes to the creation of a physical landscape where suburban densities and development patterns spread both inward—taking over the urban fringe and older, weaker parts of the city—and outward, eating up former rural areas. In this new context, there are no great health benefits to moving out of the city, and, in fact, there are greater health risks associated with living in sprawled, car-oriented suburbs. It is important to remember that the return to density is not a vindication of the city. It is a clustering of mixed activities for greater economic, social, urban-design, and quality-of-life benefits—including health—within an otherwise bland environment

Denser is healthier today. While it may be doubted that the arguments for density put forth here will convince the neighbors of a proposed development to accept higher densities, it would be encouraging to have someone, somewhere, at a public hearing stand up and say we need higher density in order to protect our health.

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