The Ecological Approach to Self-Management in Diabetes

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Interaction and Multi- and Interdeterminacy at All Levels

Whether our lives are directed by events around us or events within us, "not in our stars, but in ourselves,"[1] is of concern in ethics, aesthetics, law, religion (the Old Testament of laws and the New Testament of "faith as a mustard seed"[2] within us), and, of course, behavioral science, biology, and health. The present paper emphasizes the importance of contexts – ecological, social, organizational, community, policy – in health and health behavior; describes peer or social, community, and policy approaches to addressing contexts; and considers all of these with reference to the challenges of diabetes prevention and management.

Epidemiology of Social and Ecological Determinants of Health

Contexts play a large role in health disparities. Examples abound. Since the middle of the twentieth century in many high-income countries, smoking has evolved from a privilege of the well-to-do to a problem among those who are poorly educated, poorly paid, and/or burdened by a variety of personal and psychological problems such as depression, schizophrenia, or divorce [1]. In the United States, African Americans, Latinos/Latinas, and American Indians are about twice as likely to have diabetes as the rest of the population. Internationally, infectious diseases, especially HIV/AIDS, are much more prevalent in poor nations and, within all nations, among poor people. Diabetes along with other noncommunicable diseases are also socially stratified. Socioeconomic factors along with the production, marketing, and drawing profit from the sale of food all contribute to the sharply increasing levels of obesity both within the United States and globally [2]. At the same time, health problems can have enormous impacts on the social and economic environment as shown by the impact of HIV/AIDS in many countries in Africa.

The social determinants of health – "the circumstances in which people are born, grow up, live, work and age" (WHO 2008, 2010a) – have received great attention in recent decades. Differences in health may be revealed and characterized through statistical analysis linking health and illness and disease and death to latent variables of social inequity such as income, education, and socioeconomic status. Typically a social gradient emerges. Increases in income, education, or socioeconomic status are associated with improved health status and decreases in mortality and morbidity across a range of diseases. Reduction in income, education, and socioeconomic status is associated with worse health and increases in mortality and morbidity across a range of diseases. Causality may occur in both directions, however, such that poor health may also lead to lower socioeconomic status, income, or education, so-called health selection. Nevertheless the overriding tendency and bulk of evidence tend to show that social position determines population health status, and for this reason we may speak of social determinants of health and health inequities.

Cross-national analyses support the view that disparities in health reflect variability in socioeconomic characteristics of countries [3]. Michael Marmot's analysis of this global variability in health extends, however, beyond socioeconomic contexts per se. For example, the populations of the United States, Greece, Costa Rica, and Cuba have life expectancies ranging from 76.5 years (Cuba) to 78.1 years

[1] Shakespeare, *Julius Caesar,* Act 1, Scene 2

[2] Luke, Chap. 17, verse 6

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(Greece). However, their 2016 GNPs in US dollars range much more widely, from $7815 per person (Cuba) and $11,825 (Costa Rica) to $57,808 (United States) [4]. Marmot interprets such data as indicating that, along with income poverty and material conditions, social determinants must also play roles in the development of health risks and the paths of infectious disease transmission. Key social determinants include stress, early life circumstances, social exclusion, unemployment, poor education, lack of social support, and various addictions [5]. If obesity and other risks such as smoking and hypercholesterolemia and hypertension are the causes of noncommunicable diseases, then social determinants are among the "causes of the causes" [5], attention to which is likely to reduce population disease burden.

Articulating a Broad View of Experience and Environment: Ecological Perspectives

Several different models have been put forward to frame how social determinants in constant interaction are linked to health status and how they produce a social gradient of health. Certain approaches underline the importance of proximal factors (lifestyles and behaviors), while others place greater emphasis on distal fundamental or structural determinants such as socioeconomic conditions, "the causes of the causes" of health and disease [6]. Whitehead and Dahlgren, for instance, famously represent "the main determinants of health as a set of concentric arcs around the individual" [7]. Health is represented as "the outcome of a web of social influences" [8].

In ecological approaches [9–11], the behavior of the individual is viewed as guided by layers of influences including the family, proximal social influences such as social networks or neighborhoods, organizational influences such as worksite or community systems or healthcare systems, and larger social influences such as government, policy, or large economic structures.

Different models may specify different layers of influence and different components of each, but they share two important emphases: (1) that the behavior of the individual reflects the influence of all the layers and (2) that the layers interact in their influence so that, e.g., communities may influence families but families may also influence communities [12].

Habitually there has been a tendency to think of social determinants of health acting through different levels in a cascade, the distal impinging on intermediate factors and finally on individuals through proximal factors. But as Krieger (2008) has argued, it is important to understand that interventions at nonadjacent levels may have direct impacts. A new national law restricting or granting rights or cutting or attributing welfare taken at the macro-governmental level may have immediate implications for individuals subject to it. Furthermore different factors may operate at different levels simultaneously in consort. This is especially evident in the case of the accumulation of disadvantages within vulnerable or marginal groups and individuals. The same factors may differ in their impact at different moments in the life course, and unexpected effects may emerge. Such impacts on health and well-being do not occur in a vacuum but are mediated through the wielding of political and economic power. Discussing Pierre Bourdieu's rich but complex sociology, Ghassan Hage speaks of an "political economy of being" [13]. We may consider that different groups and individuals through social, economic, and cultural capital may have the possibility to deploy their social being to a lesser or greater extent. The real meaning of accessibility for disabled people lies here. When services and resources in the community are less easily accessible, it will be difficult for disabled people and indeed other marginal groups to fully deploy their social being, that is, to be able to exert choices which they have reason to value. Such capabilities [14] are dependent on political and economic power which both enables and obstructs choices of groups and individuals.

Relationships Among Influences: The Example of Genetic Expression and the Environment

Gene-environment interactions illustrate well how interactions among levels of ecological models are fundamental to health and well-being. Many think of genes as causes that obviate other influences on behavior. Old controversies as to whether one or another disease, e.g., schizophrenia, is *either* genetic *or* learned presumed that the one trumps the other. The reality is that genetic, other biological, behavioral, and environmental variables interact in complex ways to lead to behaviors and health states [15].

The importance of environment to whether or not a gene will have any effect is illustrated in the work of Michael Meaney and his colleagues with rat pups and their dams. It turns out that the frequency with which rat dams lick their pups and other maternal behaviors influence expression of genes related to stress response in adults. "Epimutations" (specific changes in methylation of cytosines on genes) mediate the relationship between rearing and adult stress response [16]. A large number of studies of Meaney and his colleagues and other groups show that this epigenetic structuring of gene expression is the result of a series of intracellular processes that can be set in motion by external contextual influences such as maternal nurturance [17]. The expression of a cell's genes is thereby dependent on the environment within the cell, an interdependence between gene and the intracellular environment that sets a model for gene X environment interactions at the levels of whole animals and populations.

The role of central nervous system serotonin in cardiovascular disease illustrates well the complexities surrounding gene X environment interaction. As contributed to and summarized by Williams and his colleagues [18–20], there is considerable evidence that long and short alleles of the serotonin transporter gene promoter polymorphism appear to affect CNS serotonin activity in ways that impact CVD risk. But this is not a simple relationship in which, for example, one or the other allele lowers serotonin and raises CVD risk. Among rhesus monkeys reared by their parents, for example, there is no difference between those with long and short alleles in CNS serotonin levels. However, among those reared among peers, the short allele is associated with reduced CNS serotonin and greater risk [21].

Socioeconomic and social factors surely may influence the pathways from the serotonin transporter gene to CVD risk. For example, overstressed parents or neighborhood crime may be analogous in humans to the levels of a rat dam's nurturance or to the peer vs parental rearing that moderates gene expression in monkeys. There are also several broad contextual factors that influence the pathway from genotype to CVD risk. The prevalence of the long allele genotypes varies by country of origin, from less than 30% in China and Japan to over 70% among populations originating in Africa [22].

But what is most interesting and most illustrative of the complexities of gene X environment interaction are perplexing inconsistencies regarding the serotonin transporter gene. It turns out that the same genotype can have both advantageous and disadvantageous effects. In some studies, the long alleles are the "bad actors" [18, 23]; those with one or two long alleles have significantly greater blood pressure responses to stress and greater CVD risk. However, in a longitudinal study of depression among young adults, the number of *short* alleles (either one or two) was related to greater likelihoods of depression and suicidality [24].

If we think of genes as conferring a simple advantage or vulnerability to some disease or condition, it is confusing that a particular genotype is associated with benefit in some studies and vulnerability in others. Williams and his colleagues have suggested another way of framing these influences, as conferring a greater or lesser *sensitivity* to environmental influences [25]. Thus, in a study of depression among young adults, those with two short alleles of the serotonin transporter gene reported greater depression than those with other genotypes *if* they had been exposed to early adversity in childhood or recent negative life events. Among those exposed to positive early environment or recent events, on the other hand, those with two short alleles reported least depression [26]. It seems that the two short alleles confer not advantage or disadvantage, per se, but greater responsiveness to the environment, for good or ill.

Others have noted a similar pattern of greater sensitivity to environment. In one study, observers' measures of poor home and neighborhood quality during adolescence predicted lower self-esteem in young adulthood among those with short alleles. In contrast, there were no effects of home and neighborhood quality among those with two long alleles [27]. In a study of those exposed to a series of hurricanes in Florida in 2004, county-level indices of joblessness and crime moderated the effects of the transporter gene in a remarkable interaction. In counties with high crime/high unemployment, the short allele was associated with higher levels of post-traumatic stress disorder, but in counties with low crime/low unemployment, the short allele was associated with lower risk of post-traumatic stress [28]. Putting these findings together, it seems that short alleles confer greater sensitivity to environmental influences, either positive or negative. That is, sensitivity to environment may be, itself, influenced by genetic variation. Thus, genotype is far from destiny, independent of context. Rather, sensitivity to context is itself embedded in some genotypes – no doubt further influenced by other contexts in the external, phenotypic, and intracellular environments.

What Meaney and Williams and their colleagues point out at the level of the cell is parallel to what others have called "reciprocal determinism" [29] in the relationships between human behavior and its environmental surround. Just as the cell phenotype acts as an environment that influences the expression of the cell's genetic material and the further emergence of the cell's phenotype, so our environment governs our actions which, in turn, influence the environment that will govern our next actions. Continuing up the ladder of complexity, one can see the same kind of reciprocity in the influence of:

- The group on the individual and the individual on the group
- The organization on the division and the division on the organization
- Policies on organizations and organizations on policies

This pattern of reciprocal influence of surround on agent and of agent on surround appears an important dynamic across living systems. It poses an important counterpoint to more primitive models such as those which get lost in debate over whether genes *or* environment is important, models that seek a single cause and in which a single thing can be only a cause or an effect but not both.

The Illusion of the Fundamental It is worth noting that we can see either party to such a reciprocal relationship as fundamental. We might say the work unit is the fundamental determinant of employee performance as moderated by the organization, or we might say that organization is the funda-

mental determinant, as moderated by the work unit. Both may be equally true. Both illustrate the illusion of "fundamental" amidst the reality of multiple, multi-level, interacting determinants. Diabetes provides a classic example. Pima Indians in the United States show "the highest prevalence of type 2 diabetes mellitus … of any population in the world" [30]. Yet, Pimas living in Mexico have relatively low levels of diabetes. Ample evidence links genetics to diabetes *within* the Pima population [30]. Thus, the relationships among genes, environment, and diabetes among the Pimas can be stated in either of two ways:

- Genetic factors associated with membership in the Pima population have a strong influence on prevalence of diabetes among a population exposed to the obesigenic environment of US diet and food distribution.
- The obesigenic environment of the United States has a strong influence on prevalence of diabetes among a population genetically predisposed to high rates of diabetes.

Genetics as Model for Analyzing Social and Ecological Influences

In genomics, causal relationships are inferred through cluster analysis and related statistical techniques that compare differences in probabilities of hundreds or even thousands [31] of genes among those with varied phenotypes. As an example, Fig. 4.1 shows gene arrays characterizing women with poor or good "signatures" for likelihood of subsequent metastases following incident breast cancer [32]. In such analyses, no one gene is the cause or indicator of the phenotype. Instead, the relationship between phenotype and all the genetic markers in the analysis is probabilistic, not all or none.

This approach to characterizing genetic influences is descriptive but persuasive as to the likely causal relationship between profiles and outcomes. To what extent does it provide a model for making judgments about causal influences in a multilevel approach to complex behavior, such as might be arrayed by genetic, personal, social, organizational, and geographic influences?

From the perspective of the individual, we can envision complex webs of influence including genetic and other individual characteristics as well as, outside the individual, the ecologic layering of family, neighborhood, community, worksite, government, and policy, all arrayed in a spatial analysis. These multilevel complexes could be examined as they explain, for example, likelihood of smoking and its relationship with rates of cardiovascular disease and cancer or BMI and its relationship with diabetes, obesity, and other related diseases.

Ecological Analysis and Diabetes

Consider adults with diabetes. Even if they spend 6 hours a year in a professional's office – certainly more than average – that still leaves over 8760 hours a year they are "on your own." The ecological perspective provided a basis for program planning of the Diabetes Initiative of The Robert Wood Johnson Foundation that demonstrated successful implementation of diabetes self-management programs in "real world," ethnically and economically diverse primary care, and community settings around the United States [33, 34]. To guide program development across 14 different project sites, an ecological perspective was used to identify the resources and supports for self-management that people with diabetes need to manage their disease in their daily lives.

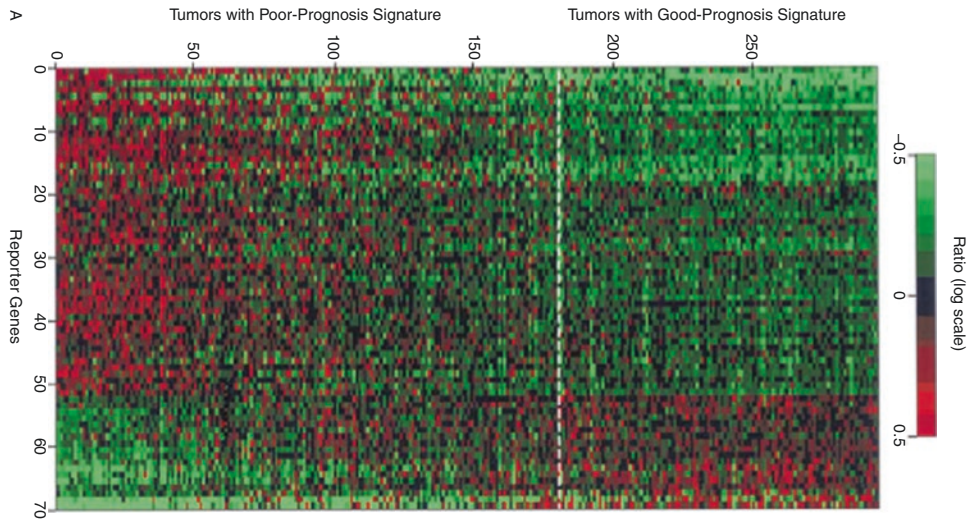

Fig. 4.1 Gene arrays among women with poor or good prognosis signatures for subsequent metastasis following incident breast cancer (from van de Vijver et al. [32])

These include (i) continuity of quality clinical care; (ii) individualized assessment; (iii) collaborative goal-setting; (iv) opportunities to learn skills both specific to diabetes (e.g., measuring blood sugar) and for addressing challenges, including negative emotions, that may interfere with management; (v) ongoing follow-up and support; and (vi) community resources such as for regular physical activity and healthy diet [33–35]. The last two, ongoing follow-up and support and community resources, especially illustrate the contributions of an ecological perspective to diabetes management.

Sustaining Health Behaviors: Follow-Up and Support

Sustaining diabetes self-management is of key importance. We all have great respect for intervention studies that include follow-up of 1, 2, or 3 years. Consider now that the average individual with type 2 diabetes will live 20, 30, or 40+ years with the disease. How do we make the extension from studying maintenance of change over a year or two to developing systematic ways of supporting individuals needing to maintain changes for decades?

Major guidelines [36] of the American Diabetes Association, the American Association of Diabetes Educators, and the American Dietetic Association distinguish between diabetes self-management education, the results of which often deteriorate by 6-month follow-up, and diabetes self-management support to "assist the individual … to implement and sustain the ongoing behaviors needed to manage their illness." This reflects reviews in diabetes self-management that showed that length of time over which intervention is maintained is the best predictor of changes in blood sugar control [37].

The importance of sustained contact is not limited to diabetes. It was recognized in early meta-analytic reviews of research on smoking, for example. In their 1988 review, Kottke and colleagues noted that "Success was … the product of personalized smoking cessation advice and assistance, repeated in different forms by several sources over the longest feasible period" [38]. More recent reviews have continued to document the importance of duration of interventions in smoking cessation [39]. In research on weight loss and weight management as well, duration of interventions emerges as a key predictor of success [40–42].

The *Diabetes Initiative* of the Robert Wood Johnson Foundation came to recognize that the most important characteristic of type 2 diabetes and self-management of it is that it is "for the rest of your life." [43] It sounds simple, but it is striking how this consideration reframes thinking about self-management programs. As an example consider the goals in working with a 45-year-old adult whose diabetes is in poor control. Is the goal getting that control improved in the next 3 months? Or is the goal establishing an approach to living with diabetes that will help the individual attain the best possible control over the next three or four decades? Does the choice of goal have implications for the approach to helping the individual? Clearly, the life-span is an important context of behavioral medicine and one we are just beginning to grasp [44].

In 1968, early leaders in the field of behavior modification, Donald Baer, Montrose Wolf, and Todd Risley, noted that maintenance of behavior changes needed to be arranged or planned, as they put it, to be "programmed rather than wished for or lamented" [45]. An April 2018 search of PubMed for papers with "diabetes" (or "diabetic") and self-management in their titles or abstracts yielded 4287 responses. A subsequent search with these terms and cognates of "sustain" or "maintenance" yielded only 504, 8.51%[3]. A parallel search just of "self-management" yielded 14,506, while that with "self-management" as well as cognates of "sustain" or "maintenance" yielded 1730, again 8.38%. Clearly our research has focused on and indeed made progress in developing approaches to initiating change in health behaviors. A major challenge now entails sustaining them.

From the perspective of "programming" maintenance of behavior, contexts take a central role. Behavior will be sustained to the extent that daily lives of individuals provide opportunities for the behavior, facilitate it, and reinforce it. It is the contexts of neighborhoods, workplaces, communities, families, and friends that must sustain the healthy behaviors that prevent or manage disease and enrich lives.

The content of follow-up may include continued assistance in refining problem-solving plans and skills, encouragement in the face of challenges, and assistance in responding to new problems that may emerge, assistance that may entail linking patients back to primary care providers or other parts of the disease management team. The Diabetes Initiative grantees identified a number of strategies for providing follow-up and support [43], including nurse follow-up by telephone [46–51] as well as through community health workers, lay health workers, *promotoras*, or health coaches [52–55].

The structure of clinical care may also contribute to ongoing support through group medical visits [56, 57]. In these, all patients in a particular category (e.g., those with diabetes, cancer survivors, or, perhaps, those with any of several chronic diseases) are scheduled for a group visit in a 2- or 3-hour block of time. Physicians and other staff carry out individual medical visits within this group visit that also includes educational and supportive discussions or other activities.

[3]Search syntax: ((diabetes [tiab] OR diabetic [tiab]) AND self-management [tiab]) AND (sustain* [tiab] OR maintain* [tiab] OR maintenance [tiab]). Date of search: 26 April, 2018

In spite of the importance of sustaining key behaviors, *ongoing* follow-up and support for *good self-management* are not recognized as an important service. For example, Medicare and, in most states, Medicaid provide 10 hours of DSME but only with physician certification and only for 1 year after diagnosis [58]. After that year, services are limited to 2 hours of DSME unless further worsening triggers eligibility for another 10 hours of DSME. Additionally, education by a dietitian, "medical nutrition therapy," is also covered but also only with a physician's order. In a variety of programs, health "coaches" are often made available for those whose HbA1c measures exceed some criterion (e.g., 8%) but not to help those who are below that criterion to maintain their good management. Our systems of providing healthcare are still slow to recognize what Baer, Wolf, and Risley noted in 1968, which maintenance of changes in behavior "… needs to be programmed rather than wished for or lamented" [45].

Community Resource Access to Healthy Food

An early study examined the distribution of supermarkets and fast-food restaurants in St. Louis in the United States [59]. Supermarkets were audited and sorted into tertiles according to their offering fresh fruits and vegetables and lean, low-fat, and fat-free meat, poultry and dairy products. Of 21 supermarkets in census tracts with greater than 75% African American population, none were in the highest tertile. In contrast, 17 of 30 (57%) of census tracts with less than 10% population below the poverty level and more than 75% white population were in the top tertile.

Do neighborhood resources make a difference? Obesity rates vary between neighborhoods within cities such as New York. A range of factors would seem to be involved including the presence of supermarkets and food stores and the area income [60]. Earlier research examined the relationships among obesity and supermarkets and convenience stores in neighborhoods [61]. After adjusting for gender, race, age, income, education, and physical activity, it turns out the presence of supermarkets in a census tract is associated with a lower prevalence of obesity (prevalence ratio = 0.83 relative to census tracts with no supermarkets), while the prevalence of convenience stores was associated with a higher prevalence of obesity (prevalence ratio = 1.16 relative to neighborhoods with no convenience stores). Those in census tracts with only convenience stores were 1.45 times as likely to be obese as those in tracts with only supermarkets.

This is an area in which the view of self-management as the individual's own responsibility can be especially damaging. The benefits of teaching about physical activity and healthy diet are compromised if people live in neighborhoods in which it is dangerous to walk alone, in which food sellers offer little healthy food, and with little public transportation to access better resources. Studies indicate that such deprivation of community resources is more common in low-income and minority neighborhoods [59].

The Ecology of Professionals

A critical feature of application of the ecological model is to recognize that it applies as much to providers as to recipients of care. For example, the network analyses of influences of social networks and ties on obesity [62], cigarette smoking [63], depression [64], and other features of health and quality of life have been extended to physicians' prescription of medications [65]. This leads to recognition of the importance of systems that facilitate good clinical care and professional services, not just the training and commitment of individual providers.

Wagner's Chronic Care Model articulates the organizational and system features that support integration of Resources and Supports for Self- Management with key components of clinical care [66]. One health system instituted a comprehensive approach to improving a range of diabetes care services, including handouts and manuals, outpatient programs, web-based programs, telephone/nurse case management, financial incentives for physicians' meeting testing guidelines, and patient incentives for annual eye exams. These were followed by improvements in a variety of outcomes [67]. But the emphasis on such integration of comprehensive clinical and self-management services is not widely shared in healthcare. Audits of health plans utilized by major companies [68] show little support for such elements of care, and 60% to 70% of patients with diabetes report not having received self-management interventions [69].

Another ecological approach to systems of care is the Patient- Centered Medical Home (PCMH). A recent review of evaluated demonstration projects showed encouraging evidence for the benefits of PCMH in diabetes care [70]. At the organizational level, the PCMH includes resources such as electronic medical records, evidence-based algorithms and care plans, and ties to referral sources and other community-based resources for patients. In many presentations of the Patient- Centered Medical Home, the interdisciplinary, collaborative team – i.e., the social or organizational level of the ecological model – is emphasized as its central characteristics.

A Social Strategy: Peer Support

The chapter now turns to three areas of application corresponding to three key levels of the ecological model, the social, community, and policy levels. At the social level, peer

support programs – as known by varied terms, e.g., "community health workers," "*promotores de salud*," "lay health advisors," and "health coaches" – are widespread and supported by a diverse literature [71–77]. There are many ways in which peer supporters can encourage health. Among these are helping individuals sustain important health behaviors.

Peer support may be an especially promising approach to providing ongoing support for disease management and sustained changes in health behaviors, such as in smoking cessation and weight management. To begin, peers have time, a critical ingredient in all of healthcare [78]. Whether volunteer or paid staff, nonprofessionals trained to assist and encourage ongoing efforts at disease management and prevention can be readily available to those they help and spend time with them to get to know them and their circumstances, thus increasing the credibility of their assistance. Additionally, peers gain the advantage of being "like me." Research shows that individuals rely on experts to understand what is important and set priorities but to peers and "peer coping models" [79] to gain confidence that they, themselves, can implement a plan of action. Adding to their credibility, peer supporters have the advantage oftentimes of having the health problem with which they are assisting. Also, they often come from similar neighborhoods and so share the perspectives and experience of those they are seeking to help.

Extending the advantages of time and similarity, peer supporters can work with individuals on the details of implementing important health behaviors. For example, it is one thing to set as an objective physical activity for 150 minutes a week. It is another thing to work out exactly what activity, how often, and where and to organize how that activity will fit in with other responsibilities and daily routines. In a report of qualitative analyses aptly titled "*Teaching How, Not What*," [55] a participant noted that her peer supporter "taught me a lot about how to control my diabetes, how to eat healthy, and how to do my exercise."

A 2014 review in the *Annual Review of Public Health* [80] identified contributions of community health workers to basic health needs (e.g., reducing childhood undernutrition), to primary care and health promotion, and to disease management. Another review [81] included peer support interventions from around the world that addressed a wide variety of prevention and health objectives entailing sustained behavior change (in contrast to relatively isolated acts such as cancer screening). It identified papers from the United States (34 papers); Canada (7); Bangladesh, England, Pakistan, and Scotland (4 each); and Australia, Brazil, Denmark, Ireland, Mozambique, New Zealand, South Africa, and Uganda (1 each). The health issues papers addressed included pre- and postnatal care (17 papers), cardiovascular disease (10), diabetes (9), asthma (6), HIV (6), mental health (8), cancer (4), substance use (3), and chronic fatigue syndrome and chronic obstructive pulmonary disease (1 each). Across all 65 papers, 54 (83%) reported significant between-group or pre-post changes showing benefits of peer support. Among the 48 papers reporting RCTs, 39 (81%) reported significant between-group or pre-post changes. The review also included summary of 19 reviews of peer support interventions. Across these 19 reviews, a median of 64.5% of papers reviewed reported significant effects of peer support.

Nineteen papers reviewed provided pre- and post-intervention measures of hemoglobin A1c (HbA1c) as a measure of glucose control [82–95]. Using the individual publication as the unit of analysis, the average HbA1c declined by 0.76 points (e.g., from 8.76% to 8.00%; $p = 0.001$). In diabetes circles, a reduction of HbA1c by half a percentage point, e.g., from 8.5% to 8.0%, is generally considered clinically meaningful. The average reduction across these 19 studies of 0.76 points is thus very striking and adds considerably to the evidence for the benefits of peer support in diabetes management [81].

Peers for Progress (peersforporgress.org) is a program at the University of North Carolina, Chapel Hill (led by coauthor EF), that is dedicated to promoting peer support in health, healthcare, and prevention [96]. In addition to effectiveness, projects sponsored by Peers for Progress have shown real-world applicability. Among 14 funded in 9 countries – Argentina, Australia, Cameroon (2 projects), China, England, South Africa, Thailand, Uganda, and the United States (5 projects) – all 14 were able to be implemented, often in under-resourced settings and/or with disadvantaged populations. Based on data provided in progress reports, average baseline HbA1c in these 14 was 8.71%; clearly the projects were not "cherry picking." Across peer support interventions, projects retained 81.9% of their participants, again quite impressive especially considering the underserved settings and disadvantaged populations of many of the projects. The average decline in HbA1c was 1.18 points, well above the 0.5 point reduction generally considered clinically meaningful. Other indicators of benefits included reduced hospitalizations. Two years after the end of funding from Peers for Progress, group programs in Uganda and South Africa had continued and reported *increased* participation and attendance. Similarly, a private, not-for-profit healthcare company adopted the program as routine care for diabetes in all of its clinical sites [97].

Strategic Advantages of Peer Support

Peer support is especially beneficial for PWD with high needs and those that are hardly reached by conventional healthcare services. Two meta-analyses have shown an association between higher baseline HbA1c and larger effect size [98, 99]. Compared to usual care, peer support is an effective strategy for improving glycemic control for underserved, low-income, minority populations [100–102]. For example, a program for ethnic minority patients of safety-net clinics in

San Francisco reported significantly greater reductions in HbA1c with peer support in addition to usual care, compared to usual care alone [103]. These benefits of peer support were significantly greater for patients categorized as *low* on medication adherence and self-management at baseline [104]. Similarly, in support exchanged within dyads of US veterans with diabetes, improvements in blood glucose relative to controls were greatest among those with initially low levels of diabetes support or health literacy [87]. In an underserved Chicago population, a low-intensity, home-based community health worker intervention was more effective at decreasing HbA1c among participants that had lower levels of diabetes self-care at baseline [105]. These are important observations: intervention worked across all individuals but worked especially well relative to controls for individuals whose diabetes management was in most need of improvement (as suggested by various indicators). This pattern of peer support reaching and benefitting those whom we would expect are most difficult to reach and benefit was sustained in a systematic review of peer support programs across a variety of health conditions [106]. Therefore, peer support is a viable strategy to address one of the major challenges in population health management: benefitting high-need groups that experience disproportionate burdens and costs of care.

Peer support has also demonstrated strong potential to address diabetes and comorbidities [100, 107]. The co-occurrence of diabetes and depression is quite common; PWD are twice as likely to be depressed as those without diabetes, and symptoms of depression are present among almost one third of PWD [108]. Psychological problems, from heightened distress to serious psychopathology, compromise self-management behaviors and exacerbate disease. Among PWD, depression is associated with poor glycemic control and decreased adherence to medical treatments [107]. Peer support directly mitigates depressive symptoms by providing social and emotional support through regular, affirming contacts. Even if recipients of peer support do not change their behaviors, they still experience emotional benefits from having someone to talk to [109]. Additionally, peer support addresses diabetes and depression together by helping PWD overcome socioeconomic barriers and teaching common skills to cope with both conditions. Peer supporters can help identify safe places to exercise and ways of buying affordable food, as well as coach PWD to develop healthy coping skills when facing stressful situations and setbacks. For example, a CHW stress management intervention for US Latinos with type 2 diabetes found a dose-response relationship between attendance at stress management sessions and improvements in HbA1c and diabetes distress [110].

In some cases, psychological improvements have been observed as a by-product of peer support programs designed principally for diabetes. With support from *Peers for Progress*, the PEARL project in Hong Kong examined the impacts of peer support on diabetes-related distress [111]. The study found that peer support reduced distress and lowered hospitalization rates to normal among patients with high levels of depression, anxiety, and/or stress at baseline. In the control condition, these patients accounted for a disproportionate amount of hospital care. PEARL was designed to assist diabetes management, not to reduce emotional distress. Nevertheless, the peer support model was able to achieve substantial effects on distress and associated hospitalizations. Another example is the REACH program, a CHW diabetes lifestyle intervention for African Americans and Latinos with type 2 diabetes in Detroit [112]. Although the intervention was not intended to reduce symptoms of mental health problems, it was able to reduce diabetes-related distress by encouraging positive lifestyle changes and coping skills that could be applied to both diabetes and mental health.

A Community Strategy: Community Action

Recognition of the diverse types and levels of influence on behavior and health can leave one discouraged as to the possibility of changing such influences as the built environment, culture, or social networks. Surely interventions in such arenas are challenging. Nevertheless, promising approaches have been developed. Here, we focus on broad community campaigns to combat cardiovascular disease (CVD), smoking cessation, and diabetes prevention. These provide models for community approaches to diabetes management but ones that have been too little pursued.

North Karelia: CVD Risk Reduction in Finland

The North Karelia project [113] sets a strong example for incorporation of multiple channels and intervention approaches, from mass media to cooperation with agricultural, dairy, and food merchandising groups to improve the availability of healthy foods such as low-fat milk [113]. The program was developed through the Department of Epidemiology of the National Public Health Institute within the Finnish region of North Karelia with field offices at the level of county departments of health and local advisory boards. Community organization in North Karelia included collaboration with existing official agencies and voluntary health organizations so that "the new health service activities initiated by the Project became part of formal public health activities in the area." [113], p. 166. Mass media interventions interacted with local newspapers and community organizations and campaigns as well as including the production of health education materials. Training activities included doctors and nurses but also social workers, representatives of voluntary health organizations, and informal opinion leaders. Training was organized through county-level or other

local organizations. Training and development of treatment guidelines in the health system included reorganizing treatment for hypertension and care following myocardial infarction. Cooperation with other local organizations included not only the voluntary health agencies but also the critical food industry (e.g., including dairies and sausage factories) and grocery stores [113], pp. 166–167.

In comparison to other parts of Finland, the North Karelia campaign led to significant reductions in cardiovascular risk factors [114] and mortality [115] as well as reductions of cancer risk factors [116]. Two characteristics appear critical in the North Karelia community organization: (1) the variety of activities and channels included and (2) the attention in all areas to implementation through and in collaboration with local organizations.

Since the days of the North Karelia project, numerous population and community-based interventions on health promotion and diabetes prevention have been carried out around the world, and important learnings and recommendations for optimizing intervention and evaluation processes have been published [117].

A Danish research group (coauthor PB and colleagues) has developed a conceptual framework, the supersetting approach, to integrate the breadth of community resources, including citizens and professional stakeholders, for social action and health promotion. It involves the coordinated engagement of multiple stakeholders in multiple community settings to implement multiple actions at multiple levels [118]. The supersetting approach includes five principles:

1. *Context* to ensure that everyday life challenges of citizens and professionals are respected and considered in planning activities
2. *Participation* to ensure that people are motivated to take ownership of processes of developing and implementing interventions
3. *Action competence* to ensure that people acquire skills and competences to express and act on their visions and aspirations
4. *Integration* to ensure that activities are implemented across the boundaries of specific settings
5. *Knowledge* to ensure that scientific knowledge is used to inform action and produced from action.

Moreover, the supersetting approach includes three highly participatory, structured, and research-based phases of (1) describing the context, (2) developing and implementing the intervention, and (3) conducting the evaluation. These phases have been optimized methodologically through iterative processes of co-creation with citizens, social workers, health professionals, and researchers. Although generally acknowledged that complex interventions are difficult to evaluate [119], there is now sufficient evidence from meta-analyses of intervention studies on community engagement to conclude that they may positively impact on a range of health outcomes [120].

An important extension of community approaches is their integration with life course perspectives. Type 2 diabetes provides a case in point, as conventional approaches targeting high-risk adults will not efficiently ameliorate this growing disease burden. It is therefore essential robustly to identify determinants across the entire life course and, subsequently, appropriate interventions at every stage to reduce an individual's disease risk [121]. A life course approach has the potential to prevent noncommunicable diseases, from before conception through fetal life, infancy, childhood, adolescence, adulthood, and into older age. Epidemiological research in cardiovascular disease has shown health benefits resulting from the cumulative effects of health behavior over an individual's lifetime, not from a change in lifestyle [122]. On this basis it is important also to involve children and youth in decisions pertaining to the shaping of the social and built environments of their everyday lives. This was done within the framework of a large community-based intervention project in Denmark by addressing school children's perceptions and visions for a socially and physically improved school environment [123]. Guided by an everyday life perspective and applying participatory action research methods including social imagination and visual techniques, the study observed that children were very capable of articulating their thoughts, ideas, and visions for a better and healthier school environment. Identified challenges and solutions differed widely and represented a broad perspective of health including social, physical, environmental, and emotional aspects. The paper concluded that children can be visionary and creative stakeholders and important agents of change in community development efforts if methods to include them are interactive, participatory, and carefully adapted to the age of the target group.

Cigarette Smoking

Although apparently a simple behavior, cigarette smoking illustrates well the broad range of contexts emphasized in this chapter. As detailed in an integrative review in 2004 [1], influences on smoking range from the brain physiology of nicotine addiction to broad economic factors. At the individual level, addiction to nicotine and genetic factors contribute to long-term smoking [124, 125]. Psychological conditioning is also important. The average smoker of a pack a day for 20 years has inhaled over a million times, establishing diverse conditioned associations of smoking with work, relaxation, drinking coffee, and other routines and various moods like anxiety and depression [1].

Research from Scotland and France [126] shows that people at the lower end of the social gradient are more likely to smoke and smoke longer than those from higher

up on the social gradient. However it is not only social position that will determine whether one becomes a smoker and one's smoking habits. These will also depend on which neighborhood one lives in. It has been shown that the practice of smoking is favored by the proximity and density of points of sale for tobacco (Henriksen et al., 2008, McCarthy et al., 2009, Cantrell et al., 2015). These have often found to be concentrated in deprived areas. Van Lenthe and Mackenbach (2006) have also found that people from deprived communities are more likely to smoke but even more so if they live in stressful neighborhoods. Stressors included "physical quality (decay), required police attention, noise pollution from traffic, and population density in neighborhoods." Similarly, objective and perceived measure of neighborhood crime have also been correlated with smoking.

Smoking also illustrates well the reciprocal and complex relationships among influences. As lower socioeconomic status may incline people to smoking, better economic and social prospects and associated better health, increased life expectancy, and security that go with them provide incentives for quitting smoking or not taking it up in the first place [126].

Other determinants among the broad range of social and environmental influences on smoking include:

- Parents' and peers' smoking are major predictors of youth smoking [127].
- Marketing and advertising – cigarettes are one of the most heavily marketed consumer products in the United States: tobacco companies spent $12.49 billion in 2006, even with restrictions on electronic, print, and billboard ads (American Lung Association) [128]. Youth with greatest exposure to tobacco marketing are more likely to start smoking and to become frequent smokers [129].
- Influence on government regulations through contributions to candidate campaigns for office [130] and influence on media coverage of risks of smoking through advertising in major media [131], all driven by the profitability of cigarettes.

The many determinants of smoking across multiple levels of influence illustrate well the concept that influences at different ecological levels interact with each other. For example, the genetics of nicotine metabolism and the addictive nature of nicotine create strong markets for cigarettes. Profitability of selling cigarettes drives both (a) enormous advertising and marketing campaigns that promote the anxiety-reducing and mood-elevating benefits of nicotine as well as (b) political contributions to control restrictions on harmful tobacco products. The cycle continues as the success in addicting large numbers of smokers and keeping them addicted ensures the profitability of the cigarette business.

Comprehensive Intervention Programs to Reduce Tobacco Use Smoking rates among adults in the United States have declined from 42% in 1965 to 15.5% in 2016 [132]. This reduction in smoking rate has been achieved through the best example of a multi-level population-based health behavior interventions to date. Highlights at the several ecological levels include individualized smoking cessation programs, nicotine replacement therapy, and counseling by health professionals (intrapersonal level); workplace and community-based programs as well as programs tailored to reach different groups (social and cultural level); clean indoor air restrictions (physical environments), news coverage, government reports, and anti-smoking campaigns of various health agencies (population-level mass communication); and restricting access to cigarettes and raising taxes on their sale (policy level) [1]. Clearly, interactions among these levels are numerous. For example, clean indoor air policies have driven changes in the physical environment of smoking as well as workplace programs. As another example, creation of desire to quit through mass communication and social marketing has created markets for the development of improved individual cessation interventions.

There has been considerable development of organizational- and community-level interventions to promote nonsmoking. At the organizational level, reductions in smoking have been reported through programs restricting smoking at the workplace [133]. Community-based studies that emphasized community participation in program development have been successful in low-income city neighborhoods and at the county level [134, 135]. COMMIT was a large trial of community organization designed to improve access to numerous options for smoking cessation throughout the entire cities. It achieved appreciable impacts among light and moderate smokers but failed to show benefits among heavy smokers [136, 137]. Commentaries that accompanied publication of these results noted the importance of broad, public health approaches to reducing population prevalence of smoking [138] as well as ways in which intervention planning might have more broadly and effectively engaged communities, their organizations, and leaders [139].

Extending beyond the organization or community, comprehensive statewide programs have created substantial reductions in smoking. These programs embody broad campaigns of public education, including "counter-marketing" TV advertisements and billboards, increased taxes on cigarettes, support services for cessation, smoking prevention programs for youth, and multicultural approaches, all coordinated through community coalitions [140]. The scope of tobacco policy has expanded to include international initiatives such as the World Health Organization's Tobacco Free Initiative and Framework Convention on Tobacco Control (www.who.org).

Amidst the many contributors to reductions in population smoking, Livingood, Allegrante, and Green have also suggested that mass communication on the harms of cigarettes has had a role to play in this irrefutable normative "culture change of accommodation to intolerance of smoking" seen in the United States [141]. This is seen to operate through indirect effects through secondary transmission within groups of people rather than being attributed directly to the influence of mass campaigns. This reinforces the message from North Karelia that multi-level and diversity of interventions contribute to bringing about such a change in norms and indeed behavior change.

Finally, the broad ecological approach to smoking cessation is underscored by the recognition that no one type of smoking cessation intervention is reliably effective for 50% or more of those to whom it is delivered [1], and only a small proportion of smokers ever participated in a formal program. Tobacco use is a social and public health problem, not just an individual behavior. Smoking reductions *require* an ecological perspective; population-level changes reflect the aggregate of the many influences promoting nonsmoking, not a single "magic bullet."

Community Organization for Diabetes Prevention in India

The Kerala Diabetes Prevention Program (K-DPP) was a cluster RCT conducted in 60 polling areas (clusters) of Neyyattinkara sub-district in in Trivandrum district, Kerala state in India [142]. Polling areas are well-defined and identifiable locations demarcated with landmarks such as hills, roads, etc. Participants included those at risk according to age, family history, low level of physical activity, and waist circumference as included in the Indian Diabetes Risk Score. The intervention extended over a year and included group sessions held on weekends in community settings. After an introductory meeting, two half-day sessions led by local experts covered key information about prediabetes, diabetes, and ways to prevent it. Trained peer leaders were chosen in conjunction with group members. They then led meetings to discuss how to apply the information about diabetes prevention in their daily lives. These discussions were held twice in the first month and then monthly for the remainder of the 12-month intervention. Sessions lasted 60–90 minutes and included 10–23 participants with family members also encouraged to attend.

In addition to the structured sequence of educational and discussion sessions, participants were encouraged to participate in a variety of group activities to support healthy lifestyles and diabetes prevention. These included yoga and walking groups, kitchen gardens, etc. Additionally, the organization of the program at the local, community level of polling places facilitated casual contact of peer leaders with group members. Through these contacts, peer leaders provided encouragement of individuals' prevention plans, information about missed sessions, reinforcement of progress, and the opportunity to share and discuss other questions or concerns of participants.

At 24-month follow-up, incidence of diabetes was 17.1% among participants from control polling places who received an educational booklet and advice for lifestyle change and 14.9% in the intervention polling places (RR = 0.88, $p = 0.36$). The two groups differed significantly, however, in several important areas. Those from the intervention polling places achieved greater reductions on the Indian Diabetes Risk Score ($p = 0.022$). Most notably, among those with impaired glucose tolerance, the relative risk of diabetes in the program relative to control polling places was 0.66 ($p = 0.03$). It should be noted that incidence among those with impaired glucose tolerance was the primary outcome of the major efficacy studies of diabetes prevention in China [143], Finland [144], and the United States [145]. That is, the K-DPP, developed with substantial community input and implemented in rural polling places in a low-/middle-income country, replicated the results of major international efficacy trials, reduction of incidence of diabetes among those with impaired glucose tolerance.

A Policy Strategy: Health in All Policies

If you wish to markedly improve population health in an equitable way, it will be necessary to orient policy toward the non-health sector such as housing and to take into account the environment, and especially the built environment, in which people live, work, and play. Social, economic, and cultural conditions should be considered as a significant part of our environments. The bulk of evidence from social determinant research and informed practice suggests that in order to improve health and reduce health inequities, it is necessary to act on areas of life and activity lying beyond the health sector [146, 147].

The idea of Health in All Policies (HIAP) is not new. The first article of the Alma Ata declaration proclaims that "… the attainment of the highest possible level of health is a most important world-wide social goal whose realization requires the action of many other social and economic sectors in addition to the health sector." More recently, the Adelaide Statement [148] has argued strongly for Intersectoral Action for Health (IAH). This stressed how cross-sector collaboration and joined-up government were not only a key to better health and equity but may also be linked to sustainable development, citizen participation, and more efficient economies. The Adelaide Statement singled out the following non-health sector areas and issues: economy and employment, security and justice, education and early life, agriculture and food, infrastructure, planning and transport, environments and sus-

Table 4.1 Sectors in which actions can be taken to reduce key risk factors for NDCs

	Tobacco	Poor diet, nutrition	Physical inactivity	Alcohol	Unhealthy environment	Pathogens	Injuries and violence
Health	✓	✓	✓	✓		✓	
Education	✓	✓	✓	✓		✓	✓
Finance	✓	✓		✓	✓		
Urban planning			✓	✓	✓		✓
Agriculture	✓	✓			✓		
Industry	✓	✓		✓	✓		
Transport			✓		✓		✓

Adapted from Figure 6 in Meiro-Lorenzo et al. [149]

tainability, housing and community services, and land and culture. As can be easily appreciated, all these areas are related to social determinants of health and tackling inequities. The logical policy follow-up to such initiatives, "Health in All Policies," highlights the necessity for intersectoral initiatives including the health sector.

Table 4.1, adapted from a World Bank report [149], indicates how different sectors such as education, finance, urban planning, agriculture, industry and transport, and health itself may have a significant role to play in reducing risk factors for chronic and noncommunicable diseases.

Healthy Cities

Perhaps the best examples of health in all policies and a "beacon of hope" may be seen in the WHO Healthy Cities movement [150]. Its evolving agenda and philosophy initiated in 1986 incorporate health into urban policy and planning to create healthy sustainable and economically prosperous environments and just communities. The Working Cities movement is epitomized by the WHO European Healthy Cities Network involving some 100 flagship cities and 31 national networks across the WHO European region. [151] This comprises some 1500 cities (some 90 in France alone). Twenty networks have been accredited formally by the WHO. These represent 1137 local governments and a population of 156 million people Healthy Cities endeavor to foster health in all policies through highlighting the importance of improving leadership for health, participatory governance, intersectoral collaboration, and upstream action at the local level to improve population health and tackle health inequities [152]. Different cities and their municipal councils fix priorities and initiate projects in a wide range of environmental and health domains. In France these include projects on Radon and indoor air pollution, physical and sporting activities to tackle obesity, school transport schemes encouraging walking to school or environmentally friendly vehicles, healthy nutrition, and carrying out a Health Impact Assessment in order to inform decisions about such initiatives. Healthy Cities teaches us that such initiatives need long-term vision and planning. It may take 30 years to reverse the taken-for-granted dependency on cars. Planning may involve thinking, participation, and implementation of policy changes in successive phases to reach long-term goals [150, 153].

A study of the members of the French Healthy Cities Network investigated how health was taken into account by city authorities through different non-health sectors such as transport, green spaces, social action, youth, education, culture, sport, and housing. Although it was featured less strongly within some sectors, e.g., housing policy, health was featured prominently in connection with green space policy, urban design and transport, and active travel or mobility policy. There is now good evidence that such urban policies prevent disease and impairment, and, important for sustainability, save energy, money, and lives.

City of Well-being: A radical guide to planning [150] provides a wide range of evidence suggesting that "spatial arrangement of towns can influence active travel and recreational activity to a significant extent – and in certain situations it can influence diet" [150]. Walkable, safe environments, and in particular distance from stores and services are key factors in fostering walking and cycling. The fact that this varies substantially from country to country and city to city and neighborhood to neighborhood indicates that urban design taking into account spatial factors and distance can influence norms and reduce dependency on cars. Thus a joint Canadian and American study [154] cited by Heritage [152] suggests that people living in neighborhoods adapted to walking and in proximity to stores move four times more than those living in areas adapted to cars. However living in a walkable district or a car-friendly area may not always be a matter of individual choice.

Evidence cited from the United States, China, and India suggests that cycling rather than driving can reduce obesity, diabetes, and hypertension significantly [150]. It is estimated that increasing cycling in the Paris area to 4% of all travel will produce benefits in terms of mortality 20 times greater than the risks due to accidents or accidents caused by cyclists or the effects of air or noise pollution and stress [155].

The WHO recently championed a system for assessing the economic impact of changing urban mobility patterns. The Health Economic Assessment Tool (HEAT) which may

contribute to broader assessments of health impact allows municipalities to make estimates of the amount of money and lives saved that could be gained through switching from driving to cycling and walking. The value of a statistical life is fixed at 4 million Euros for France, but it is also possible to simply reflect on benefits in terms of number of lives saved [156]. As an example of such estimates, the French city of Nantes hopes that 12% of all journeys in 2030 will be by bike. If this is achieved, the HEAT calculation shows that 67 lives will be saved each year or 670 over 10 years. In monetary terms the estimate is made that 2,682,000,000 € will be saved over the next 10-year period if the 12% target is reached. Currently this stands at 4.5% in the Nantes metropolitan area. This in itself represents a saving of some 1,005,000,000 € and 260 lives over 10 years.

In addition to walking and cycling, urban planning may consider distances needed to walk to stores and services. Other effective policies include car sharing/pooling promoted through strategically placed carpooling parks, transport zoning with 20 km and 30 km zones coupled to the designation of cycle lanes, bike parks with credit card renting of both regular and electric bicycles (especially important in hilly cities), chaperoned walking of children to their local school by volunteer parents, signage indicating not distance but time necessary to walk from one point to another, and general interchangeability in public transport so that transfers from bike to rail to bus are cost-free. Coupled to encouraging active mobility, there are also parallel efforts made to render all public places and spaces accessible to physically disabled people using wheelchairs or parents pushing baby carriages, tactile paving guidelines and studs in foot pavement for blind people, traffic signals equipped to give oral cues, and even instructions to blind people guided by personal GPS controllers. If well-planned, cities will not just favor more walking but also chance encounters with people from the neighborhood thus fostering social support and community ties and impacting on mental health.

Behavior change is not just about education and providing information to individuals but is also about creating new physical, sociocultural, and attitudinal environments which favor healthy behaviors and habits. The Healthy Cities movement embodies this idea well and illustrates how a holistic view of health and health promotion such as in the following statement of the International Union of Health Promotion and Education's may reap great benefits if applied with intelligence:

> Health is a basic human need. It is fundamental to the successful functioning of individuals and of societies…./… The main determinants of health are people's cultural, social, economic and environmental living conditions, and the social and personal behaviours that are strongly influenced by those conditions. [157]

As much as research may guide and show the value of HiAP and related approaches, evaluation such as through Health Impact Assessment can never be a substitute for political decisions. It will never replace the necessity for politicians to take difficult decisions and have the vision and political will necessary to tackle sources of disease in our environment to develop opportunities for health and well-being especially where these would seem to run counter to short-term institutional prerogatives or market opportunities [158]. Barton and his co-workers have put forward a Settlement Health Map [150, 159] to explain and analyze the interplay of different factors impacting on health and well-being in the built environment. As Barton suggests this offers a useful tool for generating discussion and debate, thus situating different stakeholders' responsibility within the urban environment, and for shaping intersectoral and multi-stakeholder involvement in creating healthier conditions for urban living [150]. Health Impact Assessment and other evaluation approaches may provide data for consideration in such processes, but they cannot replace them.

Globalization

Globalization and the trends associated with it provide an important context for HiAP. Globalization typically describes changes in production and its organization associated with neoliberalism, the free circulation of information, capital, and goods and the primacy of financial markets over other aspects of the economy [160]. However as Scholte argues [161], it should not be conflated with liberalization as such since other economic policy agendas could be pursued which would highlight positive benefits of globalization and supra-territorial relations. These are according to Scholte "social connections that substantially transcend territorial geography": [161] a new way of configuring and handling social space. In recent years, such supraterritoriality is epitomized by the Internet and by the fact that local events may become instantly global and have global consequences. This may be seen in communication campaigns such as the response to terrorism "Je suis Charlie" or the current "Me Too" campaign in denouncing sexual violence toward women. Trans-world travel and migration and how business, financial operations, and markets are organized globally working as a network also highlight that we are living in a supraterritorial world. Territorial space can also be bridged, for example, in telemedicine or online trans-world training such as MOOCs.

Arguably, globalization is not new. There has always been movement of goods and labor, but distances are being shrunk, and travelling times across the world have grown progressively shorter. Current global connections are characterized by transplanetary flows with simultaneity and instantaneity. The premier property of successful modern commerce is its capacity to create universally transferable objects which circulate through frontiers and borders with utmost ease. This

aligns well with a neoliberal agenda which espouses the free movement of information, goods, and financial capital, together with the nonintervention of states in the economy, private and business affairs. This agenda after some resistance from non-aligned developing countries has been taken up by an overwhelming majority of countries in both the developed and developing worlds who now organize or have to organize their economies in conformity with such neoliberal principles [160]. It is associated with changes in management, work organization, and practices. It has led to the delocalization of industry, reduced wages, and wage costs for multinational companies within a globalized economy.

Geertz [162] has noted that, along with globalization, people living in different communities are also subject to an opposing movement emphasizing the uniqueness of nations, and nationalistic ideologies, and regions, local products, customs, and beliefs perhaps as a bulwark against threats to local identities. Thus people from different countries may not only find similar globalized goods, modes, and beliefs in their countries but also be united by a sense that they must respect their local traditions and ways of doing things. Again people may strive to be as connected to the contemporary as much as possible while at the same time falling back on and upholding tradition. Recent political changes may confirm this dialectic and the current move toward political isolationism and a backlash against free trade and political cooperation, e.g., Brexit in the United Kingdom or the recent emphasis in the United States on "America First." Such apparently contradictory movements (which may be harnessed politically) uphold the idea, nevertheless, that ultimately we live in both globalized and localized worlds.

Locality and local cultures should not be opposed to globality and universalism, since both are intermeshed and interact with each other to produce new forms of social organization, space, and sociocultural being. Thus it is more fruitful in line with the overall socio-ecological model of this chapter to avoid dichotomies and to conceptualize social space as not being made up of discrete entities but incorporating both the global and the local and similarly characterizing the people living in them as having plural identities influenced through both their global and local cultures. Furthermore it is also wise not to demonize globalization since it also allows the transfer of knowledge and experience quickly to enable and emancipate people.

We live in a global world on one planet, and ultimately we are all affected by planetary phenomenon such as global climatic change, migration, widening inequities, emergence of infectious disease, and noncommunicable disease epidemics. The latter, for instance, are associated with the spread of tobacco and obesity. These however are driven not by globalization as such, but rather by the neoliberal harnessing of this phenomenon for private profit.

Globalization and Health

Bearing such complexities in mind with respect to different contexts, globalization has been argued to produce both positive and negative impacts on health [163, 164]. In 2001 Feacham claimed that "Globalisation is good for your health, mostly." [165] Dollar maintained that "the higher growth that accompanies globalization in developing countries generally benefits poor people … globalization has indirect positive effects on nutrition, infant mortality and other health issues related to income" [163]. Among negative aspects cited were the spread of disease (AIDS) due to increased migration and travel as well as the impact of tobacco through free trade [163]. Huynen, Martens, and Hilderink [166] citing Fidler [167]suggest that the World Trade Organization has more influence on the governance of global health than the WHO and that it is unclear whether World Trade Organization agreements may protect health.

Globalization appears to have affected some countries, such as Asian countries, more positively than others (African, Latin American, and Eastern European countries). On one hand slow and uneven growth was associated with stagnation in health indicators, and on the other, economic crises in middle-income countries such as the former Soviet Union produced economic instability, sharp rises in unemployment, and dramatic effects on health and life expectancy. Additional negative claims have included that globalization has had deleterious impacts on health and health inequities, especially in poor developing countries and among poor households [168–170]. Of particular interest with respect to health and inequity is the observation that "high income inequity reduces the pace of growth and of poverty reduction." [164]

Income Distribution and Other Effects of Globalization

Recent work on austerity shows that recessions can impact on people's health negatively, as one would intuitively suspect, but also positively [171]. This may largely depend on whether support from social protection systems is maintained or cut. Ironically however recession in itself may have less effect than the austerity measures taken to combat it, measures that arguably are bad for health and kill massively [172].

"Population health tends to be better in societies where income is more equally distributed. Recent evidence suggests that many other social problems, including mental illness, violence, imprisonment, lack of trust, teenage births, obesity, drug abuse, and poor educational performance of schoolchildren, are also more common in more unequal societies." [173] The measure of inequity taken is how much richer the top 20 percent than the bottom 20 percent are in each country. Significantly in richer countries what counts is not absolute wealth but whether the wealth is distributed more or less equally. As Wilkinson has stressed [173], it

makes little difference how a degree of equality is achieved. Countries such as Sweden and Japan are vastly different in many respects and have different social protection and fiscal systems, but their relatively low degree of income inequity correlates well with health and may be contrasted with the situation in less equal societies. The situation with respect to inequity and health and other social indicators seen between countries is also mirrored among states in the United States. States with the highest degree of inequity also have high levels of poor social outcomes including health.

Of particular importance is the labor market. Bambra [174] reminds us that "work (paid wage labor) and worklessness (lack of paid work) are not the discreet activities of individuals, but are essential parts of the way in which the totality of society is politically, socially and economically organized." Being in work is an important condition for health, having an income and for social inclusion, but can also lead to bad health through the impact of an adverse physical or indeed psychosocial working environment. These risks follow a social gradient, lower-paid workers being more vulnerable to workplace hazards and accidents as well as having less control over their work and related stress in the workplace.

Supranational Policy

One example of the influence of European policy on national policy is the regulatory context on urban planning and environmental health of the European Union (EU). The Green Paper and the Leipzig Charter put forward an integrated sustainable urban development to overcome demographic, social, and environmental problems in European cities. Two EU Directives have been implemented to address the issues related to ambient air quality (2008/50/EC) and environmental noise (2002/49/EC). The Parma Declaration (5th Ministerial Conference on Environment and Health in 2010) [175] described the way forward in the work of environment and health in Europe. It set out concrete targets to tackle key urban environmental risk factors, paying special attention to children's health, inequities, and emerging environmental health challenges.

The influence of supranational policy agendas sets the scene for national legislation and implementation and can have both positive and negative effects on health. This can easily be seen in another important non-health field within Europe, namely, agriculture and food policy. The Common Agricultural Policy provides a strict regulatory framework and subsidies for farmers in Europe. This has important impacts on land use, the form of agriculture practiced, its impact on employment and the environment, and the type and price of food available favoring either health or disease [176]. Thus on one hand, subsidizing beef and dairy production favors high saturated fat intake, and on the other hand, the lack of support for fruit and vegetables favors comparatively high prices and lower consumption, all with obvious implications for health. Consequently recommendations have been made for public health policy and agricultural policy goals to be aligned to favor higher and more equitable consumption of fruit and vegetables and less sugar, dairy produce, and meat [176, 177].

Interactions Among Determinants and Sectors

A central point of most writing in these areas is that different environmental or contextual determinants often interact in their influences on health. Good examples include the relationships between air pollution and poverty. Irrespective of the levels of exposure, there is a correlation between being poor and the resultant harmful effects of pollution. This would seem to be related to the second mechanism of differential susceptibility. Through having been exposed to repeated insults of their environment during certain periods of their life (windows of exposure) [178], poorer populations have developed a greater susceptibility to resultant health effects. As Deguen and Zmirou conclude, in the case of ambient air quality, long-term multipolar urban planning and diversity-sensitive housing policy may be the best way to tackle environmental and social inequities and to mitigate differential health impacts [179].

Examples: Housing and Urban Life

To further the discussion of HIAP, we will now take a more detailed look at two of the most important non-health sector areas: housing and urban planning and development and how these impact on people's lives.

National and local government policy with respect to issues such as mortgages, local housing taxes (rates), and rent fixing will largely determine whether the supply of social housing is high or low. As this is written, the US federal government is considering raising rentals on low-income housing. Access to social housing (housing owned and rented out by local authorities to people with low incomes or specific needs) will for the most part be determined by residence in the community and recognized need such as being a lone woman with children. In France, a country with a tradition of strong social policies, it is estimated that more than 500,000 people do not have a home. Among those, 133,000 are actually homeless, others are living on sofas of friends, hostels, squats, etc. [180] If the number of people living in very "difficult housing" (chronic overpopulation, dangerous buildings, lack of basic amenities) is added, the number rises to 3.6 million, more than 5% of the French population. Another 5 million people are considered to have a very fragile housing

situation (lack of house maintenance, large unpaid rents, etc.), and nearly 3.5 million face fuel poverty [180].

Even if appropriate and affordable housing has been heralded as a fundamental human right, it remains one which is far from being upheld in many developing and developed countries alike. The WHO "Closing the gap in a generation" report warns that "One of the biggest challenges facing cities is access to adequate shelter for all. … This crisis (of housing) will worsen social inequities in general, and in health in particular." [181] The US Surgeon General's 2009 Call to Action asserted that "To improve the nation's overall health, we must improve the health of the nation's homes and ensure that safe, healthy, affordable, accessible and environmentally friendly homes are available to everyone." [182]

Closely related to housing, indoor air pollution can be caused by both chemical and biological sources. Interventions directed to these can be effective, however. Lead hazard control in the United States has shown to be a very effective intervention, decreasing dust lead levels by 78% over a 3-year period (Sandel et al., 2010). In France, exposure to radon is the second leading cause of lung cancer after tobacco causing up to 2900 deaths per year [183]. Radon mitigation is effective in reducing individuals' risk of lung cancer and is cost-effective compared to other healthcare and environmental interventions [184].

Examples: Urban Environmental Impacts, Planning, and Development

More than half of the human population worldwide now lives in towns and cities. This is likely to increase to 60% by the year 2030. In Europe and the United States, 75% and 80% of people, respectively, live in urban areas [185, 186]. In the developing world, this is likely to lead to megacities in Asia and other large cities in Africa and 2 billion people living in slum conditions worldwide. Thus it is important to draw lessons from the Healthy Cities movement to prepare for an increasingly urban world [187].

From a physical perspective, the urban environment has also assumed considerable importance due to its high population density, the size of buildings, and the existence of a considerable technical infrastructure coupled to diverse industries having high potential for different kinds of environmental pollution impacting on human health. These may aggregate or intensify the chemical and biological hazards associated with housing described above. Additionally, the health impact of noise is strongly related to the proximity of the population concerned and the source of noise emission. Thus an increase of 10 dB of sound intensity corresponds to an increase in prescribed sleeping pills and cardiovascular disease medications [188].

The Chicago, 1996, and French, 2003, heatwaves illustrate how the urban environment may also exacerbate risks to health. Built-up environments lacking trees, hedges, bushes, and other plants tend to conserve heat (or cold). The impact of such events on mortality and morbidity is exacerbated, vulnerable isolated members of the population being trapped in veritable islands of heat within the urban environment [189].

The design of the neighborhood and the provision of urban green spaces have an impact on health risks, influencing aesthetic perceptions and physical constraints and determining the degree of social mixing. Poorly maintained and deteriorated urban environments lacking of green areas are associated with lower levels of physical activity and increased rates of overweight, partly explained through people's perception as a reaction to the aesthetic impression, which also affects mental health and social isolation. The presence of accessible municipal services, public gathering places, and green areas can counteract some of these effects. In addition, environments mimicking natural conditions (green corridors, parks, etc.) help by reducing ambient air pollution, cooling urban areas, and providing a barrier against noise and may even have an influence on preventing the development of some forms of cancer [190].

Capabilities go beyond achieving a set goal to encompass the idea that what matters is possessing the freedom to envisage and choose from a range of possibilities in relation to the projects and life plans that people have reason to value. Neighborhoods structure the health practices that people engage in, notably through the unequal distribution of resources. The idea of resources may be widened to include not just physical resources but also intangible resources which may be seen as relational processes. Neighborhoods are not just passive geographical spaces, but living dialectics of structure and agency in which people adapt to constraints and embrace freedoms in different domains over time, places where individuals and communities engage in practices producing health on a daily basis [191].

Given that low-income populations are disproportionately found in environments with worse urban features (less green spaces, poor urban design, etc.), many different approaches have been developed in the last decades to address health inequities by changing the neighborhood characteristics of low-income people. One approach to changing neighborhood characteristics is to move people from high- to low-poverty neighborhoods. Moving neighborhood can improve mental health, reduce obesity, and impact positively on some wider determinants of health [192]. Several studies have examined the effects of giving people housing vouchers to change home and neighborhood. "Moving to Opportunity" permitted families to move from public housing in high-poverty neighborhoods to private housing in lower-poverty or nonpoor New York neighborhoods. Moving out of the

public housing/high-poverty neighborhoods was associated with lower distress among parents and lower anxious/depressive and dependency problems among their sons [193]. Similarly a randomized environmental experimental intervention carried out in Chicago [194] has shown that obesity and diabetes risk may be reduced by moving to different neighborhoods. Three groups were constituted. One group was offered housing vouchers provided they changed address and moved to another neighborhood. Another group was offered the equivalent sum but was given no instructions or advice on moving, and a third, control group, was offered neither advice nor money. Over a 7-year period, there was no significant difference between the latter two groups, but the objectively measured risks of developing obesity and diabetes were reduced in the group who moved home. Positive effects were seen 10 to 15 years later in prevalence of obesity and diabetes [194].

Evaluation of the effects of moving inhabitants out of unhealthy neighborhoods shows benefits that might be achieved but not a feasible approach for general application. Urban regeneration programs, aiming at the whole neighborhood level, are argued to be more cost-effective than the movement of individuals to better areas, including because they benefit the community as a whole [195]. Yet the evidence supporting this idea is still weak. A systematic review in the United Kingdom [192] found small positive impacts on socioeconomic determinants of health but potential negative impacts as well. Mixed tenure has also been promoted in many European countries as a means to tackle social exclusion and create sustainable communities. However the evidence is inconclusive on whether it actually promotes social cohesion and residential sustainability or improves people's perceptions of the neighborhood. Nor has it been found to provide better job opportunities or changes in income mix [195].

Other interventions that have the potential to improve health and health inequities include the demolition of distressed housing and relocation of residents; universal design standards to favor the elderly and people with disabilities; crime prevention through environmental design; smart growth and connectivity designs; zoning (regulating how land or a site may be or not used for certain purposes, e.g., prohibiting alcohol outlets near schools); and interventions concerning green space around housing [196].

Urban environments are already home to two-thirds of people with diabetes. This makes cities the front line in the fight against type 2 diabetes. In 2014, three global partners, Steno Diabetes Center Copenhagen, University College London, and Novo Nordisk, launched the Cities Changing Diabetes (CCD) program to accelerate the global fight against urban diabetes. Today, the program has established partnerships with key stakeholders in ten cities around the world to address the social factors and cultural determinants that increase type 2 diabetes vulnerability among those cities residents [197]. The CCD partners have modelled what it will take to hold the rise of diabetes prevalence at 10.0% globally. A 25% reduction in obesity from 2017 levels is required by 2045. This is the long-term global target for CCD.

Neighborhood Design and Social Isolation

A rapidly emerging area of research that epitomizes the ecological perspective is that regarding the impact of our physical and built environment on our social relationships and behavior. As background, there is ample evidence about the association among mortality, health, and social isolation.

A meta-analysis of 148 studies involving 300.000 persons documented that individuals with strong social relationships had a 50% increased likelihood of survival over an average study period of 7.5 years compared to individuals with weak social relationships [198]. Moroever, associations between social isolation and type 2 diabetes have been documented in several studies [199, 200].

Research suggests that architectural design impacts social isolation and integration. Among older adults in Chicago, Illinois, in the United States, social isolation was more common in dilapidated, run-down areas [201]. In addition, elderly people who lived in high-rise public housing buildings were less likely to venture into neighborhoods than those who lived in low-rise public housing buildings (after controlling for other environmental aspects and personal characteristics) [201].

The influence of neighborhood design on perceived social isolation can also be understood on a population-level basis. Wu and Chan conducted a cross-sectional study among approximately 4500 Singaporeans over the age of 60 to determine how public housing influenced older urban residents' social interactions [202]. In Singapore, almost 90% of residents reside in Housing Development Board (HDB) public housing, which function as a neighborhood block in which residents are able to access social support services for the elderly and children and public spaces such as playgrounds, markets, and cafes [202]. The remaining 10% with higher household incomes reside in private housing. In their study, Wu and Chan found that the strongest predictors for decreasing the likelihood of isolation were residence in the HDB public housing and daily social participation in HDB neighborhood events. Accordingly, they hypothesized that the HDB built environment functioned as a community and encouraged social care, social support, and social interaction among residents. In contrast, those who resided in private condominiums or gated communities were at greater risk of social isolation because of less frequent social interaction and proximity to others [202].

As the built environment may discourage social interaction, several features have also been linked to increased social interaction. In particular, indoor and outdoor common spaces have been shown to support social ties among older individuals [203]. By offering opportunities for informal face-to-face contact, common spaces allow individuals to foster and maintain casual social relationships that have been found associated with health, including among older adults [204]. In a study of older individuals aged 60–90 in Chicago Public Housing buildings [203], those who lived in the closest proximity to trees and vegetation experienced higher levels of social support and integration than those with little nearby vegetation. Moreover, in a study of 273 Hispanic elders living in East Little Havana in Miami, Florida [205], researchers found that architectural features such as porches and stoops encouraged greater person-to-person contact and were positively associated with perceived social support and negatively associated with psychological distress. On the other hand, architectural features, such as windows, allowed for broader observation of the surrounding area but removed individuals from close person-to-person contact and resulted in lower levels of perceived social support. This suggests that common spaces that actually allow individuals to engage with others are more beneficial in increasing support than those that simply increase observation of surroundings [205].

In addition to common spaces and architectural design, social interaction may also be influenced by perceived accessibility of resources. Richard and colleagues [206] conducted a study to assess neighborhood correlates of social participation among older adults living in an urban environment in Montreal, Quebec. They found that a significant predictor for social participation was perceived accessibility to key resources, in that greater access to key resources within a 5-minute walk was associated with increased social participation. This has been confirmed by several other studies, which have found that higher levels of participation occur in places where people hold a positive image of their environment [201, 207]. For instance, Bowling and Stafford [207] conducted a cross-sectional study of perceptions of neighborhood infrastructure and social engagement among older adults. They found that perceptions of poor local facilities in the area, particularly poor facilities for people aged 65 an older, were associated with greater likelihood of low social activities. This suggests that the accessibility of social resources, services, and facilities is an important determinant of social participation and interaction. This emerging field of evidence thus points to an association between the built environment and social support, whereby neighborhood design, architectural features, and perceived accessibility of resources influence individuals' levels of social support and participation. However, research is still needed to document how these components can be manipulated in existing settings to reduce social isolation.

HiAP and Community Organization

It has been argued that HiAP approaches are distinguishable from other intersectoral initiatives to advance health equity in two important ways [208]. First, because they emphasize health in all *policies*, HiAP approaches are coordinated primarily by formal structures and mechanisms of governments that are responsible for policies. Second, initiatives adopted under HiAP approaches are explicitly linked to structural or long-term governmental policies or agendas, rather than focusing on specific problems. While recognizing the importance of applying the HiAP approach at governmental level, it has also been argued that intersectoral collaboration and action should also be nurtured at more local levels. The Sundsvall Statement on Supportive Environments for Health that emerged from the 3rd International Conference on Health Promotion in Sundsvall, Sweden, in 1991 thus recommended the building of alliances and strengthening cooperation between health and environment campaigns and strategies to advance supportive environments at the community level [209]. Health in All *local* Policies is thus a meaningful concept in the context of local community development when referring to the polices and strategies of all stakeholder organizations involved in decision-making and agenda setting and not just local government institutions [210]. The meta-message of this chapter clearly applies here. Because of the multiple layers and sectors of multiple determinants of health behaviors and health, the broadest possible range and diversity of sectors and influences should be brought into campaigns to address important health problems and challenges. We should reject analyses or rhetorics that incline to privileging one or another approach.

A Key Change in Perspective

Increasing emphasis on non-health policy flies in the face of representations of health that are taken for granted in the general population. Health is often reduced to healthcare, and this is how governments and citizens traditionally represent health, dividing up the world into health and non-health. Similarly, health is often viewed as determined by individual characteristics – e.g., "good genes" – and individual choices. This may lead to viewing the individual as responsible for her/his own health [211]. In contrast, the ecological perspective casts such views as imposing an unreasonable attribution of responsibility to the individual – a sort of victim blaming – by ignoring the diversity of forces that shape each individual's behavior. Some may see such "robbing" the individual of responsibility as a reduction of individual and human dignity. This concern about dignity may represent a Western view that individual dig-

nity and recognition of external influence are somehow opposed. In other cultures, influence of the surround is assumed and not seen as detracting from the dignity of the individual [212].

A 2015 French study [213] suggests that local stakeholders involved in a community project may perceive health more broadly than might have been anticipated. They were described as seeing health "as a global resource for life, determined by a large number of factors (behaviors, social life, work conditions, education, transportation, etc.) and for which every local actor has a responsibility." Similarly, the success of a Healthy Cities initiative in Portland in the US state of Oregon shows that such policies can be acceptable and effective outside Europe's strong tradition of social and health protection.

The example of Penwerris, in Falmouth, Cornwall in the United Kingdom provides a model for changing perspectives and achieving intersectoral collaboration at the community level. In 1995, this socially deprived area had the highest number of poor households, the highest proportion of children in households with no wage earners, and the second highest number of lone parents. More than 50% of homes lacked central heating and the illness rate was 18% "above the national average" [214]. Community health nurses, known as "health visitors," pinpointed 20 residents who they felt could work constructively on the estate's problems with the authorities. Five agreed to participate. The health visitors went on to initiate intersectoral action inviting the representatives of health, social services, education, local government, and the police to a series of meetings. Most importantly, in parallel with an injection of funds following a successful application for an energy improvement grant for the area, a shift in power was granted by the authorities to allow the community partnership to fix priorities and take decisions about their own community and lives. Problems were discussed and "discovered" between the actors, and different solutions are being explored. This was not based on classical needs analysis carried out from above but emerged and relied on local knowledge, ideas, and initiative. Regeneration was not planned from outside but emerged from within [214].

Five years on, the situation had undergone a spectacular radical transformation. Improvements of a whole series of community indicators had occurred including a 50% drop in crimes, a 42% fall in child protection registrations, and a drop of 70% in postnatal depression. Furthermore there were no unwanted teenage pregnancies, educational achievement had hugely improved, and the unemployment rate had fallen by 71% in both men and women [214]. Interviews and two focus groups to understand the process of change suggested that, in line with complexity theory, the downward spiral of social deprivation and urban decline was reversed through acting at a critical point, developing trust and self-confidence, favoring self-organization within the community, and leading to a reconfiguring of social relationships among residents, different statutory agencies, and new actors. This success has led to similar initiatives with other deprived communities based on similar principles of trust and self-organization being set up in other urban areas in the United Kingdoms [215].

Implicit in the emphases on ecological determinants and, especially, Health in All Policies is a focus on general health and well-being, not one or a particular disease. As agricultural policy, for example, will affect diet and all the diseases that nutrition influences, the breadth of impacts on health will be necessary to justify proposals to alter policies not directly related to health. Surely a proposal for major changes in national agricultural policy to benefit a small number of people with a specific disease would have much less likelihood of adoption than one that may be justified as benefitting all children and adults in a society. So too and consistent with considering the many determinants of health, it is important also to consider health beyond the prevention of disease and incorporate salutogenesis and resources for health and well-being favoring a sense of coherence and quality of life [216–218]. Again, the broader focus makes excellent conceptual and policy sense and also recruits additional reasons in support of policy proposals that may emerge from it.

Extension to Diabetes

We have presented a range of ways non-health sector factors and policies may impact on human health. We have also sketched a number of different policies that may reduce or mitigate deleterious health impacts. We have also stressed that health should be seen positively and that physical and sociocultural environment have the potential to promote and improve health. Increasingly non-health policy is taking up the gauntlet and addressing a number of these issues at the macro and micro level. At the macro level, this has been tackled notably through adapting recommendations from Health in All Policies within national and supranational government policy agendas. At the micro or local level, numerous initiatives tackle proximal lifestyle issues. At the local level, the practice of carrying out systematic health impact assessments on new infrastructure development projects has become increasingly frequent. Also at the community and city level, collaborative community organization such as in the supersetting approach has been shown effective.

As a way of summarizing the many topics the chapter has addressed, Table 4.2 sets out advantages or contributions each of the approaches can make toward diabetes prevention and management.

Table 4.2 Examples of application to diabetes prevention and management of multilevel, multi-sectoral interventions

Peer support	A major approach to dissemination of the Diabetes Prevention Program in the United States is group-based, implemented by trained nonprofessionals [221] Substantial evidence for benefits of group, individual, and dyad-based peer support in diabetes management [81]
Community organization	Kerala Diabetes Prevention Program [142] in rural communities in India utilized community engagement in program development and implementation and replicated results of major diabetes prevention programs [143–145] while reducing CVD risk
Health in All Policies	Urban, agricultural, housing, economic, transportation, and business policies of local, regional, national, and international governments all influence activity levels, diet, stress and emotional well-being, as well as access to care and adherence to preventive and treatment regimens for diabetes and other chronic diseases
Multi-sector, multilevel engagement	The global prevalence and burdens of diabetes in terms of health impacts, complications, quality of life, and costs of care of the disease and its many complications all justify engagement of all sectors of society and government in prevention and improving its treatment

Concluding Thoughts

In contrast to old oppositions of nature versus nurture, genetics versus environment, or biology versus psychology, twenty-first century science is clear that causes of health, illness, and well-being are complex, multidimensional, and interactive. Those with serious diseases need good medical care, but it is also clear that economics, policies, environments, organizational and social factors, personality, and a host of other contextual features play major roles in the etiology of health problems, their prevention, and their management. Moreover, despite frequent pessimism as to population trends in health, a broad range of community, health education, and health promotion approaches addressing community, policy, economic, social, and personal factors can be successful in reducing populations' health problems, such as with cigarette smoking in the United States [1, 138] or cardiovascular disease in Finland [113–115].

At least since Villermé's writings of the nineteenth century, e.g. [219], we have known that the places we live in are not equal as regards health, well-being, and indeed death. Here we have emphasized social, community, and non-health policy over clinical care. In line with Health in All Policies, it will become more and more necessary for government, policymakers, and indeed stakeholders to accept that all these segments have important parts to play in making the world a healthier and safer place. Such a realization however is also linked to our values and views on the sources of inequity and health. It is clear that inequity is a major source of poor health and disease. It is also abundantly clear from the evidence we have at our disposal that the social, community, and non-health sectors could have a substantial role in righting such inequities. In the field of environmental health, a sea change has occurred through the recognition that we all live in the same world with finite resources, and this has opened the way for greater sustainable development and more friendly environmental policy. We believe it will be necessary for a comparable change of representations to occur accepting that the health and welfare of individuals are deeply tied to the circumstances and environments in which they work, live, and play.

The time has perhaps come when it will become habitual to think of people being embedded in sociocultural and economic contexts with habitual practices rather than as decontextualized individuals within statistical populations with free choice of behaviors and free choice of dwelling and neighborhood [220]. Once this way of thinking has become normative, then the determining role of the social, community, and non-health sectors and the necessity for different sectors and the health sector itself to work together will be very apparent. Furthermore the idea that insalubrious, rundown, unhealthy, unsafe, non-accessible, or segregated environments are acceptable will become unthinkable, a thing from the past.

Multiple-Choice Questions

1. Reduction in income, education, and socioeconomic status is associated with:
   (a) Improved health and decreases in mortality and morbidity
   (b) No changes in health, mortality, and morbidity
   (c) Better health and increases in mortality and morbidity
   (d) Worse health and increases in mortality and morbidity
   (e) Worse health and decreases in mortality and morbidity
2. Social determinants of health:
   (a) Are irrelevant in the development of health risks
   (b) Play key roles in the development of health risks
   (c) Can be corrected with the use of new medications
   (d) Are important, but only secondary to genetic traits
   (e) Are irrelevant in the paths of infectious disease transmission
3. Epimutations refer to:
   (a) The relationship between rearing and the adult stress response
   (b) Abnormalities resulting from environmental factors
   (c) Acute changes in DNA methylation

(d) Prenatal disorders of genetic development
(e) Major causes of stillbirth

4. Socioeconomic and social factors:
   (a) Are irrelevant to CVD risk
   (b) Probably are related to CVD risk, but it has not been documented
   (c) Influence the pathways from the serotonin transporter gene to CVD risk
   (d) Are the leading contributors of CVD risk
   (e) Are not influential for health status at all
5. Resources and supports for self-management that people with diabetes need to manage their disease in daily life include all of the following except:
   (a) Continuity of quality clinical care
   (b) Individualized assessment
   (c) Collaborative goal-setting
   (d) Community resources
   (e) Access to the latest, most-expensive medications
6. Sustaining diabetes self-management:
   (a) Is secondary to the level of professional expertise of health providers
   (b) Is a component of key importance in the ecological approach
   (c) Is not important because intervention studies include follow-up of 1–3 years
   (d) Is based on a 1-week admission to a specialized diabetes center
   (e) Has negative consequences in physician-patient relationship
7. Diabetes self-management support:
   (a) Is exactly the same as self-management education
   (b) Is exclusively provided by specialists in the medical office
   (c) Is provided by other patients with expertise
   (d) Is the ability to assist the individual to implement and sustain ongoing behaviors needed to manage their illness
   (e) Is unnecessary in diabetes management
8. The best predictor of changes in blood glucose control:
   (a) Medical expertise
   (b) Number and cost of medications
   (c) Absolute compliance with doctor's orders
   (d) Length of time over which interventions are maintained by patients
   (e) Self-monitoring of blood glucose
9. The most important characteristic of type 2 diabetes and self-management:
   (a) It is "for the rest of your life."
   (b) It is impossible to achieve.
   (c) It has to comply with protocols of randomized controlled trials.
   (d) It is feasible for all patients.
   (e) It is totally dependent on new technologies.
10. Patients rely on peers:
    (a) To understand the pathophysiology of diabetes
    (b) To learn how to best comply with doctor's orders
    (c) To gain confidence to implement a plan of action
    (d) To understand what is important and set priorities
    (e) To endure the increasing burden of suffering

Correct Answers

1. (d) Worse health and increases in mortality and morbidity
2. (b) Play key roles in the development of health risks
3. (a) The relationship between rearing and the adult stress response
4. (c) Influence the pathways from the serotonin transporter gene to CVD risk
5. (e) Access to the latest, most-expensive medications
6. (b) Is a component of key importance in the ecological approach
7. (d) Is the ability to assist the individual to implement and sustain ongoing behaviors needed to manage their illness
8. (d) Length of time over which interventions are maintained by patients
9. (a) It is "for the rest of your life."
10. (d) To understand what is important and set priorities

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