

Commentary

Urban Planning and Public Health: A Story of Separation and Reconnection

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● Planning and Health

Over the past decade, we have witnessed the rebirth of an important relationship between urban planning and public health. Urban planning was itself a health response to poor living conditions in the urban settlements of the early industrial era. It is indeed perplexing how far planning drifted away from its century-old public health roots. Plagued by overcrowding, lack of sanitation, and industrial pollution, planners created building regulations such as New York City's Tenement House Act of 1901, put in place "Euclidian" zoning to separate smokestacks from homes^{1,2} and developed "garden cities" and "streetcar suburbs" as a refuge from city life that was, at the time, rather noxious and noisy. Early planners like Frederick Law Olmsted were very clear about the connection between planning and health and the need to mitigate poor public health conditions in urban centers.

Zoning and other development regulations were developed in the early part of the 20th century to protect the health, safety, and welfare of the general public³ primarily through the argued need for separation of residential and industrial uses. Through the application of these development regulations, planners were able to forge land use actions that were health beneficial at that time. The practice of "Euclidian zoning" or the separation of uses formed, in part, a basis for what became an auto-dominated single-use landscape. This approach to land development and transportation investment evolved into a highly planned and regulated landscape and also into what we call sprawl. It is interesting to note that we often find sprawl hostile and unplanned, but it is not unplanned at all. It is the large scale at which it is designed that is so unfriendly, hostile, and monotonous to the pedestrian. Amos Rapoport perhaps best clarified how we perceive different envi-

ronments as we move through them in his theory of the "numbers of noticeable differences." An interesting place to walk offers variety as one moves through it at 3 mph. To the contrary, a suburban arterial that changes only at 40 mph is boring to the pedestrian.^{1,4}

Ironically, our failure to adapt the land development regulations and transportation facility design standards over time has resulted in the promulgation of health adverse environments as a norm and not the exception. Our cities, industries, technologies, and priorities changed, and now the need to reconnect planning and public health is arguably becoming an urgent one. Sprawl, now the dominant development paradigm, may actually be undermining our health in a number of ways—decreased physical activity levels, and less access to healthy food associated increases in obesity; increased rates of asthma and other respiratory illnesses from ozone; higher rates of traffic-related injuries; and to say nothing of the stress of long commutes.

The built environment can influence public health largely because of the transportation choices that result from different approaches to community design.⁵⁻⁸ For years, urban planning researchers have been documenting associations between patterns of development and transportation behavior. The research has evolved considerably in recent years with the advent of Geographic Information Systems and faster, more

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adept computer and database systems. A number of literature reviews and meta-analyses have summarized this body of literature.^{9–17} The reviews agree that all else being equal, households in “walkable communities” (see sidebar) have been shown in research to walk and bicycle *more* and drive *less* than households in sprawling, automobile-dependent locations. Although causal evidence at this point is limited, significant associations have been found in many different locations and at many scales of measurement.

The results are highly intuitive; especially at the extreme. Live further away from work and nonwork destinations where the car is your only option and you drive more and walk less. Transit is not even an option. King County Executive Ron Sims has become a leading spokesperson for the development of walkable communities from both health and climate change perspectives. He notes that it alarms him that we even need research to prove that this connection exists.

What Is a Walkable Community?

The land use/transportation literature has consistently found a number of built environment characteristics that are associated with more walking, bicycling, and transit and less driving:

Close-in location: Neighborhoods that are centrally located mean that commute distances will likely be shorter, with more convenient transit service.

Compactly developed: Neighborhoods with higher residential densities put more people within walking distance of everyday goods and services.

Mixed use: Neighborhoods with a mix of homes, shops, and services and other destinations within walking distance facilitate walking for everyday errands.

Interconnected street networks: A “gridiron” street layout, as opposed to one dominated by cul-de sacs and wide arterials, allows more direct connections between destinations. This is especially important to encourage walking trips.

Pedestrian-friendly design: A landscape that is designed for pedestrians means narrower streets, wider sidewalks, easier and safer street crossings, and architecture that is easily accessible and visually engaging.

● Summarizing the Evidence

Recent research in both the planning and public health fields has begun to measure the associations between an area’s walkability and health outcomes, such as

physical activity and body weight, exposure to air pollution, traffic safety and others. This research has consistently found that residents of walkable communities are associated with measurably higher physical fitness levels, lower likelihoods of obesity and traffic crash risk, and fewer harmful air pollutants per capita than residents of more automobile-oriented communities. These distinct outcomes are discussed below in more detail.

Physical activity and body weights

For each individual, body weight is generally determined by a combination of genetic makeup, energy consumed (what we eat) and energy expended (our activity level). Sedentary lifestyles combined with a prevalence of high-energy, high-fat, high-sugar foods have resulted in alarming increases in obesity and associated diseases.

Diseases associated with obesity and low rates of physical activity—heart disease, obesity, high blood pressure—are currently among the leading causes of disability and death. Even for those who are not overweight, obesity has a huge impact on the healthcare system and related costs, through increasing healthcare costs and waiting times.¹⁸

The US Surgeon General’s 1996 report on physical activity reported that even modest increases in physical activity tend to reduce mortality for both older and younger adults, which means that walking or bicycling for errands, to work, or to school can be an important part of an integrated strategy to reduce obesity rates. Discovering the importance of moderate activity levels led the public health field to understand the importance of urban and transportation planning, engineering, and architecture. It created a mandate for them to find out more about these people create communities. Planners can encourage physical activity and healthier energy balances by making walking, bicycling, and public transit convenient and attractive and changing land use patterns to support these choices. By now, numerous studies have found relationships between built environment patterns and physical activity,^{19,20} body weights and overweight/obesity,^{8,19,21–23} and conditions related to obesity.²¹

Our transportation choices impact our physical activity levels in other ways, too. Driving is fundamentally a sedentary activity, that is, time spent in a car means that time is not available for healthy activities, such as exercising or spending time with family. Our Atlanta study found that each additional hour spent in a car per day was associated with a 6 percent increase in the likelihood of obesity.⁸ For public transit, the inverse is true—research indicates that because transit users are also walkers, transit may play an important role in

facilitating physical activity (U. Lachapelle, MSc, and L. Frank, PhD, unpublished data, 2008).^{8,24,25}

Exposure to air pollution

The study of both air pollution generation and exposure is quite complex, as each pollutant comes from different sources, has its own patterns of dispersion, and therefore different health impacts and associations with land use patterns and transport. The wind and weather patterns of a particular location adds a layer of complexity, and the performance of each individual vehicle adds yet another. Vehicle use is associated with several air pollutants linked to adverse respiratory health impacts: fine particulate matter, air toxins, carbon monoxide (CO), oxides of nitrogen, and volatile organic compounds.

In general, how humans are affected by air pollution depends on two major factors: the total amount of pollution that occurs in an area and their proximity to a specific pollutant. Higher-density areas, although they are linked to lower levels of emissions per capita, may also create higher exposures to some pollutants, purely because of higher overall traffic levels and congestion in urban areas. This conflict is of crucial importance for particulate matter and CO, which concentrate close to their source. However, exposure to ground-level ozone is often higher in more sprawling outlying areas downwind from urban centers.²⁶ Ozone is a major health hazard and considerable literature now makes it clear that it can even be deadly.²⁷

In the land use/travel research, walkable neighborhoods have consistently been associated with less per capita vehicle travel.^{9,10,12,28} Although vehicle travel may be used as a proxy for air pollution, it is important to actually estimate vehicle-related emissions for different pollutants. This is because many factors other than distance of travel impact pollution generation including cold starts, vehicle types, and the variation in speed. Some pollutants are much more associated with engine warm-up periods (CO and hydrocarbons), whereas others are more of a function of distances traveled (ozone and carbon dioxide). This distinction determines whether the numbers of trips or the distances traveled as a result of a land use pattern creates more pollution. Some have argued that increased numbers of short vehicle trips in urban centers creates more pollution on a per capita basis.²⁹ By not actually modeling the emissions associated with each trip, they did not take into account the effect of distances traveled as well. Our own work in the Atlanta and Seattle regions measured emissions on a per trip basis and took into account emissions from starts and hot stabilized engine operation. We found repeatedly that residents of more walkable environments generate significantly

lower levels of both ozone precursors (volatile organic compounds and oxides of nitrogen) and CO.^{23,30,31}

Short motor vehicle trips in urban conditions tend to have relatively high per mile emission rates because of cold engine starts and traffic congestion, so reducing these trips can bring relatively large net emission reductions. These short trips also have the most potential for replacement by walking and cycling. Still, when encouraging walkable neighborhoods, it will be important to consider other interventions that can reduce emissions exposure—making vehicle traffic smoother, encouraging low/zero-emissions vehicles, and increasing the physical separation between vehicle traffic and people. Land uses associated with vulnerable populations—medical centers, schools, senior centers—should always be sited carefully to avoid sources of pollutant exposure such as high-traffic roadways. Freight and goods movement needs to be separated from pedestrian-oriented corridors.

Pedestrian and traffic safety

In the United States, traffic crashes kill more than 40 000 people per year.³² The built environment and traffic safety affect each other in a number of ways. The likelihood of an accident increases with time spent and distances traveled in cars, all else being equal. Demographics and driving conditions (nighttime versus daytime, urban versus rural) are other known predictors of accident frequency and also accident severity—for example, daytime driving in urban areas is associated with more frequent, yet nonfatal collisions.³³ High-risk drivers have an entirely different accident risk profile—obviously a major concern to the insurance industry. Lower-density, single-use, disconnected environments are associated with higher levels of vehicle use and potentially increased risk of accidents for lower- and normal-risk drivers through greater exposure. Higher-speed suburb to city commutes may also be associated with more serious incidents as well. Design standards have long focused on vehicle safety often at the expense of accommodating pedestrians. Some would argue that roads designed to move vehicles as efficiently as possible, often at higher speeds, mean collisions that do occur are more severe. It is, however, the interface between vehicles and pedestrians and bikes that is the most concerning. A primary deterrent to walking is exposure to high-speed traffic and danger. For pedestrians and cyclists, the combination of fast-moving traffic and auto-oriented street design creates an environment that is unpleasant as well as unsafe. Especially in the case of women, children, persons with disability and the elderly, safety from traffic is crucial to encourage walking.

Several recent studies have found that per capita traffic fatality rates tend to be higher in sprawling

communities than in compact, mixed-use communities.^{34,35} This difference is likely a result of increased per capita vehicle travel, more driving by teenaged and elderly motorists because of poor travel options, and higher travel speeds and volumes. Multiple studies have shown traffic volumes^{36,37} to be strongly linked to the frequency of collisions. Traffic speeds are closely linked to crash severity. The fatality rate for pedestrians struck by a vehicle traveling below 30 kph is only 5 percent. At 50 kph, the fatality rate increases to 45 percent and at 60 kph, to 85 percent.³⁸

A number of different design interventions can be linked to pedestrian safety through their impact on traffic speed. Although enforcement of speed limits can have value, traffic speed is affected more by the “design speed” of a roadway than by the posted speed limit. The design speed is the maximum speed that feels safe to motorists, and can be lowered by narrowing the lane width and by adding other features such as street trees, sidewalks, and traffic calming.

● Causation: Impacts or Associations?

Debate continues in the literature over whether the relationship between land use and travel is causal in nature. Some argue that the differences in transportation behavior that emerge in these studies may be occurring because of people’s preferences for neighborhood type and/or travel choice,¹⁶ for example, those people that prefer driving to walking will “self-select” into neighborhoods where it is easier to drive. Therefore, this argument goes, changing the built environment may not result in changes in travel behavior, because people’s transportation decisions will be driven by their preferences rather than by their surroundings.

Recently, researchers have been testing the relationships between neighborhood design while taking into account people’s preferences for neighborhood designs and/or travel mode. Over the past 3 years, several new studies have been released that confirm the importance of land use on travel behavior even when controlling for individual predisposition toward travel and neighborhood preferences. Overall, research results suggest that both preferences and the actual features of the neighborhood in which we reside impact our travel behavior.^{17,39–45} In our study in the Atlanta region, we were able to control for neighborhood preference and found that neighborhood walkability remained a significant predictor of miles driven and distances walked, even after adjusting for demographics and neighborhood preference.³⁹

Furthermore, there is recent evidence of latent demand for more walkable neighborhoods.^{46,47} These studies suggest that simply accommodating the exist-

ing demand would allow those who are currently located in auto-oriented environments to choose a more walkable one, thus lowering rates of vehicle travel and emissions. It is perhaps the combined message that comes from travel behavior and residential location choice studies that is most important. Many people are not located in environments that they would prefer and most of the “mismatched” people are in places that are less walkable than they want. If they were located in environments that were more walkable and more in alignment with their underlying preferences, they would walk more and drive less. For that segment of the population that prefers walkable environments, our research further suggests that they would have a lower body mass index as well. To the contrary, those who are not predisposed to walking will not change the amount they walk much regardless of their environment. This segment will, however, drive considerably less when located in a more walkable setting, likely because of shorter trip lengths.

Applying the evidence

Although questions remain, there is consensus in the research that policies, regulations, and funding practices that encourage a shift in travel from private vehicles to nonmotorized transportation and transit can provide multiple benefits in the form of increased physical activity, less sedentary time in cars, less per capita air pollution and greenhouse gas emissions, and reduced accident risk.

Doubt is fundamental to good science. Policy, however, relies on timely application of knowledge in real situations. Given the severity of the obesity crisis and the fact that the same strategies that encourage active travel can also help achieve other public health, environmental, and quality-of-life objectives, planners should take action now as guided by the precautionary principle. The precautionary principle is a “distinctive approach to managing threats of serious or irreversible harm where there is scientific uncertainty.”⁴⁸ When problems urgently demand solutions, waiting for a high degree of scientific certainty may be inappropriate and may even exacerbate risk of harm.

In this particular case, we believe that planners have a moral and ethical obligation to apply the evidence to practice. Health Impact Assessment (HIA) is a process that seeks to inform decision makers of the impacts of a given policy or proposal and holds much promise as a means to understanding the health impacts of planning. Similar in concept to Environmental Impact Assessment, HIA is well established in Europe and gaining momentum in the United States as a valuable tool for a wide array of topics. A forthcoming article in the *American Journal of Preventive Medicine* summarizes

the use of HIAs to date in the United States to evaluate a variety of policy and planning proposals, including redevelopment and zoning changes, living wage ordinances, transportation projects, oil drilling proposals, a power plant, even the Federal Farm Bill. The HIAs summarized also range greatly in budget/scope, approach and methods used to evaluate health impacts, and in some cases were clearly influential on a project's design.⁴⁹

As practitioners gain familiarity with HIAs, the need for evidence-based evaluative tools becomes clear. For planners, existing land use and transportation planning tools can be used and modified to successfully estimate how proposals might affect health. Standard planning metrics, such as residential density and vehicle per miles traveled, can be used as indicators in the absence of local data. We are developing such a planning tool as part of the HealthScape project in King County, Washington (www.metrokc.gov/healthscape). By applying research relationships from our research in King County to an existing sketch planning model (I-PLACE3S, developed by the California Energy Commission), it will be able to assess the impacts of different land use scenarios on physical activity, walking, and obesity. As part of an HIA process, the San Francisco Department of Public Health developed the Healthy Development Measurement Tool (theHDMT.org), a set of more than 100 indicators that can be used to assess of the effects of land use and transportation decisions on health.

● Conclusions

Evidence is mounting on the health impacts of land development and transportation investment practices. Yet to date, relatively little has been done to apply evidence to actual transportation and land use actions being considered for approval and funding by local, state, and federal agencies. The majority of development being permitted in the United States continues to mandate reliance on the car as the primary means of travel, often negating the ability to travel between destinations by foot, or transit. The evidence is not complete and causation may remain unclear for years to come. However, efforts are underway to establish methods and tools for planners and healthcare practitioners to work together to evaluate the relative health impacts of various approaches to building and retrofitting our communities.

Failure to apply mounting evidence to real world land development and transportation investment decisions that impact health is arguably counter to the moral requirements bounded and expressed within the precautionary principle. With the current lack of leadership at the federal and state level, some local commu-

nity leaders are acting within this vacuum, and developing and testing tools and approaches of their own. The National Association of County and City Health Officials and the Robert Wood Johnson Foundation and other organizations are beginning to develop national collaborations to foster the development and sharing of approaches and tools to fill this void.

The National Environmental Policy Act in the 1960s spoke directly to the need for evaluating and mitigating not only the environmental but also the health impacts of major projects. The environmental impacts were a concern partly because of their potential health impacts on humans. Regulations governing development actions such as zoning, subdivision, and building codes are underpinned by health, safety, and welfare. It therefore remains an irony, if not a convenience, that evaluating the health and environmental impacts of alternative approaches to community design is deemed too costly of a luxury. At its most simplistic level, it is once again just a question of who wins and who loses. Including detailed health-based evidence within land development and transportation investment processes threatens to transfer costs borne by society at large to those who would otherwise gain the most by way of externality.

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