

3 Building Bridges: Systems Approaches to Local Environmental Health Problems

Chapter 2 outlined the separate evolution of the U.S. systems for protecting public health and managing the environment. Although one of the main goals of environmental management is to protect human health, there are significant gaps in the current system's ability to identify, prevent, or address health hazards resulting from cumulative environmental exposures at local scales. At the same time, the public health community has become more aware of how social, economic, and environmental health determinants contribute to the health problems facing our society and particularly to the health disparities facing low-income urban areas and communities of color.

The widely recognized paradox of the U.S. health care system is that it spends more per person than any other country, and yet its health status is worse than many countries that spend far less on health care (Brink 2017; Fox 2016). The diseases that dominate health costs and drive health inequities are chronic conditions like obesity, diabetes, and heart disease. These same diseases are influenced by factors including people's education, income, and environment. Such social determinants of health may affect health directly through increasing people's exposure to environmental hazards, crime, and poor nutrition or indirectly by shaping individual behaviors and people's access to preventive services and care. Social determinants of health, in turn, are shaped by policies, systems, environments, and institutions outside the purview of the health care system.

Recognition of the importance of social determinants of health has encouraged public health professionals to work toward changing policies that shape social, economic, and environmental conditions. This "Health in All Policies" (HiAP) approach encompasses a range of environmental policy

arenas, including housing, air quality, neighborhood design, and exposure to toxic chemicals. However, public health agencies have limited opportunities to impact the social determinants of health that lie outside the scope of health agencies. Local environmental health collaborations provide such opportunities.

Local environmental health initiatives have diverse structures, processes, and strategies and their most significant outcomes are often indirect, multi-level, multisector, and long-term. Because of this, it is difficult to assess their contributions to systems change. Similar challenges faced scholars studying the collaborative ecosystem management institutions that emerged to fill the gaps in federal environmental policies in the 1990s. Over time, however, social scientists developed frameworks to characterize, evaluate, and disseminate these efforts. This chapter presents a conceptual framework developed to assess collaborative ecosystem management efforts and adapts it to the context of local environmental health initiatives. This framework guides analysis of the case studies presented in subsequent chapters.

Signs of Failure: Public Health, Health Care Costs, and Health Inequities

Rising health care costs and growing disparities in health status (see box 3.1) within the United States suggest that our health system is ineffective, inefficient, and inequitable. These indications of failure have driven government leaders, health care systems, and public health professionals to look for new ways to address the causes of disease, poor health, and the high costs of health care.

A recent Commonwealth Fund analysis found that the United States spends more on health care per person than any of the other thirteen high-income countries studied—over \$9,000 per person annually (Squires and Anderson 2015). Health care costs accounted for 17.1 percent of the U.S. gross domestic product in 2013; the runner-up, France, spent 11.1 percent. Nonetheless, the United States had the lowest life expectancy in this group (78.8 years). This trend is reflected in other measures of population health, including infant mortality, in which the United States ranks just below Poland, Hungary, and Slovakia (MacDorman et al. 2014). Health care costs are projected to exceed 20 percent of gross domestic product by 2025 (Keehan et al. 2017). In response to these problems, in 2007 the Institute

Box 3.1

What Are Health Inequities?

According to Paula Braveman et al. (2017, 2), “Health equity means that everyone has a fair and just opportunity to be as healthy as possible. This requires removing obstacles to health such as poverty, discrimination, and their consequences, including powerlessness and lack of access to good jobs with fair pay, quality education and housing, safe environments, and health care. Health equity is the ethical and human rights principle that motivates us to eliminate health disparities; health disparities—worse health in excluded or marginalized groups—are ... how we measure progress toward health equity.”

Health disparities are often linked with social or economic disadvantage, historical discrimination, or exclusion. Health inequities may be thought of as a special kind of health disparity that are “systematic, avoidable, and unjust.” For example, “health inequities include the increased rates of asthma hospitalization in children living near freeways or the lower life expectancies for African Americans living in low-income neighborhoods” (Rudolph et al. 2013, 9).

Since people may disagree about what is “believed to reflect injustice” (health inequity) versus merely “morally suspect” (health disparity), there are variations in use of these terms. As the environmental justice movement has shown, many differences in exposure to environmental harms are the cumulative result of unfair, racist, or discriminatory policies, practices, or decisions. Therefore, environmental health disparities are usually considered to be inequities.

for Health Care Improvement proposed a “Triple Aim” framework, the goals of which are to “improve the patient experience, reduce per capita costs and improve the health of populations” (Berwick, Nolan, and Whittington 2008).

The primary causes of mortality and morbidity in the United States, according to the Centers for Disease Control and Prevention (CDC), are chronic diseases such as heart disease, cancer, respiratory disease, and stroke that result in high health care costs, reduced productivity, and susceptibility to other health problems over many years (CDC 2017f; Johnson et al. 2014). Obesity contributes to many of the leading causes of preventable death, including heart disease, stroke, diabetes, and some cancers (CDC 2017e). These diseases are strongly linked to behaviors, environment, and access to preventive care.

Health Inequities in the United States

Significant health disparities exist within the United States by race, income, and geography. The gap in life expectancy for blacks is 3.6 years shorter than for whites and 14.6 years shorter for those with the lowest 1 percent of income than those with the highest 1 percent of income (Chetty et al. 2016; Kochanek, Arias, and Anderson 2015). In fact, life expectancy has been decreasing among the poor (DeSalvo et al. 2016; National Academies of Sciences 2015). Many cities have documented dramatic differences in health status between people living in adjacent communities (May et al. 2013). For example, in 2013, life expectancy for babies born in one neighborhood in New Orleans was twenty-five years lower than for those born just a few miles away (Robert Wood Johnson Foundation 2015). Such disparities are frequently correlated with an increased burden of chronic disease among communities of color and people with lower socioeconomic status (Gillespie, Wigington, and Hong 2013; Osborn, de Groot, and Wagner 2013; Healthy People 2013; CDC 2017a; Ogden et al. 2010; National Cancer Institute 2008; Meyer et al. 2013). For example, the national infant mortality rate in 2010 was 5.18 per 1,000 live births among non-Hispanic whites but more than double that rate (11.14) among non-Hispanic blacks (CDC 2014c). Geographically, infant mortality is highest in the southeastern states and among low-income mothers (CDC 2018e; Chen, Oster, and Williams 2016; Mathews, MacDorman, and Thoma 2015). Disparities in health between more and less advantaged populations is a growing concern within the U.S., especially because economic inequality is increasing (Rudolph et al. 2013). Race is associated with health above and beyond socioeconomic differences (Williams 2012). In response to these disturbing trends, U.S. public health efforts have focused on promoting health equity, as reflected in Healthy People 2020, the government's statement of national goals for health promotion and disease prevention (see box 3.2) (CDC 2014b).

A Historical Perspective on Health Equity

The observation that poorer people have poorer health dates back to the origins of the field of public health, when the health problems in London's slums were attributed to unsafe living and working conditions (Dannenberg, Frumkin, and Jackson 2011). In 1842, Edwin Chadwick's *Report on the Sanitary Conditions of the Labouring Population in Great Britain* documented

Box 3.2

Healthy People 2020

Healthy People 2020 Vision: A society in which all people live long, healthy lives.

Overarching Goals:

- Attain high-quality, longer lives free of preventable disease, disability, injury, and premature death;
- Achieve health equity, eliminate disparities, and improve the health of all groups;
- Create social and physical environments that promote good health for all; and
- Promote quality of life, healthy development, and healthy behaviors across all life stages (Office of Disease Prevention and Health Promotion 2018b).

that the “gentry and professional” classes lived longer than lower classes. Chadwick attributed this to differences in the social and environmental characteristics of their neighborhoods (Chadwick 1842). Sanitary surveys in Massachusetts and New York came to similar conclusions (Corburn 2009). Maps of poverty and health trends conducted by settlement houses in several cities in the late nineteenth century documented a strong association between poverty and poor health. Even after sanitary reforms and declines in infectious disease in more modern times, George Rosen (2015, 319) wrote that “the appalling inequalities in health conditions that exist throughout the world today are directly and intimately connected with the fundamental problem of wealth and poverty.” In 1980, the Black Report showed that income was the strongest predictor of health among British workers, a finding that was affirmed by the Whitehall studies that correlated the incidence of disease with grade of work within the British civil service (Gray 1982; Marmot et al. 1991; Marmot, Shipley, and Rose 1984). Studies continue to find connections between income and health to this day (White and Edgar 2010). The persistence of these trends despite widespread improvements in health care suggests a multifaceted relationship between wealth and health.

Efforts to address health disparities have had varied rationales, approaches, and goals. Concern for the health of the poor had a clear component of self-interest when epidemics of contagious disease festered in low-income neighborhoods and could readily spread to adjacent areas. As Rosen wrote,

“Without being his brother’s keeper, anyone who valued his life felt it eminently desirable not to have virulent diseases and the conditions that foster them too close at hand” (Rosen 2015, 184). Beyond this utilitarian concern, many initiatives to address health disparities are based on a normative goal to promote the well-being of all citizens. The argument that societies have an ethical obligation to help the poor has long justified public health efforts. This argument is countered by the socially conservative view that government should not limit individual choice or “incentivize” unproductive behaviors through public health programs (Schneider 2016). An economic rationale for prevention is that it saves taxpayers money if excessive health care costs are avoided by preventive efforts. This logic is particularly persuasive in countries with government-funded health services. However, even in the United States, which lacks a single-payer health system, the costs of treating people who cannot afford to pay is passed on to wealthier citizens through tax revenues used to support Medicare, Medicaid, and charity care at hospitals. Another long-standing perspective on reducing health disparities is enlightened self-interest. Some American sanitarians of the nineteenth century argued for investment in prevention because sick workers could not be productive. Emerging research shows that modern societies with greater inequality have worse health status for all citizens, which suggests that reducing health disparities may improve society’s overall well-being (Wilkinson and Pickett 2009). These different ways of framing the problem of health disparities lead to different views of appropriate public health policies to reduce disparities and address the social determinants that contribute to them.

Social Determinants and Health Equity

In the past decade, global public health professionals have focused on the role of social determinants of health (WHO 2018).¹ A 2008 report emphasized that social and physical environmental determinants may have equal or greater impacts on health than genetics, behavior, and health services combined (Commission on Social Determinants of Health and World Health Organization 2008). Although estimates vary, there is consensus that medical care explains only a small increment of health status compared to behaviors, social factors, and environmental conditions (McGovern, Miller, and Hughes-Cromwick 2014). This stands in contrast to the small percentage

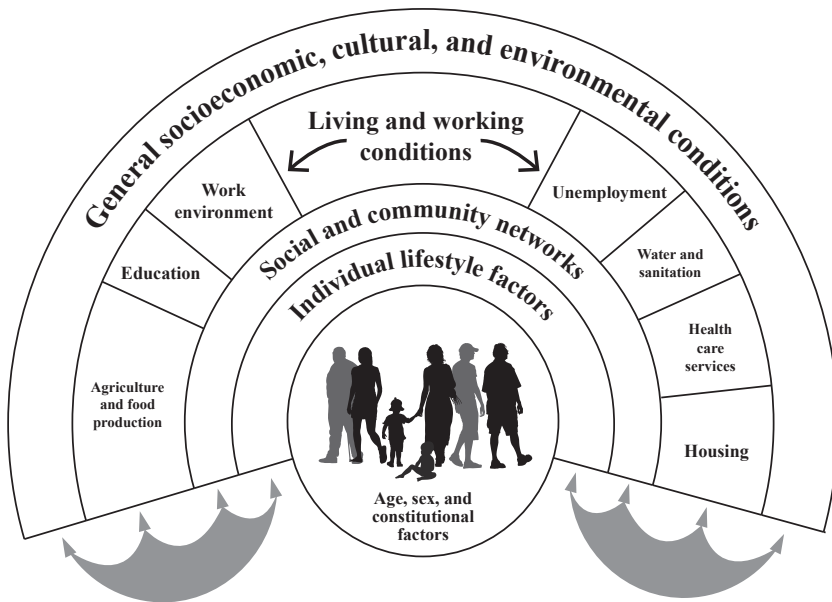


Figure 3.1

The broad determinants of health

Source: G. Dahlgren and M. Whitehead. 1991. *Policies and Strategies to Promote Social Equity in Health* (Stockholm, Sweden: Institute for Futures Studies).

of the U.S. health care budget that is spent on prevention programs aimed at social determinants of health (McGinnis, Williams-Russo, and Knickman 2002). In fact, some have suggested that the low social services expenditures contribute to the United States' high health care costs compared with countries that invest more in prevention (Squires and Anderson 2015; Avendano and Kawachi 2014; DeSalvo et al. 2017).

Health professionals recognize that social factors outside the sphere of public health contribute to the chronic conditions and diseases that drive U.S. health care costs (Marmot and Bell 2009). According to the socio-ecological model of health, these determinants interact in complex ways to cause or exacerbate disease (WHO 2009; Institute of Medicine 2002; Dahlgren and Whitehead 1991). Figure 3.1, sometimes called the “policy rainbow,” emphasizes the multilevel impacts of society, environment, community, and family on the health of individuals (Dahlgren and Whitehead 1991; Rudolph et al. 2013). The Centers for Disease Control and Prevention

Box 3.3

Health Determinants in Healthy People 2020

The Importance of an Ecological and Determinants Approach to Health Promotion and Disease Prevention

Health and health behaviors are determined by influences at multiple levels, including personal (i.e., biological, psychological), organizational/institutional, environmental (i.e., both social and physical), and policy levels. Because significant and dynamic inter-relationships exist among these different levels of health determinants, interventions are most likely to be effective when they address determinants at all levels. Historically, many health fields have focused on individual-level health determinants and interventions. Healthy People 2020 should therefore expand its focus to emphasize health-enhancing social and physical environments. Integrating prevention into the continuum of education is an integral part of this ecological and determinants approach (Office of Disease Prevention and Health Promotion 2018b).

highlighted the importance of social and physical environmental determinants of health as part of the Healthy People 2020 goals (See box 3.3, *Health Determinants in Healthy People 2020*).

Thomas Frieden (2010) proposed a “Health Impact Pyramid” as a framework for understanding the multiple roles of public health and the power of systems-change approaches to improving social health determinants (see figure 3.2). The pyramid has five “levels of public health action.” The base of the pyramid represents actions addressing socioeconomic factors such as poverty and racism. The next level is changes in environments that make it easier for people to make healthy choices. As Frieden (2010, 591) noted, “The defining characteristic of this tier of intervention is that individuals would have to expend significant effort not to benefit from them.” At the top of the pyramid are clinical care and health education efforts. Actions at the bottom levels of the pyramid have the largest potential for sustained positive impacts. Public health professionals have limited ability to address the fundamental factors at the base of the pyramid (e.g., poverty). However, there are opportunities to impact the next level of the pyramid to make healthy choices the “default choice” through systems change.

There are multidirectional relationships between these social determinants of health. Most significantly, there is a two-way relationship between poverty and health. Being unhealthy can contribute to poverty, since health

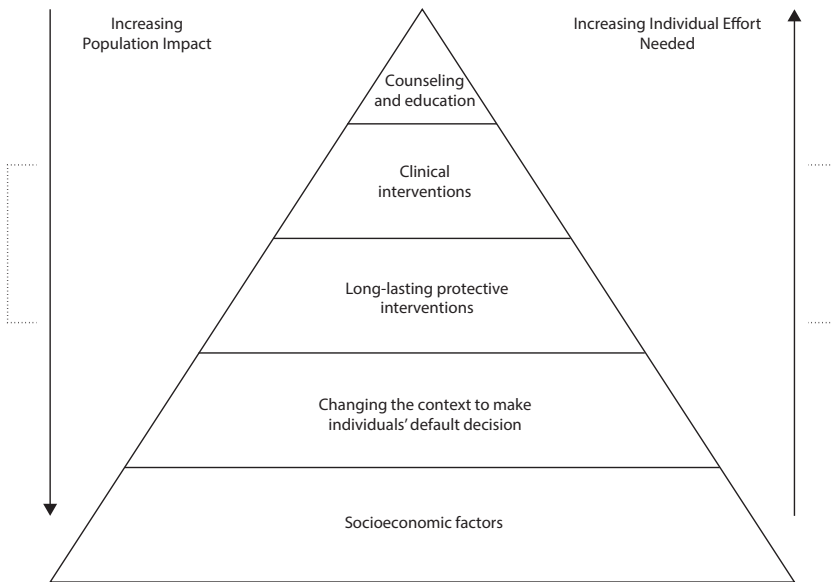


Figure 3.2

Health Impact Pyramid

Source: Thomas R. Friedan. 2010. "A Framework for Public Health Action: The Health Impact Pyramid." *American Journal of Public Health* 100 (4): 509–595.

problems can interfere with education, make it harder to work, limit one's ability to travel to needed services, and require expensive medication. As well, being poor can increase health problems through multiple pathways, including limited access to health education, preventive services, and care; insufficient resources to pay for quality food and housing; being exposed to more air, water, or soil pollution; likelihood of having a hazardous job; and chronic stress from economic hardship and exposure to violence. These complex interactions make it difficult to prove that any particular economic, social, and environmental factor causes a health condition or to predict the impact of changing social determinants on any individual's health. Nonetheless, it is clear that multiple health determinants connected with poverty contribute to health inequities.

Despite the potential for systems-level interventions to improve social health determinants, address health disparities, and reduce health care costs, there have been few incentives for health professionals and institutions to engage in such work. Recently, health care reform has introduced

opportunities for health systems to align financial incentives with improving social health determinants. Previously, health care providers were only reimbursed for treating patients (fee for service). With value-based programs, health systems are reimbursed for improved health of their patient population (fee for value). These programs provide incentives to invest in prevention programs, such as home visiting programs, that keep people out of the hospital (DeSalvo et al. 2017). Under the Affordable Care Act, enhanced requirements for nonprofit hospitals to conduct Community Health Needs Assessments, create an implementation plan, and document their related “community benefits” as part of their tax-exempt status encourage health systems making community investments ranging from supporting community coalitions to financing education, low-income housing, and even parks (National Center for Healthy Housing 2018a; Robert Wood Johnson Foundation 2012). At the same time, financing models have been developed including pay for success and social impact bonds in which an investment in nonmedical prevention projects is repaid by savings in health care costs (Galloway 2014). These financial incentives may encourage health care organizations to support systems changes that affect social determinants, including environmental quality.

These developments in policies and institutional frameworks have led to calls for an expanded role for public health in addressing social determinants. DeSalvo and others (2016) describe this new role as “Public Health 3.0.” They refer to the history of public health prior to the 1988 Institute of Medicine report as Public Health 1.0, and that report’s call for a reinvigorated public health infrastructure is termed Public Health 2.0 (DeSalvo et al. 2016, 621). Public Health 3.0 refers to a new era of enhanced and broadened public health practice that goes beyond traditional public department functions and programs. This vision calls for public health professionals to be strategic leaders in building community capacity, cross-sector collaboration, and “environmental, policy, and system-level actions that directly affect the social determinants of health” (DeSalvo et al. 2016, 622).

Environmental Determinants of Health

Within this focus on social determinants of health, health professionals increasingly recognize the key role of the physical environment (figure 3.3). The World Health Organization estimates that 23 percent of deaths in the world are caused by “modifiable” environmental factors (Prüss-Ustün

et al. 2016). Both environmental risks and resources can interact with social factors, stress, poverty, and racism to cumulatively affect health (Kjellstrom et al. 2007; Payne-Sturges et al. 2015; Northridge, Sclar, and Biswas 2003). Changes in the built environment—particularly access to healthy food and opportunities for physical activity—can help people live healthier lives (Northridge, Sclar, and Biswas 2003; Dannenberg, Frumkin, and Jackson 2011; Kochtitzky et al. 2006). Inclusion of environment in the Healthy People 2020 goals encouraged public health professionals’ renewed focus on the built environment (Corburn 2009; CDC 2015b; Brennan Ramirez, Baker, and Metzler 2008; Northridge, Sclar, and Biswas 2003).

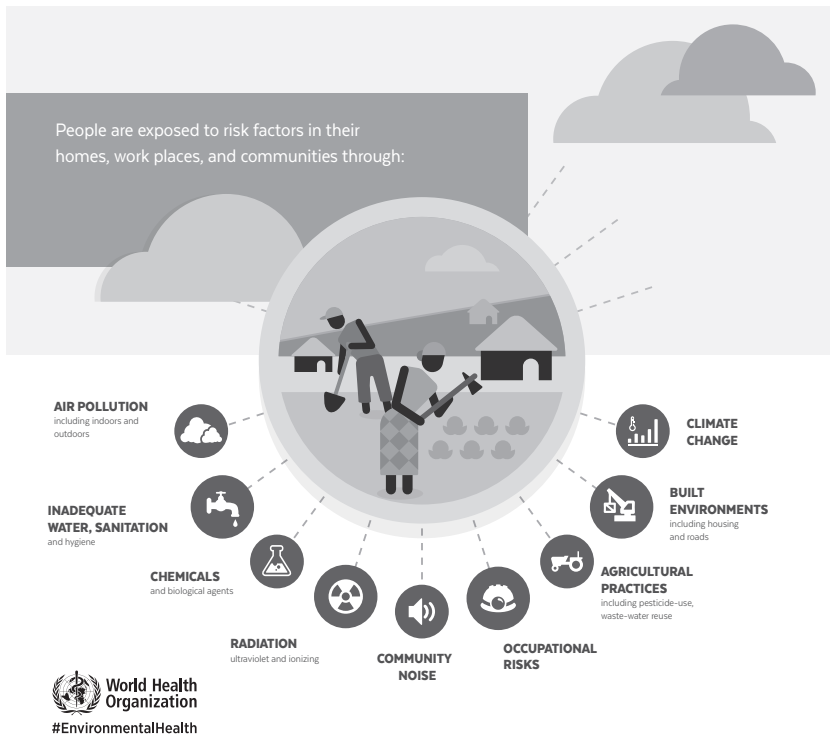


Figure 3.3

How the environment impacts our health

Source: http://www.who.int/quantifying_ehimpacts/publications/PHE-prevention-diseases-infographic-EN.pdf?ua=1.

Environmental factors may be more actionable than some of the more fundamental social determinants of health such as economic status. Environmental improvements may be objectively measured, making it easier to document progress. Physical changes in the environment are durable and can continue to impact people positively over time, even as other socioeconomic conditions change. Environmental factors influence many other determinants including poverty, education, and social capacity. For example, creating bike paths in low-income neighborhoods may help residents more easily reach food stores, jobs, and schools while reducing their transportation costs so they have more money for food, housing, and health care. Thus, improvements in the physical environment often have ripple effects on other social determinants of health.

Recognizing these connections, many public health professionals have enhanced their involvement in environmental health, either through expanding their scope of work or partnering with others (Kent and Thompson 2012). To encourage such collaboration, the National Association of County and City Health Officials (NACCHO), in its Resolution 99–13 (adopted on November 7, 1999), called for better integration between environmental protection and public health (see box 3.4, NACCHO 1999). However, the decreasing staff capacity in local and state environmental health departments poses a challenge to accomplishing this goal (NACCHO 2017).

Addressing the environmental determinants of health may require changes in the roles, resources, tools, and training of public health professionals. The next section introduces approaches that aim to support efforts by public health professionals and others to integrate health into decisions that shape social determinants of health, including environmental conditions.

Health in All Policies

Improving environmental health determinants often requires changing policies and systems in non-health sectors. The idea of Health in All Policies (HiAP) is that human health should be considered in all policies that shape social determinants of health. This sounds like common sense. In fact, community members are often surprised to discover that many public decision processes do not directly consider health outcomes. Those that do often address a only narrow set of health concerns. Increased concern about the contributions of social determinants to health disparities has focused attention on how to better incorporate health considerations into non-health

Box 3.4

The Integration of Environmental Health and Public Health Practice

WHEREAS, the Institute of Medicine's 1988 Future of Public Health Report states that "The removal of environmental health authority from public health has led to fragmented responsibility, lack of coordination, and inadequate attention to the public health dimensions of environmental health issues;" and

WHEREAS, environment and health are intimately related, and environmental health is a public health activity, yet the two fields are often isolated and overly distinct in their current missions; and

WHEREAS, local public health agencies bring a unique, population-based approach to environmental health issues and an emphasis on prevention and system-wide approaches to health;

THEREFORE, BE IT RESOLVED that the National Association of County and City Health Officials (NACCHO) advocates for resources, policies, programs, and legislation that promote the integration of environmental health and public health practice; and

BE IT FURTHER RESOLVED that NACCHO endorses the development and/or enhancement of coordinated training for the environmental health workforce in public health sciences such as epidemiology, social and behavioral sciences, physiology and biology, and for the public health workforce in environmental sciences such as ecology and urban planning (NACCHO 1999).

decisions. Health in All Policies, "health impact assessment," and "policy, systems, and environmental" change work are all concepts that relate to improving health equity through action in multiple sectors (Browne and Rutherford 2017).

International public health organizations were among the first to use the phrase Health in All Policies (WHO 2015). The idea dates back at least four decades to the 1978 Alma-Ata Declaration on Primary Health Care (WHO 1978).² The theme was developed through a series of global meetings and articulated in the "Helsinki Statement on Health in All Policies" in 2013: "Health inequities between and within countries are politically, socially and economically unacceptable, as well as unfair and avoidable. Policies made in all sectors can have a profound effect on population health and health equity" (WHO 2014).

Within the United States, HiAP has been promoted by public health organizations such as the National Association of County and City Health

Officials (NACCHO), the Association of State and Territorial Health Officials (ASTHO), the National Academies of Medicine (NAM), and the American Public Health Association (APHA) through webinars, publications, training programs, and conferences. The Affordable Care Act incorporated the concept through its National Prevention Council (Shearer 2010). The first report of the National Prevention Council (2011, 7) envisioned “a prevention-oriented society where all sectors recognize the value of health for individuals, families, and society and work together to achieve better health for Americans” and named “healthy and safe community environments” as one of four “strategic directions.”

The Centers for Disease Control and Prevention has promoted HiAP by providing technical resources and community grants (CDC 2015a). At the state level, California has been a leader in implementing this idea through a statewide HiAP Task Force established in 2010 (State of California Department of Justice 2017b). To encourage other states to pursue this approach, the APHA and the Public Health Institute published “Health in All Policies: A Guide for Local and State Governments,” which drew on California’s experiences related to environmental determinants of health (Rudolph et al. 2013). Several localities have committed to integrating HiAP into their decisions, programs, and practices. For example, Multnomah County, Oregon, established a Health Equity Initiative in 2007 that aimed to address “the root causes of socioeconomic and racial injustices that lead to health disparities” through local policy change (Multnomah County 2018).

A closely related concept to HiAP is “policies, systems, and environments” (PSE). The terms PSE and HiAP are sometimes used interchangeably (ChangeLab Solutions 2018b; Public Health Institute 2018). HiAP emphasizes the need to infuse health into non-health policies, whereas PSE highlights the importance of multilevel systems change by private, public, and nonprofit stakeholders in addition to changes in the policy sector. These approaches are sometimes referred to as “upstream” health promotion to distinguish them from public health’s traditional focus on individual education and behavior change (Ehlinger 2015; Butterfield 2017; Rudolph et al. 2013; Williams et al. 2008). In this book, the terms HiAP, PSE, upstream health, and “integrating health into non-health policies” are used depending on context to refer to systems-change approaches.

Many public health stakeholders developed experience in PSE work through tobacco control efforts (American Cancer Society 2015; Trochim

2006). Decades of public education campaigns about the dangers of smoking failed to reduce smoking rates. Significant reductions in smoking rates did not occur until higher taxes on cigarettes, restrictions on advertising, banning cigarette sales to minors, and smoke-free environment policies were implemented (Task Force on Community Preventive Services 2000). The success of this effort encouraged public health professionals to address other complex health issues with comprehensive, community-based, multilevel systems-change approaches (Sallis et al. 2006; Schneider 2016). More recently, PSE has been promoted as a framework for active living and healthy-eating initiatives seeking to make the “healthy choice the easy choice” (Honeycutt et al. 2015; Levi 2012; Oakar 2017).

Advocates of HiAP and PSE encourage their integration into private-sector and nonprofit decision-making as well as public policy. For example, the nonprofit Active Living by Design promotes wellness through its human resources, workplace, and institutional food procurement choices. Several health care organizations have made similar efforts throughout their operations by reducing chemicals use, providing healthier food options in cafeterias, supporting active transportation by employees and patients, and hosting farmers’ markets (Ashe et al. 2016; HERO 2018). The Robert Wood Johnson Foundation has advanced these ideas through its Culture of Health campaign (Plough 2015).

The concepts of HiAP and PSE emphasize inclusive decision processes and the need to build community capacity. For example, the Minnesota Health Department developed a “triple aim for health equity” that sets forth HiAP as a means to promote health equity and emphasizes the importance of community engagement in these efforts (Ehlinger 2015). These efforts are described further in chapter 5.

Despite these initiatives, integrating health into non-health sectors remains a challenge. As noted previously, one barrier is that non-health agencies, policies, and practices seldom *require* consideration of health. Therefore, integration of health is voluntary. A second challenge is that “considering human health” is a very broad goal with multiple possible (and potentially conflicting) interpretations. Third, even when there is consensus about health equity goals, integrating health into non-health decisions may require data, assessment strategies, expertise, and expense beyond the institution’s existing resources. In other words, simply setting health equity as a goal does not clarify which health outcomes to assess,

how to balance impacts on disadvantaged communities versus the whole population, or what to do when there are gaps in information.

One framework for integrating health in non-health policies is called Health Impact Assessment (Harris-Roxas et al. 2012; Bhatia et al. 2011). A Health Impact Assessment (HIA) is a voluntary, collaborative process to analyze the health outcomes of proposed decisions. Government agencies, foundations, and nongovernmental public health organizations have promoted HIA through grants, training programs, and policy statements. HIAs begin by building consensus around what are the most critical health equity implications of a decision, thus creating a shared definition of what impacts should be assessed. By involving decision makers and other stakeholders, the process aims to recommend solutions that are feasible within the context at hand. By providing a structure for cross-sector collaboration, HIAs can help integrate multiple types of information to clarify the health equity impacts of a decision (Pew Charitable Trusts 2018a, 2018b).

HIAs have been conducted in a wide range of sectors, including education, criminal justice, transportation, education, and land use (Pew Charitable Trusts 2018a). The land use planning sector, in particular, has promoted the practice of HIA (American Planning Association 2016). Several federal agencies have funded HIA efforts and provided technical support (CDC 2018d, 2015a). Private foundations have also played a role in developing HIA capacity across the country, notably through the Health Impact Project of the Robert Wood Johnson Foundation and Pew Charitable Trusts, as well as several regional health foundations (Pew Charitable Trusts 2018a). HIA courses are offered in many planning and public health programs, and a professional society supports development of the practice (Society of Practitioners of Health Impact Assessment 2018). Together, these efforts have informed hundreds of decisions across the country and raised awareness of the health equity impacts of non-health decisions (Bourcier et al. 2014; Pew Charitable Trusts 2018a).

Nonetheless, HIA has several limitations. First, it is reactive—HIAs are conducted to inform pending decisions, not to create new initiatives. Furthermore, decision-making processes seldom allow time for a full HIA. However, “prospective” HIAs have been conducted when decisions can be anticipated, as in the expansion of wind power developments in Oregon (Oregon Health Authority 2013). As voluntary processes, HIAs are limited by available funding and staff resources. Most HIAs in the United States

have been grant-supported, although there are efforts to institutionalize HIA in some jurisdictions. Agencies in the land use sector have developed toolkits to streamline health assessment, including San Francisco's Healthy Development Measurement Tool and the Mid-Michigan Mapping and Impact Assessment Toolkit (Farhang et al. 2008; Wernham and Teutsch 2015; Mid-Michigan Regional HIA Program 2018). Lower-cost "desktop HIAs" that rely on existing tools, data, and analyses have also become more common (Dannenberg et al. 2008; Pew Charitable Trusts 2018b). Some have advocated for integrating HIA into the National Environmental Policy Act (NEPA) Environmental Impact Statement process; others caution against such a formalized process (Bhatia and Wernham 2008).

The practice of HiAP, PSE, and HIA have increased public health professionals' opportunities to engage in systems change to impact social determinants of health. These approaches provide models for integrating data across sectors, encouraging collaboration between institutions, and promoting multilevel solutions. Many of the local environmental health initiatives discussed in this book were informed by these concepts and related experience.

Collaborative Ecosystem Management

Public health professionals' growing interest in systems change is similar to environmental and natural resource managers' development of ecosystem management several decades ago. By the 1990s, environmental managers had recognized that existing institutions often failed to protect ecosystems. U.S. environmental policies had evolved to manage each resource individually, with different goals, separate agencies, and specific technical expertise, usually along politically determined boundaries (e.g., cities, states, park boundaries, water districts) with limited opportunities for input from resource users and the public. These gaps contributed to slow progress in addressing environmental problems and resolving natural resource use conflicts. In response, new institutions were developed to manage ecosystems more holistically, proactively, and collaboratively. This section describes the evolution of these efforts (referred to as "ecosystem" or "collaborative environmental" management efforts), similarities and differences to local environmental health initiatives, and how conceptual frameworks for ecosystem management may inform environmental public health protection.³

Ecosystem management focuses on the complex interactions between physical, human, and biological components of the environment and the geographic scale at which these forces interact (John 1994; Koontz 2004). Managing resources separately makes it difficult to account for cumulative impacts and interactions across different resources and political units (John 1994). Place-based ecosystem management collaborations were developed to manage systems more comprehensively. Ecosystem management's key features include enhanced public participation (particularly by those dependent on a natural resource), decisions based on multidisciplinary science, and collaboration between multiple institutions that affect the ecosystem (Koontz 2004; Wondollock and Yaffee 2000; Yaffee 1996).

The surface water quality management example given in chapter 2 demonstrates some of the problems of single resource management. The Clean Water Act's focus on point sources like industries and wastewater treatment plants only addressed a small portion of surface water pollution sources, which include runoff from residential development, farms, industries, and extraction of natural resources. There was no comprehensive system to avoid overpollution by point and non-point sources throughout the watershed. Decisions by individual landowners that had a significant impact on water quality—for example, how much fertilizer to apply, where, and when—were beyond the scope of the Clean Water Act (CWA). The CWA did not create institutions within which water quality managers, private developers, municipal wastewater plants, farmers, agriculture agencies, local land use planners, and community groups could coordinate their activities to protect water quality.

Given these gaps, it is not surprising that some of the earliest collaborative environmental management efforts developed to manage watersheds. Watershed management organizations span a range from community-based coalitions to public-private partnerships to government-sponsored participatory planning groups (Koontz 2004; Sabatier et al. 2005). Many watershed protection organizations are community-led (Steelman 2010; Koontz 2004). Some work closely with private industry to gain voluntary compliance with their goals. Others are organized and funded by government agencies. For example, in 1987, the Great Lakes Water Quality Agreement established a model for collaborative ecosystem management of forty-three Areas of Concern (AOC). Each AOC received financial support to develop a Remedial Action Plan that involved multiple agencies and

stakeholders, public participation, scientific assessment, and public education (U.S. EPA 2018; Vallentyne and Beeton 1988; MacKenzie 1996). Over time, the idea of collaborative watershed management was integrated into the federal system of water quality management—for example, through the Stormwater Management Phase II rule, which provides for education, watershed planning, and public participation to reduce non-point sources of pollution (U.S. EPA 2005).

Collaborative institutions for environmental management evolved in other sectors, including forest, fisheries, and wildlife management. Many of these collaborations were led by government agencies, such as U.S. Forest Service (USFS) efforts to increase collaboration in forest planning and management in the 1990s (Wondolleck and Yaffee 2000; Lee 1993). Today, collaboration is an established part of USFS practice, including a “collaboration cadre” of staff that supports these efforts (U.S. Forest Service 2018). By 1994, eighteen federal agencies had adopted ecosystem management approaches that incorporated collaboration (Koontz 2004; Morrissey, Zinn, and Corn 1994; MacKenzie 1996).

Environmental policy scholars studied these varied collaborative institutions from a wide range of perspectives, asking questions like: What are criteria for success of ecosystem management? What contributes to their success? How successful are they compared to existing environmental institutions? Several common themes emerged from this research (Sabatier et al. 2005; Koontz 2004; Wondolleck and Yaffee 2000; Koontz and Thomas 2006; Yaffee 1996). First, ecosystem management requires multidisciplinary information, including the knowledge of communities that use natural resources. The knowledge of diverse technical specialists, user groups, and managers is also important. Second, public participation is critical throughout the process. Third, the effort must facilitate collaboration among multiple institutions involved in managing different aspects of the system. Finally, the ability to adapt to changes in the ecosystem, political landscape, or partners’ resources is key (Lee 1993; John 1994).

Studies of ecosystem management efforts revealed that their impacts are often indirect, long-term, or even invisible (Koontz 2004; Korfmacher 1998). Therefore, in order to assess ecosystem management efforts, it is important to evaluate their processes and indirect effects as well as their short-term outcomes and likely future trends. Sometimes the process of collaboration establishes new relationships that then lead to positive changes

in other parts of the system. Because of these complexities, most studies of collaborative environmental management have focused on understanding both the collaborative process and the outcomes initiated by these efforts. This generally requires in-depth, multimethod case studies that can capture the varied goals, perspectives, and experiences of the participants (Yin 1984).

Before applying lessons learned from ecosystem management to local environmental health initiatives, it is important to consider some critical differences between the two fields. The goal of collaborative environmental management is to maintain a healthy ecosystem while sustaining desired human uses, whereas the goal of local environmental health initiatives is usually to promote health equity without disrupting the local economy. Both goals require choices about values, priorities, and distribution of costs and benefits about which stakeholders may disagree. The scale of a local environmental health initiative is usually defined by political boundaries, whereas many collaborative environmental efforts aim to manage entire watersheds or ecosystems that cross jurisdictions. Many ecosystem management efforts are established by government agencies with significant control over the sector being managed, as is the case with public lands (e.g., national parks or forests). Although most of the local environmental health initiatives explored in this book involved government agency staff, none was led primarily by government. As a result, ecosystem management partners often have the power to implement at least some of the changes the effort recommends, whereas local environmental health collaborators may need to advocate for decision makers external to the partnership to change their behaviors, practices, or policies.

The Local Environmental Health Initiative Framework

One framework for analyzing ecosystem management efforts was set forth by Tomas Koontz and others in *Collaborative Environmental Management* (Koontz et al. 2004). This framework emphasizes how collaborative environmental management initiatives frame the issue of concern, leverage diverse resources, structure their efforts, and produce diverse kinds of impacts (Koontz 2006). It is adapted here to reflect the nature of local environmental health efforts, including the roles of diverse collaborators and multiple kinds of outcomes (figure 3.4). This Local Environmental Health Initiative Framework provides a structure for examining four aspects of collaborative

initiatives: (1) problem definition, (2) resources for collaboration, (3) structure and decision processes, and (4) impacts of the efforts. Each of these elements is briefly described below.

Problem definition and issue framing refer to how stakeholders characterize the scope, scale, and nature of the issue of concern. This process often shapes the initiative's approach. For example, framing a polluted lake as a problem of industrial discharges suggests a very different strategy than portraying the problem as a failure of all watershed actors including farmers, cities, residents, and businesses to manage their wastewater responsibly. In the case of local environmental health initiatives, framing may emphasize fairness, equity, and vulnerable populations. Defining an actionable geographic scale may be challenging when the environmental determinant is managed on a regional basis but negative health impacts of concern are concentrated among a local population. Problem definition also involves focusing on a limited scope of targets, which determines the interests and expertise the initiative needs to engage. Thus, how an issue is defined and framed affects which stakeholders are involved, the scope of solutions considered, and the types of knowledge that are invoked.

Research on collaborative efforts emphasizes that their accomplishments depend largely on the resources they are able to garner. Diverse types of resources in addition to funding can support an initiative's progress. The Local Environmental Health Initiative Framework characterizes resources for collaboration as *human*, *knowledge*, and *financial*.

Human resources are the people who contribute time, attention, or skills to the overall effort. Human resources may be paid or volunteer staff and their skills, including technical expertise, leadership abilities, past experiences, credibility, social connections, and professional networks. One key human resource is staff time to convene meetings, communicate with group members, and carry out coalition tasks. Staff time may be donated by member organizations or paid for by the group's financial resources.

Knowledge resources include the information available to the initiative, as well as the ability to generate, translate, and use knowledge (Ascher, Steelman, and Healy 2010). Generating knowledge encompasses collecting new data, synthesizing the experiences of others, or analyzing existing information in new ways. The ability to interpret and communicate information to diverse stakeholders is also a "knowledge resource" and is essential to promoting the use of information in decision processes. In addition to

scientific information and quantitative data, knowledge resources may include community members' knowledge about the issue, qualitative information about community health, cultural practices, public preferences, opinions, or beliefs and recollections of past social, economic, political, and ecologic conditions. Knowledge resources may be contributed by partners or purchased with the group's financial resources (e.g., paid consultants, contracts). Collaborations often enhance their credibility by engaging technical experts, respected local leaders, or national groups with knowledge of the issue at hand.

Financial resources may come from discretionary funding of partner groups, donations, contracts, or grants. Lack of funding is a common barrier to collaboration, particularly when it limits the initiative's ability to maintain its convening functions. The source of funds, constraints on types of expenditures, and control over allocation also has a significant impact on the effort's progress. Donation of services that would normally cost money, such as airtime for public service announcements, may also be considered a financial resource.

Human, knowledge, and financial resources are clearly interrelated. The ability to identify funders, write proposals, and implement projects depends on the human and knowledge resources of the group. Grant funding (*financial resources*) can support the time of personnel (*human resources*) who can access data (*knowledge resources*) that contribute to the overall effort. Taken together, these resources support opportunities for partners to interact with each other, provide access to multidisciplinary expertise, and allow staff to coordinate meetings, communicate the group's messages, and carry out programmatic activities. Distinguishing different types of resources helps clarify who controls them, limiting factors, and how they evolve over time.

The third factor in the framework is the group's structure and decision-making processes. Collaborative efforts may or may not have formal goals, decision processes, committee structures, membership rules, and leadership roles. Some collaborative initiatives are incorporated as independent nonprofit organizations. Others operate under the auspices of a convening organization. In such cases, the discussion of group structure and decision processes focuses on how the key stakeholders interact, who the leaders are, how the collaboration functions, and whether it changes over time. Even when there is a formal institution overseeing the collaboration, mapping

out the *functional* structure and decision processes helps clarify collaborative processes and how they affect outcomes and impacts.

The final component of the framework is “impacts of collaboration.” For the purposes of analyzing local environmental health efforts, it is helpful to distinguish impacts in terms of outputs, social outcomes, and impacts on policies, systems, and environments. *Outputs* include activities, programs, analyses, educational materials, events, and other short-term, direct products of the collaborative effort. *Social outcomes* are the ways in which the effort changed individuals and their relationships with others, such as development of participants’ capacity, credibility, networks, and experiences that enable them to contribute to future change. Social outcomes may also include factors like reducing conflict, improving coordination, or changing how participating group members make decisions. *Impacts on policies, systems, and environments* include the decisions, practices, programs, or processes to which these efforts contributed. It is seldom possible to directly attribute a change in health equity to a collaborative effort in the near term. However, it may be feasible to identify how the local environmental health initiative contributed to changes in environmental conditions, policies, or decision processes that are expected to result in health improvement over

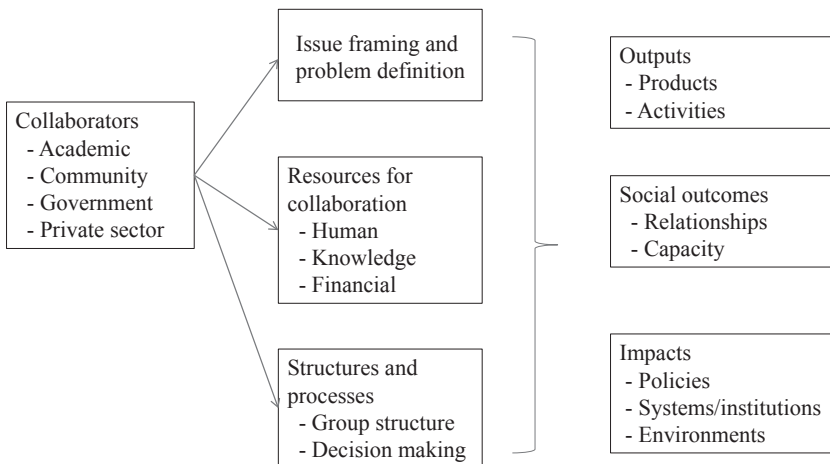


Figure 3.4

The Local Environmental Health Initiative Framework

Source: Adapted from Koontz et al. (2004) *Collaborative Environmental Management: What Roles for Government?*

time. Or, the collaborative effort may encourage partner or external organizations to produce new materials, programs, or practices. Such indirect impacts are important contributions of local environmental health initiatives but can be challenging to identify, attribute, and evaluate.

Assessing Local Environmental Health Initiatives

The Local Environmental Health Initiative Framework provides a structure for describing, analyzing, and comparing local environmental health initiatives. Unlike programs or projects with defined goals and measurable outcomes, by definition these initiatives had a more “developmental” approach, in which goals, objectives, and metrics of success evolved over time as a function of the collaborative process (Patton 2010). They generated new understanding of an existing problem, refined their objectives accordingly, created new solutions, and promoted multiple strategies to address the problem.

Table 3.1 sets forth questions that explore how the collaborative initiative redefined the problem, marshaled resources, and organized its internal processes as well as its accomplishments in terms of outputs (what it did), social outcomes (how it affected participants), and impacts on policies, systems, and environments. These questions guided the case study analyses.

One of the most fundamental challenges in evaluating the impacts of local environmental health initiatives and defining appropriate measures of success is that any changes observed must be considered in the context of the “counterfactual” (NIEHS 2013): What would likely have happened in this situation had the initiative not existed? One avenue for addressing this question is through comparison to other communities that lack such collaborative initiatives. Another is to consider the conditions and trends prior to the initiative’s work. The questions in table 3.1 guide assessment of the initiative’s problem definition, resources marshaled, internal processes, and impacts in terms of moving from the status quo toward promoting health equity.

Characterizing the initiative’s problem definition, resources, and structures focuses on how the initiative changed how the problem was addressed in the community. Questions about problem definition focus on how the initiative reframed the issue with respect to environmental health equity, mobilized new constellations of stakeholders, and identified the problem’s scope

Table 3.1

Applying the Local Environmental Health Initiative Framework

Local Environmental Health Initiative Function	Questions for Analysis
Issue framing and problem definition	<p>Did the problem definition and framing inform the strategy to engage appropriate resources, stakeholders, and approaches to create systems change?</p> <p>Were the scope and scale of the problem defined in an actionable way?</p> <p>How did the initiative frame the issue with respect to environmental health equity?</p>
Resources for collaboration	<p>How did the initiative's resources contribute to the credibility, effectiveness, and impact of the effort?</p> <p>Did the initiative bring new human, financial, and knowledge resources to bear on developing solutions to the problem?</p> <p>Did it integrate multiple sources of knowledge to develop and promote science-based solutions?</p>
Structure and decision-making process	<p>Did the initiative's structure for collaboration allow it to function effectively over a long enough time to affect systems?</p> <p>Who were the primary conveners? What were the various stakeholders' roles in the collaborative structure and decision-making process?</p> <p>How did the process engage affected community members or groups?</p>
Impacts of collaboration:	<p>What evidence is there that the initiative made progress toward addressing the identified problem?</p>
Outputs	<p>What activities, programs, and materials did it produce to expand awareness, build support, or promote solutions that enhance health equity?</p>
Social outcomes	<p>Did it develop participants' capacity (skills, relationships, resources) to address the problem beyond the scope of the collaboration?</p>
Impacts on policies, systems, and environments (PSE)	<p>How did the initiative affect decision-making processes, policies, or practices?</p> <p>Is there any evidence the initiative impacted environmental determinants or health outcomes?</p> <p>Did the initiative have impacts beyond its central scope and scale?</p>

in an actionable way. The framework emphasizes on examining whether the initiative mobilized new and diverse kinds of resources to address the problem, and also its ability to integrate them to develop credible, well-informed solutions. In addition to clarifying the structure and decision-making processes of the effort, the framework acknowledges that these may be informal, decentralized, and evolving. It particularly highlights how these structures enhanced community engagement in problem-solving.

The framework guides assessment of the initiatives' impacts in terms of outputs, development of participants' capacity and relationships, and changes in policy processes and outcomes. It is relatively straightforward to document the "outputs" of collaborative initiatives (e.g., meetings held, educational materials produced, reports issued, trainings conducted), but the success of these products depends on how they changed policies, systems, or environments. These impacts are frequently indirect and long term. Sometimes the impacts of systems-change efforts are simply categorized into short-, medium-, and long-term outcomes, in which case outputs are normally considered short-term outcomes (NIEHS 2013). The Local Environmental Health Initiative Framework distinguishes outputs from social and systems impacts to focus attention on the role of the collaborative initiative in affecting the behaviors of member and external organizations (indirect effects) versus those activities directly accomplished by the convened group.

Research on collaborative efforts suggests that social outcomes are important to implementing, supporting, and sustaining the goals of the core initiative. Therefore, the framework examines the impacts on individual participants and their relationships with others (i.e., do they bring new approaches into their organization's work, partner on projects outside of the collaboration, or engage other individuals within their organization?). Participation in a collaborative effort may enhance an individual's or an organization's credibility, skills, and experience in ways that increase their ability to be effective in future policy initiatives. It may give them access to new technical or financial resources. Relationships among participants may create networks for collaborative action that outlast the original initiative.

The complexities of evaluating collaborative efforts' impacts on policies, systems, and environments are well recognized, including the long timescale of impacts, importance of indirect effects, and the multiple factors influencing complex policy systems (Korfmacher et al. 2016; NIEHS 2013;

Patton 2010). Documenting trends in health and environmental outcomes can provide important context to understanding the long-term impact of these initiatives. It may be more feasible to identify changes in the physical environment that occurred as a result of the initiative's efforts than to link these changes to reductions in health disparities, particularly in the short term. However, population and environmental health outcomes depend on multiple factors (e.g., policies in many sectors, economic forces, cultural shifts) over long periods of time. Intermediate indicators may include shifts in funding streams, programs, or statements by political leaders.

Assessing an initiative's impact on policy and systems change is also challenging. While a collaborative effort may contribute to a policy change, it can seldom claim full credit. Local policy systems are also influenced by external forces—for example, a change in a federal law may make a local policy campaign moot. Systems change can take a long time. Therefore, failure to observe improvements in environmental public health within the lifespan of a collaborative effort may not mean that the initiative was a failure. Finally, as Garry Brewer and Peter DeLeon (1983, 322) note, criteria for a successful policy outcome depends on “who one is, where one sits, and what one intends.” Thus, different stakeholders may have different views about the appropriateness, effectiveness, or impacts of the effort.

Because of these complexities, local environmental health initiatives are most appropriately studied through exploratory, in-depth case studies (Yin 1984). In-depth case studies can document ongoing processes, internal dynamics, “invisible successes,” and potential for future systems change (Korfmacher 1998). The Local Environmental Health Initiative Framework guides exploration of the initiative's impacts on its partners' skills, relationships, and capacity as well as how it influenced changes in decision processes, policy outcomes, and systems that affect the environment.

Summary

Existing systems for environmental and public health management often fail to protect the most vulnerable populations in society from environmental health risks. These inequitable environmental conditions can create or compound health disparities. Diverse local environmental health initiatives have arisen to develop innovative ways to address these problems. However, little is known about what leads to initiation of such efforts, what promising strategies or critical barriers will emerge, or how to promote their

success. These collaborative efforts are diverse, complex, and therefore difficult to evaluate.

The Local Environmental Health Initiative Framework is used to guide analysis of the three case studies and understanding their impacts. Chapters 4 through 6 present in-depth explorations of how three collaborative local environmental health initiatives unfolded in New York, Minnesota, and Southern California. These local initiatives worked at multiple levels to improve environmental health. Each chose different strategies to pursue its goals, tapped different resources, developed the capacity of its participants, and played different roles (direct or indirect) in changing policies, systems, and environments.