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Abstract

This project focuses on improving community healthy through the environments people "live, work and play." The built environment is important because it can be used to reduce health inequities, strengthen the integration of health and planning and reduce socioeconomic issues. The project discusses the five categories that impact overall health and determines how planners can promote healthy lifestyles to counteract these factors through the built environment. Planners must be a focus on both traditional and social factors which impact human health and use metrics keep track of elements that are key determinants of health. It provides a pyramid addressing how the increasing population leads to increasing efforts needed. The authors strongly emphasize that planners should look past typical planning practices and look to "education, social services, health care, and other social determinants of health that shape long-term population health".

Each chapter discusses it discusses community examples which include active living, emergency preparedness, environmental exposures, food and nutrition, health and human services policies and social cohesion and mental health.

Resource

METRICS FOR PLANNING HEALTHY COMMUNITIES

May 2017

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Cover Source: Bruce Forster

Acknowledgments

American Planning Association's Planning and Community Health Center developed this toolkit to help planners integrate health into planning practice and decisions. The Planning and Community Health Center, one of three National Centers for Planning at APA, advances practices that improve human environments to promote public health through active living, healthy eating, and health in all policies. APA's Planning and Community Health Center is a leader in policy-relevant research that improves human environments to promote public health.

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APA is grateful to the following advisory committee members for their invaluable comments and feedback throughout the project:

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Executive Summary

The built environment is a key determinant of community health. Planning professionals are in a unique position to improve community health by shaping the environments where people live, work, and play. Therefore, it is critical that planners document, measure, track, and design built environment elements that are known to be key determinants of health. Assessing the built environment becomes especially significant because it can modify, exacerbate, or reduce health inequities.

With the aim to strengthen multisector coalitions and integrate health into planning practices and decisions, The American Planning Association (APA) has developed a set of Healthy Planning Metrics that can be used to assess, measure, monitor, and report progress toward healthy planning goals. The tool leverages existing indicator systems, indexes, interactive maps, and literature about social determinants of health. Based on the research and feedback from the advisory committee, APA has identified the following five domains where planners could intervene to improve health: 1) active living, 2) healthy food system, 3) environmental exposure, 4) emergency preparedness, and 5) social cohesion. These five domains are further divided into 14 different subdomains based on different topics.

These domains were selected based on the following criteria: relevance to field, magnitude of impact, feasibility of measuring, equity, and ability to change. Key built environment indicators and policies are identified for these categories to not only promote health but to also provide tools to analyze and measure health inequities. The attempt is to direct the planning field into new avenues of research, practice, and education that connects these different topics.

The field of public health uses established national, state, and local public health surveillance systems to track health, something planning has yet to tackle—until now. APA's broadly applicable healthy planning metrics enable planners to measure planning elements that affect community health and are useful for integrating into regular planning processes and creating monitoring plans for evaluating progress toward community goals. As planners adopt consistent metrics in diverse communities, there will be new opportunities to measure changes over time and compare across geographies.

Introduction

Protecting public health, welfare, and safety has been the goal of planning since its origin, and planners continue to play a critical role in influencing health. The numerous factors that determine overall health can be divided into five main categories—genetics, socioeconomic circumstances, environmental exposures, behavioral patterns, and health care (Schroeder 2007). Among these categories, planners directly and indirectly influence socioeconomic circumstances, environmental exposures, and behavioral patterns. Through shaping the built environment, planners can promote healthy lifestyles, influence socioeconomic circumstances, and limit damaging environmental exposures, and can help shift behavioral patterns.

The role of planners in improving public health is significant – as shown in Figure 1, socioeconomic status, exercise and eating habits, and the environment (natural and built), affect health in a more substantial way than traditional health factors such as health care services and genetic predisposition combined.

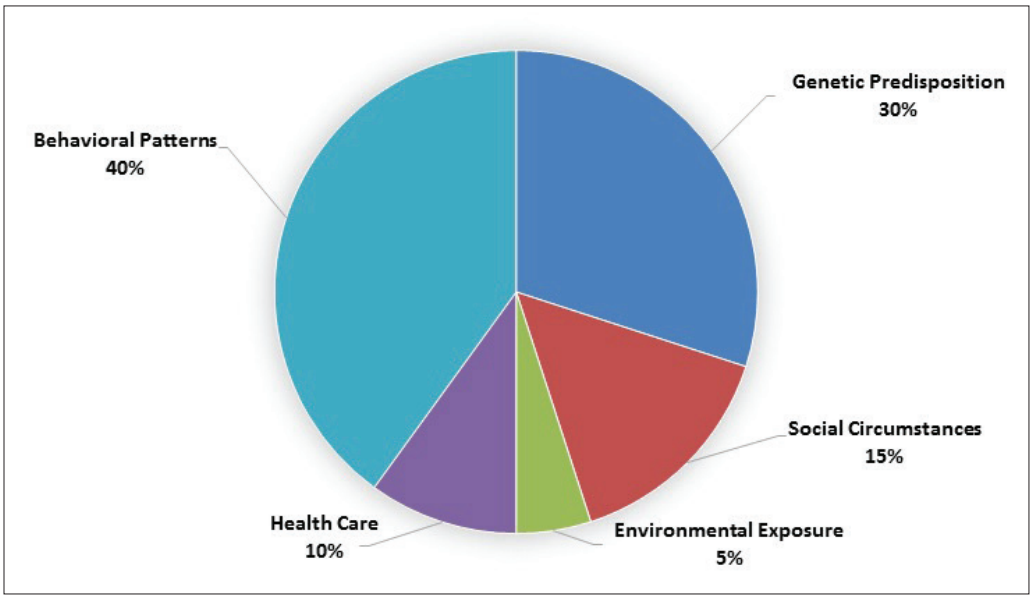


Figure 1: Determinants of Health and their Contribution to Premature Death. Source: Schroeder (2007)

Thus, it is necessary to consider determinants beyond the traditional health factors, and include social determinants of health (SDOH). Determinants are the factors that affect an individual's state of health. Social determinants of health as defined by Centers for Disease Control and Prevention (based on Marmot et al. (2008) are, "the complex, integrated, and overlapping social structures and economic systems that are responsible for most health inequities. These social structures and economic systems include the social environment, physical environment, health services, and structural and societal factors." SDOH are also greatly impacted by the distribution of wealth, power, and resources.

SDOH are connected to the issue of health inequity. Inequities in health occur due to the systematic disparities between communities with different level of social, economic, and political advantage/disadvantage. Inequities in health puts people who are already socially disadvantaged at a greater health risk (Braveman and Gruskin 2003) and planners can help reduce those inequities.

SDOH can be either proximal or distal. Proximal factors are those factors that have direct impact on a health outcome, while distal factors affect health through other intermediary factors. The distal and proximal factors are interconnected and linked. For example, the built environment in which individual lives and works—a distal factor—may have an impact on the amount of physical activity—a proximal factor—and thus on bodyweight. Since these factors are so intermingled and act at different levels, it would be a mistake to consider any of them in isolation.

So, to address the broader SDOH and their influence on health at both distal and proximal level, an approach that considers individual and social environmental factors for promoting health should be considered. Frieden (2010) proposes a five-tier health impact pyramid to prioritize actions for improving public health (Figure 2). Interventions at the lowest two tiers—socioeconomic factors and changing the context to make individual's default decisions healthy—would have the greatest effect on population health, while interventions at the top tier would be targeted to individual health. Planners have a responsibility to work actively towards making the healthy

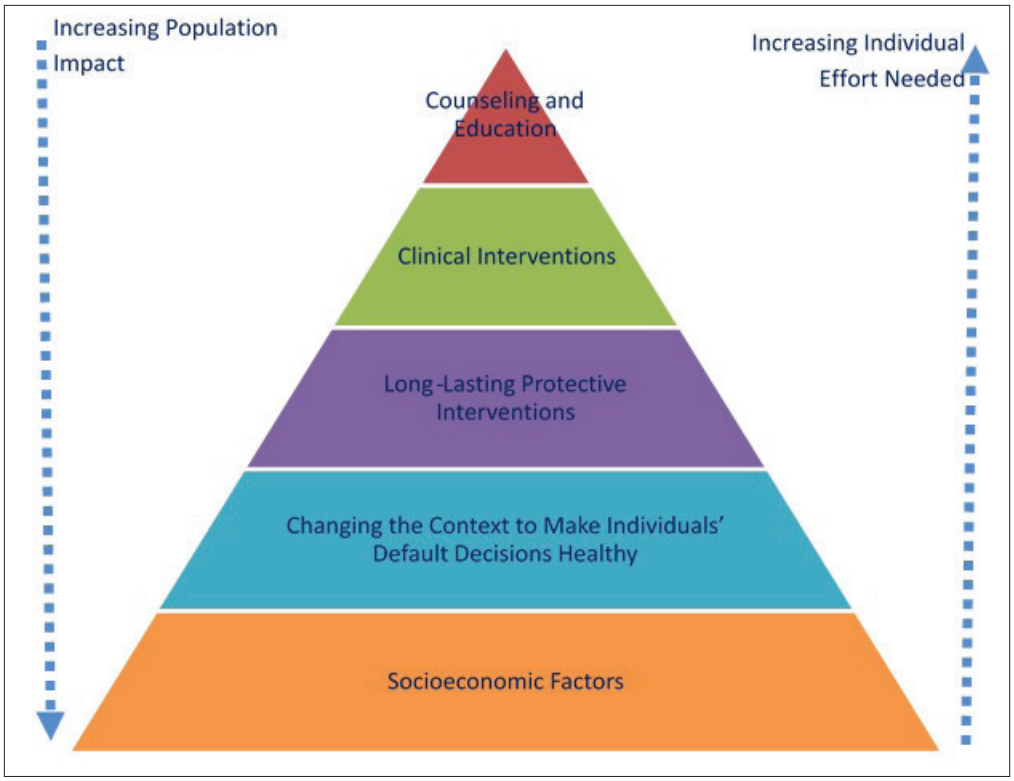


Figure 2: Health Impact Pyramid. Source: Frieden (2010)

choice an easier choice and addressing the needs of the most vulnerable. Together, these two approaches could significantly improve public health.

Methodology of the Metrics

Considering the health impact pyramid, it is critical that planners document, measure, track, and design built environment elements known to be key determinants of health. Assessing the built environment becomes especially significant because it can modify, exacerbate, or reduce health inequities (Gordon-Larsen et al. 2006). There has been a demand to create succinct but effective healthy metrics. With the aim to strengthen multisector coalitions and integrate health into planning practices and decisions, a set of Healthy Planning Metrics that can be used to assess, measure, monitor, and report progress toward healthy planning goals is proposed here. The goals are:

- to identify key indicators that can be used to assess the built environment for health
- to provide a framework to identify tools and strategies for integrating public health-related goals and policies into the planmaking process.

The metrics leverage existing indicator systems, indexes, interactive maps, and literature about social determinants of health. Moreover, an advisory committee of experts in the field of healthy urban planning was consulted throughout the various phases of the project. They were continuously involved in the process to share their expertise and give feedback on the work.

Based on the research and feedback from the committee, APA identified the following five domains where planners could intervene to improve health: active living, food systems, environmental exposures, emergency preparedness, and social cohesion. As shown in Table 1, each of these five domains is further divided into subdomains to create a total of 14 subdomains. These domains were selected based on the following criteria: relevance to field, magnitude of impact, feasibility of measuring, equity, and ability to change.

Indicators: Measurements used to analyze built environment characteristics

Metrics: Set of indicators and planning policies

Key built environment indicators and policies are identified for these categories to not only promote health but to also provide tools to analyze and measure health inequities. The indicators, along with the policies for each of the five domains, make the metrics (Table 1) an effective and practical tool for planners to refer to as they integrate health goals into plans. Finally, socioeconomic factors affect health in a major way, and so each domain includes a section on interwoven equity that explores the association between the domain topic and impacts on distribution of burdens and benefits across population groups, as well as considerations for lower-income populations and communities of color.

Importance of Using Metrics

Various tools are available to measure health and its determinants. The Build Healthy Places Network has compiled a list of important measurement tools (created by different agencies) that could be used for health-related analysis (Build Healthy Places Network 2017). With so many other tools out there, why do we need one more set of heathy community metrics? In other words, what value does this set of metrics add?

The metrics found in this report enhance the existing metrics in three unique ways:

- **Provide a more inclusive approach:** Existing tools do not cover the broad list of domains addressed here. While the active living, healthy food systems, and housing components are almost always included, environmental exposures and climate change often are not. Moreover, the connections between built environment, hazard mitigation, public health, and public policy are almost never explored in healthy community metrics. The metrics presented here provide a way to illustrate the connections between urban planning and public health in a more comprehensive way, and go beyond traditional domains of healthy urban planning to include topics such as green infrastructure, mental health, infectious diseases, and hazard mitigation.
- **Provide actionable guidance:** Few existing tools provide both built environment indicators and public policy alternatives or instruments to change the existing conditions. Rather than taking a disconnected approach and analyzing a single indicator or variable for a specific project, it is more productive to use policy options to implement systemic changes. The metrics proposed in this report provides guidance to planners in forming such actionable policies.
- **Provide clear direction:** Many existing metrics include a long list of indicators and policies offering choices from which planners can select. However, such tools can be overwhelming for busy planners. The metrics presented in this report are designed to be succinct, simple, and workable. The purpose was to create an inclusive set of metrics that capture the most important themes and indicators.

How should planners use these metrics?

There are many steps involved in creating strategies that help achieve community goal(s). Indicators, or metrics, play a key part in determining how to prioritize actions and track outcomes and impacts. Metrics can be used to formulate effective policy and implementation plans. Particularly when using planning strategies to reach public health goals, built environment indicators that promote health should be utilized. Such indicators can be used in different ways and the following discussion highlights those ways:

Metrics support smart planning

Planners face unique conditions in their own communities. The local, political, social, cultural, economic, and environmental contexts differ for each region, and so do the issues and challenges. Due to the differences in context, priorities change, and thus not all the policy and indicators listed in Table 1 may be applicable to every region. Still, these metrics could be used to analyze conditions, help prioritize a region's goals and objectives, and support the implementation of appropriate policies.

One purpose of creating these metrics was to help planners identify critical areas that lack resources for healthy living. To facilitate such spatial analysis, most of the indicators selected have a spatial component. Once those geographic areas are identified, planners can set quantitative goals for those areas, and then revisit the metrics periodically to monitor and evaluate the progress. The metrics could also enable planners to explore equity issues or analyze the association between socioeconomic status, built environment, and health.

Metrics help measure progress

The indicators can be used to assess and evaluate the existing condition of various aspects of the built environment.

For example, the number of violent crime incidents per 1,000 population can be used to identify the crime hot spots in a region. They can be used to benchmark the outcome of specific goals, such as aiming for a 1:1 jobs to housing ratio.

By combining these two methods—assessment and outcome measurement—planners can measure progress over time, facilitating the surveillance or evaluation of the effectiveness of policies. In such a case, the initial measurement can provide an assessment of existing conditions and the subsequent measurements can be used to track progress or changes over time. With that in mind, this report also proposes some key policy instruments that could be used to integrate health into planning practice.

Metrics help build relationships

The metrics could also be useful to develop new cross-sector partnerships and collaborations. Planners can share the data as well as analysis done based on the metrics to develop strategic partnerships with stakeholders from other sectors such as public health and health care. The sharing and acquiring of data and indicators could help advance the efforts from agencies across many fields to address the connection between health and planning from different points of view.

Measurable policies and built environment features can also be useful in community engagement as an evidence-based tool. Data from using the metrics to assess current conditions can spark discussions at neighborhood associations, city and county boards, and public meetings. Such information could potentially increase public awareness about current issues and support for solutions. Metrics can play an important role in many stages of the community planning process as planners, partners, and other stakeholders investigate, assess, monitor, evaluate, refine, and implement health-related plans and policies for built environment impact.

Table 1: Metrics for Planning Healthy Communities

Domain	Sub-domain	Built Environment Assessment Indicators	Planning Policies
Active Living	Active Transportation	❑ Commute mode share ❑ Ratio of sidewalk and/or bicycle lanes to roadway miles ❑ Percentage of population living within a half-mile distance of frequent-service transit stops ❑ Street intersection density	Transportation demand management policies
			Legislation prioritizing funding for pedestrian/bike facilities
			Complete streets policies
	Recreation	❑ Network distance to park entrances and other usable public open spaces ❑ Acres of park land per 1,000 population ❑ Percentage of sites implementing shared use agreements	Policies prioritizing equitable investment in parks and open space
			Shared use policies between local governments, school districts, faith-based organizations, etc.
	Traffic Safety	❑ Annual rates of fatal and serious pedestrian and cyclist injuries	Vision Zero or a similar initiative to end traffic fatalities
			Traffic calming policies and related design guidelines
Healthy Food System	Access	❑ Percentage of low-income population living in urban areas that are not within walkable distance of a full-service grocery store ❑ Percentage of farmers markets that accept SNAP/WIC ❑ Percentage of corner stores that have healthy food options ❑ Density of fast food restaurants	Incentive programs to attract full service grocers to food deserts
			Financial incentives to corner stores for carrying healthy food choices
			Policies that expedite the permitting process or provide incentives for the development of new farmers markets
			Regulations prohibiting or limiting new fast food establishments
	Production	❑ Acres of urban area that is currently in use or have potential for community gardens or urban agriculture	Remove policy barriers to establishing urban agriculture and community gardens
Environmental Exposures	Air Quality	❑ Number of facilities serving vulnerable populations that are within 500 feet of a high traffic roadway.	Policy requiring facilities serving vulnerable populations to be at least 500 feet from high traffic roadways.
	Water Quality	❑ Percentage of green stormwater investment of total stormwater investment in dollars	Policies that manage stormwater through green infrastructure or low impact development practices
	Soil Contamination	❑ Acres of brownfields that are not remediated	Policies prioritizing brownfield remediation and urban infill
Emergency Preparedness	Natural Hazards	❑ Percentage of population living within 100-year and 500-year floodplains.	Hazard mitigation policies included in all forms of plan making, from comprehensive plan to area plans
	Climate Change	❑ Percentage of population living in the storm surge area ❑ Total vehicles miles travelled	Climate change data or projection integrated into all future planning efforts
			Smart growth policies that reduce greenhouse gas emissions
	Infectious Disease	❑ Number of waterborne disease outbreaks ❑ Number of drinking water violations	Incorporate measures addressing vector control and waterborne disease into community plans, zoning restrictions, and stormwater management
Social Cohesion	Green Infrastructure	❑ Percentage of tree canopy coverage	Policies that incentivize development of green infrastructure so that it is conveniently accessible to all residents
	Housing and Community Development	❑ Jobs to housing ratio ❑ Percentage of households paying > 30% of monthly household income toward housing costs	Land use and zoning policies to promote and preserve affordable and fair housing
			Transportation policies that promote easy access to jobs, services, and amenities
	Public Safety	❑ Number of street miles without streetlighting ❑ Violent crimes per 1,000 population ❑ Percentage of population living in areas with high density of liquor stores	Crime Prevention Through Environmental Design (CPTED) policies that maximize visibility and eyes on street

Active Living

What do we mean by active living?

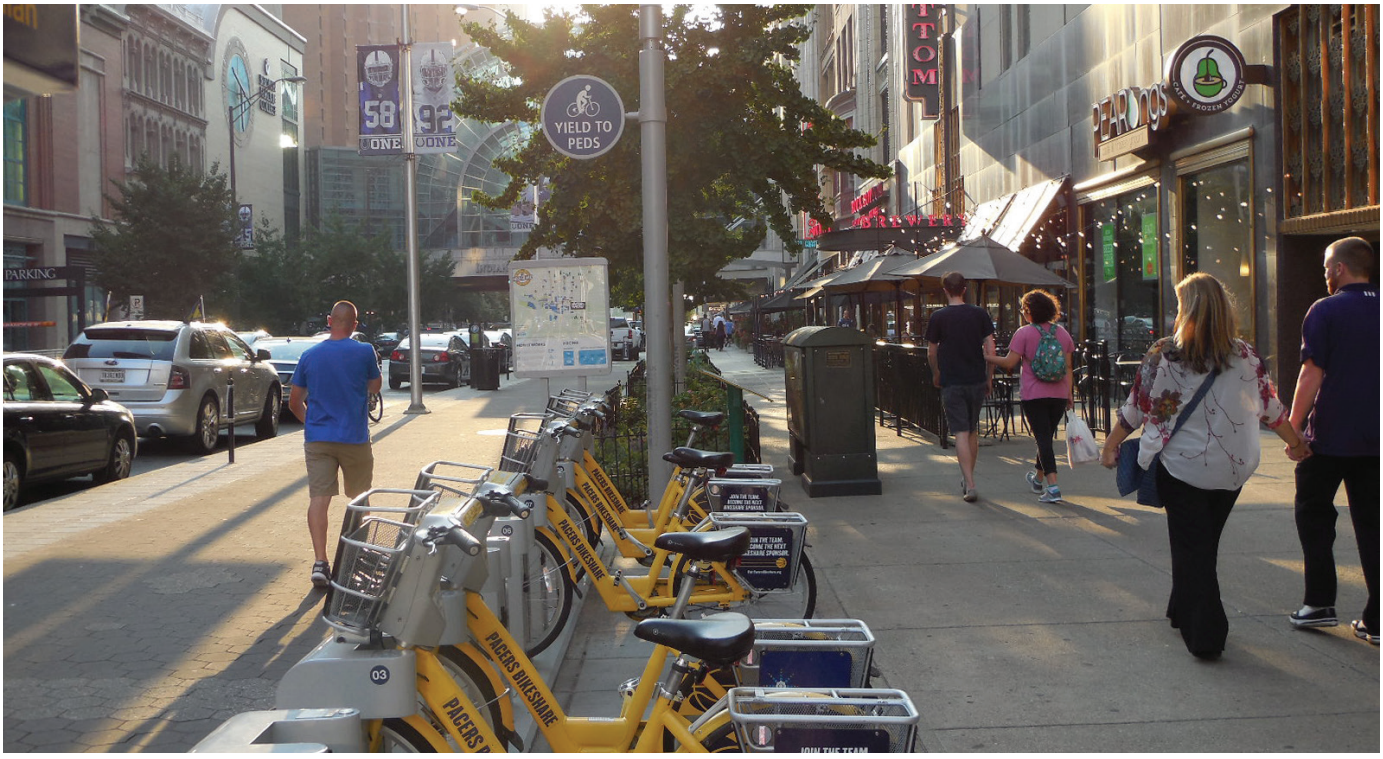
Active living means incorporating physical activity into one's daily lifestyle. An individual can achieve active living through a daily routine in many ways—working out in a gym, biking to work, gardening, or walking to do errands. Planners can encourage active living by making changes to the built environment that support active transport, promote recreation, and reduce or eliminate injuries.

- **Active transport:** Active transport (or transportation) refers to any form of self-propelled, human-powered mode of transportation, such as walking, bicycling, or skateboarding. It is often called nonmotorized transportation in the urban planning and transportation literature. Active transport can be for leisure and non-leisure purposes.
- **Recreation:** Recreation refers to opportunities for exercise, such as playing sports (whether organized or informal), taking a fitness class, playing on the playground, and walking in or to a park. Recreation can occur near the home, in parks and community centers, or in private facilities or on school grounds. Walking and bicycling are also recreational activities if the purpose of the trip is not to travel to a new destination (such as to school or work).
- **Traffic Safety:** People who are more physically active in the community—pedestrians and bicyclists—are also at a greater risk of injuries from traffic collisions. Accordingly, designing public infrastructure that promotes safety requires understanding where the most accidents or fatalities occur.

Why does active living matter to population health?

Regular physical activity is associated with healthy weight, improved mental health, and decreased risk of diseases such as stroke, heart disease, type 2 diabetes, depression, and some cancers. It also promotes social well-being by enhancing social cohesion, and economic well-being by reducing health care costs (Carlson et al. 2015) and transportation costs. Yet, only one in five adults meets the Centers for Disease Control and Prevention's Physical Activity Guidelines (CDC 2014), while almost 30 percent of adults were physically inactive in 2012 (Blackwell, Lucas, and Clarke 2014).

Planning for active living makes a place more livable and attractive to residents and employers. It also helps preserve the natural environment by encouraging active transport and reducing air pollutant emissions. Supportive environments, with facilities for walking and bicycling that are safe, accessible to all users, and distributed equitably, are most likely to help achieve an active living lifestyle.



Source: Elizabeth Hartig

How can planners impact active living?

Planners can directly change the built environment to support active living. They can influence people's travel behavior by implementing policies that support different types of transport modes. Journey-to-work data could be used to measure the commute mode share for knowing the travel behavior of residents. Increased levels of walking, biking, and use of public transit can be achieved through a complete street design approach, and tools such as impact fees could be used to fund such initiatives. A strong and sustainable transportation system that is affordable to all and supports all modes of transportation would help create healthier communities.

Similarly, providing easy access to public parks and open spaces is key to increasing recreational physical activity. Access to parks is especially critical in urban areas because of the lack of open spaces, and efforts should be taken to preserve them. Another tool for local governments is establishing a shared-use agreement with local school districts. Such agreements enable community members to use the school facilities for sports and play after regular school hours.

Finally, road design and traffic calming strategies can help reduce or eliminate pedestrian and bike related injuries and fatalities. In 2013, there were 4,735 pedestrian fatalities and estimated 66,000 injuries due to traffic crashes (National Highway Traffic Safety Administration 2013b), and 743 fatalities and nearly 48,000 injuries that were bike related (National Highway Traffic Safety Administration 2013a). Similar statistics at the local level can be used to highlight the importance for planning and engineering safer streets and calling attention to programs such as Vision Zero which focuses on designing a transport system with zero fatalities or serious injuries.

Active Living Metrics for Planners

Domain	Subdomain	Built Environment Assessment Indicators	Planning Policies
Active Living	Active Transportation	❑ Commute mode share ❑ Ratio of sidewalk and/or bicycle lanes to roadway miles ❑ Percentage of population living within a half-mile distance of frequent-service transit stops ❑ Street intersection density	Transportation demand management policies Legislation prioritizing funding for pedestrian/bike facilities Complete streets policies
	Recreation	❑ Network distance to park entrances and other usable public open spaces ❑ Acres of park land per 1,000 population ❑ Percentage of sites implementing shared use agreements	Policies prioritizing equitable investment in parks and open space Shared use policies between local governments, school districts, faith-based organizations, etc.
	Traffic Safety	❑ Annual rates of fatal and serious pedestrian and cyclist injuries	Vision Zero or a similar initiative to end traffic fatalities Traffic calming policies and related design guidelines

Interwoven Equity

Each community has unique demographics, economies, and social equity priorities. Accordingly, planners can use these metrics to explore the equity issues critical to living actively in their respective community. Low-income and minority populations have been shown to have low access to recreational facilities and parks (Moore et al. 2008). Therefore, it is important to provide safe and active modes of transport to address inequity. To tackle such issues, planners can, for example, identify the areas where residents do not have easy access to public parks and stratify those areas further by socioeconomic characteristics. Doing such kinds of analysis could help planners identify the disadvantaged areas that lack access to open spaces, which could further help them prioritize their investment and planning strategies.

Similarly, equity can be incorporated into other indicators. For instance, low-income populations had the highest rates of walking and bicycling to work in the nation between 2008 and 2012 (Zimmerman et al. 2015), and it would be more effective if efforts are taken to provide high-quality active transport infrastructure to reduce bike/pedestrian-related injuries and fatalities.

Healthy Food System

What do we mean by healthy food system?

A food system refers to the whole system that involves all aspects of food production, processing, distribution, retail, preparation, consumption, and disposal/waste. A healthy food system ensures that everyone has access to healthy and nutritious diet. It also supports a robust, diversified economy and a sustainable and resilient community that treats the environment, workers, and consumers fairly.

- **Access:** A major principle of a healthy food system is to ensure that communities are food secure—and food access is a major component of food security. Access refers to people having easy physical and economical access to healthy food that meets their dietary needs. Physical access is dependent on the geographic proximity of a healthy food store, and economic access relates to affordability. Furthermore, the concept of access is not restricted to access to healthy food but also includes access to unhealthy food (e.g. fast food) because it a combination of both these factors that determine food environment.
- **Production:** The food production component of food systems planning is not limited to growing food on farms but also includes urban food production. Urban food production takes place at a smaller scale and usually involves urban agriculture and gardening. It is sustainable, helps increase access to healthy food, and has other social benefits. Urban food production can build a sense of community around active living and a healthy lifestyle.

Why does a healthy food system matter to population health?

Access to healthy food is fundamental to human health. Having better access to healthy food has been associated with better eating habits and decreased risk of obesity and other chronic diseases. Food access is not simply a health issue but also an equity issue. For this reason, access to healthy and affordable food is a key component for a healthy, sustainable community. In addition to improving access, having more healthy food outlets benefits community and economic development because it creates more job opportunities (Bell et al. 2013).

Conversely, consumption of fast food has been associated with weight gain and obesity (Mehta and Chang 2008). Thus, it is the overall food environment that influences population health. For instance, a study done in New Orleans found that access to both supermarket and fast food restaurants played an important role in determining odds of obesity among adults (Bodor et al. 2010). In 2010, approximately 30 million people living in low-income areas in the United States had limited access to healthy food and steps need to be taken to make them food secure (Ploeg et al. 2012).

Source: Natalie Maynor, Flickr, CC BY 2.0

How can planners impact healthy food system?

Planners can improve access to healthy food options and reduce access to unhealthy options. The built environment can both optimize and present barriers to choosing healthy foods over unhealthy foods. While improving the economic well-being of the community would give residents more options to buy healthy food, it is critical that people have easy physical access to fresh and healthy food. To improve access, emphasis should be given to policies that encourage development of new food sources and outlets. For instance, innovative financing techniques can be used to attract supermarkets to areas that lack access to healthy food or help corner stores to carry healthier food choices.

While many areas need a brick-and-mortar store that sells fresh produce, it is not always feasible to attract one. In such cases, planners should try to create community gardens, farmers markets, and other similar community-based food growing projects. For example, planners can provide venues for farmers markets that have adequate space and transportation access and utilities. Another initiative can be to create a clear, transparent process for converting vacant land into community gardens or urban farms, especially in urban areas that lack access to healthy food.

Access can also mean increasing the likelihood of choosing healthy food over unhealthy options by putting barriers in place. While it can be difficult to adopt a comprehensive measure to restrict fast food throughout a community, it may be possible to create a healthy food zones around key locations such as schools or community district core areas. Planners should analyze the overall food environment rather than focusing only on full-line grocery stores if they want to change consumption behavior.

Healthy Food System Metrics for Planners

Domain	Subdomain	Built Environment Assessment Indicators	Planning Policies
Healthy Food System	Access	❑ Percentage of low-income population living in urban areas that are not within walkable distance of a full-service grocery store ❑ Percentage of farmers markets that accept SNAP/WIC ❑ Percentage of corner stores that have healthy food options ❑ Density of fast food restaurants	Incentive programs to attract full service grocers to food deserts Financial incentives to corner stores for carrying healthy food choices Policies that expedite the permitting process or provide incentives for the development of new farmers markets Regulations prohibiting or limiting new fast food establishments
	Production	❑ Acres of urban area that are currently in use or have potential for community gardens or urban agriculture	Remove policy barriers to establishing urban agriculture and community gardens

Interwoven Equity

Research shows major disparities in access to healthy and unhealthy food by income level, race, and population density (Hilmers, Hilmers, and Dave 2012; Zenk et al. 2006). These disparities are influenced by geographic, economic, and social factors, but also by a community's food production, processing, distribution, consumption, and waste recovery policies and practices. Low-income neighborhoods are both at higher risk of the chronic diseases associated with unhealthy food options (Seligman, Laraia, and Kushel 2010) and less likely to have access to the fresh, healthy foods that could help reduce those health risks.

Often, it can be difficult to attract supermarkets to low-income areas because of their low tax base, and the result is a lack of access to healthy food. However, once established, a supermarket can act as an economic anchor, raising the tax base by attracting additional economic activity to an underserved neighborhood. They can also increase the number of job opportunities.

Less infrastructure-intensive options, such as farmers markets and community gardens, come with their own set of challenges. In places with extreme weather, produce is not available throughout the year. Also, these products are sometimes pricier than equivalent produce at supermarkets, reducing their appeal to low-income populations. Some local programs have overcome this obstacle by subsidizing SNAP/food stamp purchases at farm stands.

Environmental Exposures

What do we mean by environmental exposures?

For the purposes of the metrics, environmental exposure refers to the constant interaction between humans and the natural environment. These interactions can affect and influence human well-being, of which health is a critical component. Planners can influence the natural environment by promoting natural resource management in the plan-making process and promoting environmentally sound development.

- **Air quality:** Air quality refers to the state of air around us, which can be compromised by both natural and human-made sources. For instance, the toxic air pollutants that are emitted by vehicles lead to poor air quality, which can often lead to health issues. Poor air quality from ground-level ozone and particle pollution are among the major threats to human health. The Clean Air Act has established air quality standards that limit the quantity of pollutants in the air.
- **Water quality:** Water quality refers to the condition of water relative to its use, such as drinking, washing, and recreation. The two primary federal regulations governing water quality are the Clean Water Act and the Safe Drinking Water Act. The former regulates the pollutants discharged into water bodies and the latter sets limits on the type and concentration of contaminants allowed into the drinking water system. Planners can use green and natural solutions for managing water and improving its quality.
- **Soil Contamination:** Soil contamination refers to the presence or potential presence of environmental contaminants in the soil, often on brownfields sites that are underproductive or underused. Such sites can be remediated and redeveloped, but the process is usually complicated and time-consuming. Soil-contaminated properties located in a dense urban community often have long-term economic and health effects on the community.

Why does environmental exposures matter to population health?

Environmental exposure contributes to many of the leading causes of death and disability in the U.S. Long-term exposure to air pollution has been linked to respiratory diseases such as asthma and chronic obstructive pulmonary disease, as well as cardiovascular disease and stroke. For instance, Perez et al. (2012) found that eight percent of the total childhood asthma cases in Los Angeles County were partly attributable to air pollution from roadways. According to the Centers for Disease Control and Prevention, more than 11 million people live within 500 feet of a major roadway, where they are regularly exposed to the negative effects of air pollution (Boehmer et al. 2013). Exposure to contaminat-

Source: Chris Hamby, Flickr, CC BY-SA 2.0

ed water can lead to outbreaks of gastrointestinal diseases and, in the case of chemical exposures from roadway and agricultural runoff, to serious health conditions such as cancer.

People living in urban areas experience a greater burden of exposure from the environment, including soil, air, water, and noise pollution. While there are negative health consequences for all residents, the health threats are exacerbated for people living near sources of environmental pollution, such as busy roadways or industrial or hazardous waste facilities. Some of these complications include cardiovascular risk, lead, chemicals, pulmonary risk, perinatal and infant mortality, and low birth weight (Bacot and O'Dell 2006).

How can planners impact environmental exposures?

The planning profession originated from the movement to improve environmental health through the creation of sanitation infrastructure. Clean air and water is a fundamental building block of human health and planners can help improve their quality at both the local and regional scales. At the local level, zoning regulations can be proposed that require facilities catering to vulnerable populations such as children, the elderly, and sick to be located at least 500 feet from high-traffic roadways (California Air Resources Board 2005). Strategies that reduce air pollution may also include vegetated screens that protect the people from particulate matter and noise generated on busy streets. At the regional scale, policies that reduce carbon footprint, such as those encouraging multimodal transport, should be enacted because fewer cars on the road would translate into reduced greenhouse gas emissions and air pollution.

Combined sewer systems (CSOs), which are designed to carry both sewage and stormwater in the same pipes, are a major cause of water pollution, and in the U.S, more than 700 cities have CSOs (U.S Environmental Protection Agency 2014). While an effective strategy would be to completely replace and upgrade the traditional gray infrastructure, it is a costly endeavor. Using green infrastructure techniques to reduce stormwater runoff and thus prevent toxic waste from entering natural water system is a cost-effective alternative. Green infrastructure includes features such as bioswales, rain gardens, green roofs, infiltration trench, and porous pavement. These features emphasize vegetated measures to slow stormwater flow and increase infiltration. Planners can plan for providing and protecting green infrastructure and coordinate local plans with regional green infrastructure plans. Using low-impact development to manage stormwater at its source can also be an effective way to improve water quality. The low-impact development is an approach to land development where the stormwater is managed at the source using various techniques, such as reducing impervious surfaces and creating a natural landscape.

Rehabilitating brownfield sites to productive uses not only protects the nearby residents from negative health impacts but also helps to conserve the development of greenfield sites. The feasibility of site cleanup, resources involved, and market forces may determine the appropriate reuse of the site, which can be commercial, public, residential, greenspace, or mixed use. In many cases, remediation funding is available through local, state, and or federal funding mechanisms promoting redevelopment of urban infill projects.

Environmental Exposures Metrics for Planners

Domain	Subdomain	Built Environment Assessment Indicators	Planning Policies
Environmental Exposures	Air Quality	❑ Number of facilities serving vulnerable populations that are within 500 feet of a high traffic roadway.	Policy requiring facilities serving vulnerable populations to be at least 500 feet from high traffic roadways.
	Water Quality	❑ Percentage of green stormwater investment of total stormwater investment in dollars	Policies that manage stormwater through green infrastructure or low impact development practices
	Soil Contamination	❑ Acres of brownfields that are not remediated	Policies prioritizing brownfield remediation and urban infill

Interwoven Equity

Environmental justice means having an equal degree of protection from harmful environmental exposures for all people; equity is essential to achieve environmental justice. However, in many places throughout the United States, low-income populations and communities of color have a long history of disproportionate exposure to environmental hazards that has persisted well into the 21st century. For instance, Hajat, Hsia, and O'Neill (2015) found that low-income populations and communities of color experience higher concentrations of air pollution in the United States. In addition, landfills, industrial complexes, power plants, and other sources of air, water, and soil pollution have often been located inside or adjacent to communities without sufficient political clout to force relocation or increase safeguards for population health.

The environmental justice movement continues to push for cleanup of contaminated sites and health monitoring and environmental safeguards for populations still residing in critical neighborhoods. To protect the public health of populations disproportionately experiencing environmental impacts, it is critical to understand the distribution of environmental polluting agents in areas with low-income populations and communities of color. The U.S. Environmental Protection Agency's Environmental Justice Screening and Mapping Tool (ejscreen.epa.gov/mapper) can be used to overlay the spatial distribution of environmental and demographic indicators for any area in the country.

Emergency Preparedness

What do we mean by emergency preparedness?

Emergency preparedness refers to the adaptation and mitigation of hazards or disease outbreaks that are public health emergencies and often impacts human life in catastrophic ways. Such events can be natural occurrences such as floods and blizzards, or human-made as in the case of terrorism. For this report, we concentrate only on natural events. It is critical to be prepared in advance for such events because some of them, such as earthquakes and tornadoes, happen with little or no warning.

- **Natural Hazards:** A hazard is an event that completely disrupts the social, ecological, economic, and political stability of the affected region. They are complex events involving injury, destruction, and even death, which are beyond the coping capacity of the local authorities. The frequency and severity of certain natural hazards (i.e. flooding events, drought, storms) are increasing due to climate change.
- **Climate Change:** Climate change is any significant change in climate that lasts for an extended period. The accumulation of greenhouse gases in the earth's atmosphere primarily caused by human activity is increasing the frequency and severity of some types of emergencies and unpredictability of others.
- **Infectious disease:** Infectious diseases are illnesses caused by bacteria, fungi, viruses, or parasites. These naturally occurring diseases are spread primarily from person to person, but some of them are also acquired by exposure to organisms in the environment, such as insects or contaminated water.

Why does emergency preparedness matter to population health?

The effect of hazards on human life and public health is obvious. In addition to the immediate loss of life, the negative impacts of hazards on mental health are long-term. They can also have long-reaching consequences on public health due to the damage they do to health care facilities and other critical infrastructure such as water, sanitation, and transportation.

There has been a major change in climate trends related to temperatures, wildfires, heat waves, drought, sea-level rise, hurricanes, winter storms, and floods in the last few decades. These changes affect public health at various levels. While it is hard to measure the effect climate change has on water and food quality, the effect of changing temperatures on the increasing frequency of storms is clearer. There were around 1,300 deaths per year from 2006 to 2010 from

Source: James Schwab, FAICP

extreme cold and 670 deaths per year due to the extreme heat (Crimmins et al. 2016). Climate change is also concerning because sea-level rise threatens coastal communities, and there are about 8.7 million people in the nation who could be subjected to a one percent annual chance of coastal flood (Crowell et al. 2010).

Even though there has been considerable progress in treating infectious diseases, a significant number of people still die from such diseases in the United States. The overall death rate from infectious disease has been constant since 1950, although the rates have increased for some diseases. Pneumonia and the flu are the leading cause of death among the infectious diseases (Hansen et al. 2016). Climate change is also likely to increase transmission of vector-borne diseases.

How can planners impact emergency preparedness?

Planners are routinely involved in work related to emergency preparedness. The most direct way to contribute to local emergency planning is to participate in the development or update of a local hazard mitigation plan (HMP). Bringing a planning perspective into the HMP preparation process presents an opportunity to develop pre-hazard mitigation policies, which can reduce the community's overall vulnerability. These changes might include discouraging development on floodplains and or recommendations for improving the resiliency of infrastructures. More importantly, however, they should also be able to show how the goals and objectives of any HMP or comprehensive plan element relate to other existing or proposed plans and plan elements (Schwab 2010).

Both aspects of climate change – adaptation and mitigation – should be integrated into planning processes. Mitigation for climate change refers to the actions and strategies to reduce the severity of climate change. Planners have been actively involved in climate change mitigation efforts by promoting smart growth policies that could reduce greenhouse gas emissions. For example, emphasizing the use of public transportation over private automobiles helps mitigate the greenhouse effect by reducing vehicle miles travelled.

Climate change adaptation refers to the process of preparing and adjusting the communities proactively to uncertainties of climate change. This approach has been relatively neglected and more efforts are needed to include adaptation in plan-making processes (Dhar and Khirfan 2017). Planners can adapt to climate change by making cities more resilient. Land-use planning and zoning regulations can be used to limit development in critical areas like storm surge areas.

Traditionally, planners are not involved in making plans to prepare for a major disease outbreak. However, climate change and urbanization has implications on many aspects of public health, including infectious diseases, that make it more important for planners to participate in public health preparedness. For example, places that are too cold for certain vectors could become more conducive for insects like mosquitoes because of warmer temperatures. Thus, it is important for planning activities to align with existing public health initiatives designed to reduce vulnerability from a disease event. The best way to do this would be for planners to seek out and work with both public and private sector groups involved in disease prevention initiatives (Matthew and McDonald 2006). For instance, planners can work with their public health departments to identify the highest priority vectors in the area and take steps to reduce exposure to standing water or maintain large-scale water bodies to prevent spread of waterborne diseases.

Emergency Preparedness Metrics for Planners

Domain	Subdomain	Built Environment Assessment Indicators	Planning Policies
Emergency Preparedness	Natural Hazards	❑ Percentage of population living within 100-year and 500-year floodplains	Hazard mitigation policies included in all forms of plan making, from comprehensive plan to area plans
	Climate Change	❑ Percentage of population living in the storm surge area ❑ Total vehicles miles travelled	Climate change data or projection integrated into all future planning efforts Smart growth policies that reduce greenhouse gas emissions
	Infectious Disease	❑ Number of waterborne disease outbreaks ❑ Number of drinking water violations	Incorporate measures addressing vector control and waterborne disease into community plans, zoning restrictions, and stormwater management

Interwoven Equity

Poor, underserved, and minority populations are often disproportionately affected by polluting land uses and natural hazards. They tend to live in susceptible areas such as floodplains and areas adjacent to industrial development that could release contaminants in case of a hazard. These areas often have not seen the same level of investment as their counterparts in hazard preventive strategies such as flood management and evacuation planning. By combining an assessment of human vulnerability with built environment vulnerability, planners can identify the areas that are most likely to be affected by a hazard and create plans based on that information.

Groups of people that are historically disadvantaged by socioeconomic circumstances and exclusion are considered at-risk population because they do not have enough resources to respond appropriately to hazard forecasts and warnings (Phillips and Morrow 2007). Such socially vulnerable populations face a higher risk of injury, death, disease, and property loss. They are also not well-equipped to resist and recover from the impacts of the natural hazards, which makes them even more vulnerable.

Similarly, without proactive policies, climate change and disease outbreaks would reinforce and amplify existing socioeconomic inequities. The connection between social justice and climate change has pushed the concept of environmental justice to a broader level to form the concept of climate justice. The idea behind climate justice is that adaptation and mitigation efforts should focus on the well-being of people who lack resources and face inequities.

Infectious diseases are an equity concern because lower-income people are more likely to lack access to health care and are also more likely to live in substandard housing, which can increase exposure to certain vectors. The fields of public health and urban planning has been working toward addressing such issues. Efforts are being taken to understand why low-income populations are more likely to be exposed to infectious agents than their counterparts, and how the conditions in which they live affect their health. It is important to consider the influence of social determinants of health in such discussions as area in which planners can play a significant role.

Social Cohesion

What do we mean by social cohesion?

Social cohesion refers to the shared sense of belonging and social interaction within communities. A socially cohesive community would have strong social bonds and trust among the community members, and would challenge the existing conflicts between different groups of people (Forrest and Kearns 2001; Kawachi and Berkman 2000). Planning can impact social cohesion by affecting the ways in which community residents interact with each other. Planners can do this in several ways, such as impacting the availability, accessibility, and maintenance of green and open spaces; fostering community development; and ensuring public safety.

- **Green infrastructure:** Green infrastructure is a strategically planned and managed network of green open spaces, including parks, greenways, and protected lands. Green infrastructure is often used in urban areas to capture, store, and infiltrate stormwater runoff. In addition to providing critical functions such as wildlife habitat, stormwater management, and recreational opportunities, it can also strengthen social cohesion (Maas et al. 2009).
- **Community Development:** It is difficult to provide a single definition of community development. However, there are some common themes that could help explain the concept. Providing a healthy and suitable living environment, expanding economic opportunities for people in need, providing quality and affordable housing, and generally improving the social, economic, cultural, and environmental situation of the community are some of the key goals of community development. Partnership among the members of a community including but not limited to residents, institutions, businesses, and other stakeholders (public or private) to achieve these goals is an essential element of community development.
- **Public safety:** Public safety generally refers to the prevention and protection of the public from dangers affecting safety, such as crime. Neighborhoods with strong elements of social interaction and cohesion feel safer to residents, lowering their stress levels and promoting more active lifestyles.

Why it matters to population health

Research has shown that the quality of social environments impact social interactions, which can affect physical and mental health (Rios, Aiken, and Zautra 2012). For instance, Echeverría et al. (2008) found that neighborhoods that were less socially cohesive had high rates of depression and residents of those neighborhoods tended to walk less for exercise. A higher level of social cohesion may also provide additional social support, mutual respect, and trust, which may be helpful in buffering the adverse effects of stress and depression. A socially cohesive community is also able to cope better with natural disasters and emergencies.

There is strong evidence connecting the availability and use of green spaces and people's well-being and health (Maas et al. 2006). Even best-practice toolkits such as LEED for Healthcare gives credit to hospitals for providing direct access to nature. While there is evidence suggesting that access to green areas such as parks influence health, van Dillen et al. (2012) and De Vries et al. (2013) found that the quality and quantity of streetscape greenery are also associated with health. Based on their findings, a case can be made for using green infrastructure, streetscape, and tree canopy as a tool to improve health. Green areas and other publicly accessible natural open spaces could also encourage social interaction, which could further help in improving mental health.

Housing quality and its affordability are also associated with physical and mental health. Severely cost-burdened households (households that spent more than half of their income on housing) spent 41 percent less on food and 74 percent less on health care than the households that are not severely cost burdened (Joint Center for Housing Studies of Harvard University 2016). Increasing the stock of affordable housing would free up the family resources and help in improving health outcomes. Affordable housing also provides more residential stability to families which reduces stress and related adverse physical and mental health problems (Maqbool, Viveiros, and Ault 2015).

The amount of crime affects the safety and perceived safety of a neighborhood. If a neighborhood is not considered safe, the probability of people using the sidewalks or open spaces for physical activity decreases, resulting in a negative impact on health. Lack of neighborhood safety has also been associated with parental anxiety, which translates into a potential barrier to children's physical activity (Carver, Timperio, and Crawford 2008; Weir, Etelson, and Brand 2006).

What can planners impact?

Planners can influence social cohesion in a major way by creating and improving public spaces (such as parks and plazas) that facilitate social interaction and mixing between its users. The built environment should be such that it provides a visual connection between buildings and streets, provides opportunities for residents to network in common areas, and discourages criminal behavior. There are multiple actions that planners can take to create such a built environment.

Land-use plans can provide provisions for incorporating public spaces such as pocket parks, community gardens, and other open spaces. This can help create opportunities for chance encounters while residents walk through or use such spaces. Developments that are transit- and pedestrian-oriented, mixed use, and compact would motivate residents to walk for their daily needs (from accessing amenities to going to work), and thus provide possibilities for social encounters.

Since streets are the most used public spaces, attention should also be given to streetscape design. Components of green infrastructure can be combined with the street design to develop innovative techniques to foster social cohesion. Green infrastructure can also be used to increase recreational opportunities by providing outdoor areas for people to use and enjoy. An essential factor in making these areas attractive to people would be the overall safety and security in the area.

With regards to community development and housing, planners can promote the development and redevelopment of good quality, safe, and affordable housing. If housing is affordable, the probability of people staying in the area is greater, which can foster a sense of belonging and attachment to the neighborhood. Zoning ordinances can be used to create communities where people live near their work. Reducing the spatial mismatch would reduce the commute time; people could use their extra free time for outdoor recreational activities. Since the process of community development itself encourages partnerships among different community stakeholders, it directly helps in creating social cohesion.

If a neighborhood has neglected built environment with missing lighting, broken windows, trash, graffiti and other nuisances it could lead to bigger crime and safety issues. Planners can use Crime Prevention Through Environmental Design (CPTED) policies to improve public safety. CPTED refers to policies such as addressing housing vacancies, enforcing development codes, minimizing isolated routes, and mixing land uses. CPTED and other design guidelines that could be used to reduce fear and incidences of crime.

Source: City of Austin

Social Cohesion Metrics for Planners			
Domain	**Subdomain**	**Built Environment Assessment Indicators**	**Planning Policies**
Social Cohesion	Green Infrastructure	❑ Percentage of tree canopy coverage	Policies that incentivize development of green infrastructure so that it is conveniently accessible to all residents
	Housing and Community Development	❑ Jobs to housing ratio ❑ Percentage of households paying > 30% of monthly household income toward housing costs	Land use and zoning policies to promote and preserve affordable and fair housing Transportation policies that promote easy access to jobs, services, and amenities
	Public Safety	❑ Number of street miles without streetlighting ❑ Violent crimes per 1,000 population ❑ Percentage of population living in areas with high density of liquor stores	Crime Prevention Through Environmental Design policies that maximize visibility and eyes on street

Interwoven Equity

The United States is more racially and ethnically diverse today than in the past. Income inequalities are also rising and in such a climate there is a need for greater social cohesion to support such diversity and counteract rising inequalities. However, strengthening social cohesion is a challenge due to the very existence of these diversities and differences. Investments in green infrastructure, housing and community development, and public safety may help in lowering these conflicts.

While green infrastructure benefits the natural environment, it can also be used to address equity and social cohesion. Green infrastructure can increase access to green space for everyone—but only if the resources are distributed according to neighborhood need. That need should be determined based on social, economic, and environmental (built environment and natural environment) factors.

Community development has its roots in issues of social and economic equity because the field has focused on reversing decades of disinvestment in distressed neighborhoods and bringing back economic opportunity, investment, quality housing, and employment opportunities to those neighborhoods. However, in many cases urban regeneration has had unintended consequences and led to social exclusion rather than greater equity. While investments in distressed areas revitalize the neighborhood, it can displace existing residents who cannot afford increased rents and property taxes. Thus, it is vital that in addition to economic and environmental considerations, emphasis is also placed on the social impacts of development.

Many low-income and minority neighborhoods experience more violent crime than their counterparts. Thus, residents do not perceive their environment to be safe for walking or other recreation activities, which discourages them from using sidewalks, parks, or other amenities. Strategic alterations to the built environment, such as installing streetlights, would go a long way in creating a sense of safety in these neighborhoods. Even though CPTED mainly focuses on physical environment, there has been a call to include social factors because they can affect the success or failure of CPTED policies because research suggests that negative socioeconomic and demographic dynamics and conditions could reduce the effect of CPTED policies, (Cozens and Love 2015).

Considerations when using these metrics

Planners should consider a few questions when using this set of metrics:

What about other metrics?

The included indicators and policies do not represent an exhaustive list of features that determine a healthy built environment. Rather, the set of metrics proposed here represent some of the most critical areas in which planning directly and indirectly impacts public health, making their inclusion in all aspects of planning a persuasive tool for implementing and tracking goals and policies.

What about qualitative data?

All the proposed built environment indicators are quantitative in nature, partly because quantitative data are often more readily available, and because quantitative indicators are usually simpler to measure, develop, and calculate. However, qualitative data is important, and in many instances, may be more helpful than quantitative data. In these metrics, the perception of safety—a qualitative measure—may be a better predictor of safety than the number of crime instances. Thus, using qualitative data or variables for any of the identified domains could add value to the analysis.

What about geographic scale?

The geographic scale at which the built environment indicators could be calculated is not specified. Such calculations would depend on many local factors including data availability, technical expertise, and resource availability. For example, commute mode share can be mapped at different geographic levels such as by zip code or Traffic Analysis Zones , but the scale would depend on the planning purpose, scope of the analysis, and data availability. In general, data at the smaller scale or geographic level is preferred for local level analysis.

What are the right benchmarks?

These metrics are not intended to be prescriptive. Local contexts differ, and these metrics are meant to be applied in multiple settings. Further, specific quantitative benchmarks were not recommended as part of the metrics. For instance, the threshold distance for access to amenities would be different for an urban area in comparison to a rural area. The indicators and policies should be contextualized and tailored according to the requirements of each planning area.

What about overlap?

There is an overlap between some topics (subdomains), indicators, and policies within different domains of the metrics. An example is access to parks, which is currently part of the Active Living domain because parks are critical for supporting physical activity. Moreover, parks also provide opportunities for people to interact and help strengthen social cohesion, and thus could also belong to Social Cohesion domain. In these cases, the indicator or policy is included in only one domain to avoid repetition.

Conclusion

While planning and the built environment writ large contribute significantly to the context in which people live, learn, work, and play, they do not represent the complete set of health determinants. It is critical that policy makers address systems beyond planning, including education, social services, health care, and other Social Determinants of Health that shape long-term population health. Planners are encouraged to partner with such stakeholders to ensure the planning process remains fair and equitable and considers how all of these systems can work together more efficiently. The metrics presented here can help bridge some of those gaps, and invite conversations on challenges and solutions that might not otherwise take place. Use them thoughtfully, and with purpose.

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