

Understanding the Upstream Social Determinants of Health

Nazleen Bharmal, Kathryn Pitkin Derose, Melissa Felician, and Margaret M. Weden

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Abstract

The term **social determinants of health** (SDOH) is often used to refer to any nonmedical factors influencing health, including health-related knowledge, attitudes, beliefs, or behaviors (e.g., smoking); however, SDOH also include “upstream” factors, such as social disadvantage, risk exposure, and social inequities that play a fundamental causal role in poor health outcomes—and thus represent important opportunities for improving health and reducing health disparities. This paper describes and categorizes three types of approaches used to examine upstream SDOH. **Social disadvantage approaches** focus on the link between health and neighborhood conditions, working conditions, education, income and wealth, and race/ethnicity and racism; a potential causal link is the role of stress related to coping with these factors. **Life course approaches** focus on the link between health and critical or sensitive periods in exposure to risk (adverse childhood experiences, intergenerational transfer of advantage) as well as cumulative exposures; the potential causal link here may derive from the effect of social status on the regulation of genes controlling physiologic functions (e.g., immune functioning). **Health equity approaches** consider the link between health and social inequities stemming from socio-demographic factors, such as class, immigration status, gender, sexual orientation, and disability status; social capital can serve to moderate or mediate the effects of these factors. The paper identifies several challenges to understanding upstream SDOH, including the long and complex causal pathways linking these factors with health, multiple intervening factors, limited ability to study these factors using randomized experiments, single-disease-focused research funding, and limited understanding of community buffers that can mitigate the effects of SDOH.

Social determinants of health (SDOH) are the conditions under which people are born, grow, live, work, and age (Commission on Social Determinants of Health, 2008). The term is often used to refer broadly to any nonmedical factors influencing health, including health-related knowledge, attitudes, beliefs, or behaviors (e.g., smoking). SDOH have a direct impact on the health of individuals and populations; they also help structure lifestyle choices and behaviors, which interact to produce health or disease. At the same time, SDOH are shaped by public policy and thus, in theory, are modifiable.

As the field of SDOH grows, there is increasing emphasis on understanding and addressing the fundamental causes, or upstream factors, of poor health and inequities. *Upstream* SDOH refers to the macro factors that comprise social-structural influences on health and health systems, government policies, and the social, physical, economic and environmental factors that determine health. While upstream concepts may intuitively make sense, the causal pathways linking these determinants with health are typically long and complex, and often involve multiple intervening factors along the way (Link and Phelan, 1995). This complexity makes it a challenge to study, and, ultimately, to address, the fundamental upstream causes.

To better understand the upstream SDOH, we provide here a summary of the main categories or theoretical approaches for understanding SDOH. This document is not meant to be a comprehensive or exhaustive examination of every SDOH framework, but is intended to review some of the more well-known frameworks for addressing SDOH in research, policy, and practice. We emphasize approaches where there is strong evidence of a link between SDOH and health and promising leverage points for improving individual and population health (*socio-political interventions* to improve population-level health). We also provide examples at the end of this document of SDOH frameworks put forth by national and international health institutions.

Theoretical Approaches to SDOH

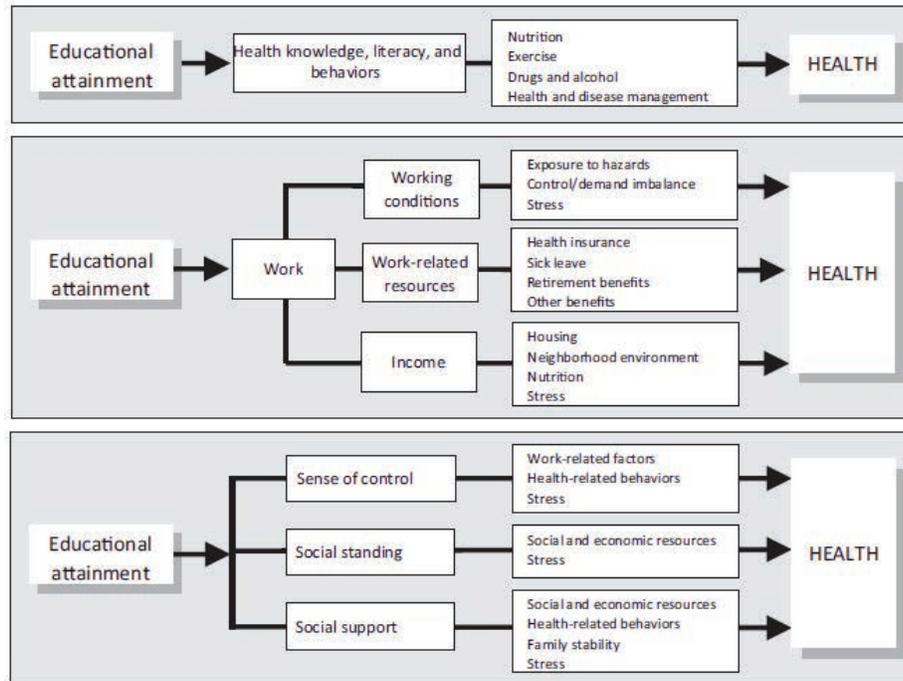
Social disadvantage approach and health

Substantial research has linked educational attainment, reading level, income (U.S.), and occupational grade (as used in Europe) with health outcomes throughout the life course. Greater social disadvantage is associated with poorer health, and there appears to be a “dose-response” relationship or stepwise/incremental gradient connecting social disadvantage to poorer health (Braveman and Gottlieb, 2014). Research is needed to clarify the underlying pathways, and health outcomes could reflect the direct health benefits of having more economic resources (e.g., healthier nutrition/food security, housing, neighborhood conditions), unmeasured socioeconomic factors, and/or associated psychological or behavioral factors (e.g., perceived control); however, reverse causation could be an alternative explanation. The theory of fundamental causes outlines why the association between socioeconomic status and health disparities has persisted over time, and postulates that those in low socioeconomic status communities lack resources to protect and/or improve health (Phelan et al., 2010). Specifically,

this theory suggests that living conditions and socioeconomic status influence multiple diseases through multiple risk factors and lack of access to resources to reduce risk, and that the effects are reproduced over time (Flaskerud and DeLilly, 2012, Phelan et al., 2010).

- *Neighborhood conditions:* Neighborhoods can influence health through physical characteristics (air and water quality, exposures, access to parks), the availability and quality of neighborhood services (transportation, schools, employment resources, housing), and social relationships within a geographic community (mutual trust among neighbors has been linked to lower homicide rates) (Williams and Collins, 2001, Braveman et al., 2011, Diez Roux and Mair, 2010).
- *Working conditions:* The physical aspects of work (occupational health and safety) can influence health by affecting an individual's risk of musculoskeletal injuries and disorders, sedentariness, and obesity and obesity-related chronic conditions (diabetes, heart disease). In addition, the physical conditions in which work is performed (ventilation, noise level) as well as the psychosocial aspects (high demand with low control, perceived imbalance of efforts and rewards) and social aspects (mutual support among coworkers) have all been associated with health. Employment-related earnings and work-related benefits (medical insurance, paid leave, schedule flexibility, workplace wellness programs, retirement benefits, child- and elder-care resources) shape the health-related decisions individuals make for themselves and their families (Egerter et al., 2008).
- *Education:* Educational attainment is linked with health in three interrelated ways. First, education has been linked to better health through individuals' increased health knowledge and healthy behaviors. The mechanism is likely explained in part by literacy (Berkman et al., 2011, DeWalt and Hink, 2009). Second, education shapes employment opportunities, which are major determinants of the economic resources that influence health. Third, education can influence health through social and psychological factors, with greater education linked to greater perceived personal control (which has been associated with better health and healthy behaviors), higher social standing, and increased social support. The role of educational quality and its supports – employment opportunities, prestige, social networks that come with a degree from an elite university – may also impact health (Figure 1).

Figure 1: Interrelated pathways linking education to health



Source: Braveman P, et al. 2011. *Annu Rev Public Health*. 32:381-98. Used with permission.

- Income and wealth:* Economic resources reflect income (monetary earnings during a specified time period) and wealth (accumulated material assets), but the latter is less frequently measured in health studies. Racial/ethnic differences in income markedly underestimate differences in wealth (Braveman et al., 2005). In addition, income loss due to poor health (reverse causation) does not fully account for the association between income/wealth and health (Muennig, 2008, Kawachi et al., 2010). Several researchers have observed health effects of income/wealth even after adjusting for relevant factors, but these associations may also reflect the effects of educational attainment and quality, childhood SES, neighborhood characteristics, working conditions, and subjective social status. Income inequality has often been linked with health, possibly through eroding social cohesion/solidarity (Wilkinson and Pickett, 2006), although a causal link has been debated (Kaufman and Cooper, 1999, Muntaner, 1999, Cooper and Kaufman, 1999).
- Race/ethnicity and racism:* Racism refers to discriminatory actions and attitudes, as well as the systemic constraints on individuals' opportunities and resources based on their race or ethnicity. Racial residential segregation is an example of institutional racism that produces and perpetuates social disadvantage in resource-challenged neighborhoods, low-quality and under-resourced schools, and inadequate and unsafe housing. Racism also directly impacts

health through stress (chronic stress via microaggressions¹) pathways (Szanton et al., 2012, Williams and Mohammed, 2009).

- *Potential Causal Link – Role of Stress*: The impact of social disadvantage on health is often the result of coping with the daily challenges of these interrelated factors and their impact on stress. Recent evidence implicates chronic stress in the causal pathways by linking multiple upstream social determinants with health through neuroendocrine, inflammatory, immune, and/or vascular mechanisms. The accumulated strain from stressful experiences may trigger the release of cortisol, cytokines, and other substances that can damage the immune defenses, vital organs, and physiologic systems, leading to more-rapid onset or progression of chronic illness (cardiovascular disease, accelerated aging) (Adler and Stewart, 2010). Allostatic load, i.e., the biological “wear-and-tear” resulting from chronic exposure to social and environmental stressors is a multicomponent construct of the physiologic regulatory system in the periphery/body and brain (McEwen, 2002).

Life course approach and health

A life course approach takes into account critical or sensitive periods in exposure to risk as well as dynamics related to cumulative exposure. Three models of life course are described (Berkman, 2009, Elder Jr et al., 2003). In the first model, there is a latency period in which **early childhood or even prenatal exposures shape subsequent outcomes** that may or may not be evident for years. In the second life course model, **exposures throughout life have a cumulative effect** (e.g., tobacco use). In the third model, often called social trajectory, **early exposures may create opportunities or barriers to critical exposures in later life**, which are themselves the critical exposures linked to disease outcomes (e.g., education impacts jobs and job-related exposures). Two areas of strong evidence for SDOH are (1) the impact of social (dis)advantage over the life course from early childhood experiences to adult health and (2) the health of future generations. Upstream social determinants influence health at each life stage (childhood health, adult health, family health and well-being), with accumulating social (dis)advantage and health (dis)advantage over time.

- *Adverse childhood experiences (ACE)*: A strong body of SDOH evidence considers the adverse health effects of early childhood experiences (associated with family social disadvantage), showing that early experiences affect children’s cognitive, behavioral, and physical development, which in turn, predict current and future health. Biologic changes due to adverse socioeconomic conditions in infancy and toddler years appear to become “embedded” in children’s bodies, determining their developmental capacity (Hertzman, 1999). Longitudinal studies (that follow individuals from early childhood into young adulthood) have linked childhood developmental outcomes with subsequent educational attainment (which is associated with adult health). However, pathways from ACE can be

¹ Microaggressions are brief and commonplace daily verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults toward people of color.

shaped by interventions. High-quality early childhood development interventions (e.g., First5LA initiatives, Head Start) ameliorate the effects of social disadvantage on children's development (Karoly et al., 2006).

- *The intergenerational transfer of advantage:* Two decades of literature examine how differences in social advantage influence health both over lifetimes and across generations (Braveman and Barclay, 2009, Braveman et al., 2011). Children of socially disadvantaged parents are less healthy and have more limited educational opportunities, both of which reduce their chances for good health and social advantage in adulthood. New research on gene-environment interactions suggests that the intergenerational transmission of social advantage and health may be partially explained by epigenetic changes in gene expression², which in turn are passed on to subsequent generations (Kuzawa and Sweet, 2009).
- *Potential Causal Link – Epigenetics:* Animal studies suggest that social status can affect the regulation of genes controlling physiologic functions (immune functioning). Educational attainment, occupational class, work schedules, perceived stress, and intimate partner violence have been linked with changes in telomere length. Telomeres are DNA-protein complexes capping the ends of chromosomes, protecting them against damage. Telomere shortening is considered a marker of cellular aging that is controlled by both genetic and epigenetic factors.

Health equity approach and health

Similar to race and racism, social inequities that stem from socio-demographic (and often less modifiable) factors - such as class, immigration status, gender, sexual orientation, and disability status - also impact health and health inequities. One example of how to conceptualize the effect of these less-modifiable factors on health comes from the Bay Area Regional Health Inequities Initiative framework, which was developed by local public health departments in San Francisco (see figure 6; better resolution <http://barhii.org/framework/>). In this framework, there is an emphasis on considering “health in all policies,” which is a collaborative approach to improving the health of all people by incorporating health considerations into decision-making across sectors and policy areas (Rudolph et al., 2013). Institutional policies and regulations from corporations and businesses, government agencies, schools, and non-profit organizations can exacerbate or improve social inequities through a population's living conditions (e.g., physical, social, economic/work, and service environments); institutional policies including tax policies, housing segregation, student quotas, zoning policies, education policies, immigration policies, and policies about marriage. One upstream approach to achieving health equity is to address institutions and their influence over living conditions.

² Epigenetics refers to the heritable changes in gene expression (turn on/turn off) that do not involve changes to the underlying DNA sequence, i.e., a change in phenotype without a change in genotype.

- *Potential Moderator/Mediator – Social Capital:* While definitions vary, social capital refers in general to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions. The concept of social capital can be deconstructed into bonding (relationships between family members or good friends, which involve social support and/or shared social identity), bridging (relationships between people who are more loosely connected and have a distinct social identity, such as members of a sports club), and linking components (relationships that are characterized by power differences, such as employer/employee), as well as structural (participation in group activities) and cognitive components (social cohesion, trust) (Uphoff et al., 2013). There is evidence that demonstrates the relationship between different measures of social capital and health, and some evidence that social capital mediates the relationship between income inequality and health (Kawachi et al., 1997). One review found that bonding and bridging social capital, such as social support, social cohesion in a neighborhood, close friends, and emotional support from family members, can buffer some of the negative effects of poverty on health, and might decrease the vulnerability of people with a lower position on the social ladder. However, certain types of social capital might benefit the health only of those who have sufficient economic capital to access sufficient social capital and it may harm the health of those who are excluded from participation in the relevant networks (e.g., poor mothers are less healthy in more-affluent areas compared to less-affluent areas) (Uphoff et al., 2013).

Governance and health

The World Health Organization Commission for Social Determinants of Health (WHO CSDH) brought together a global evidence base of what could be done to reduce health inequities, demonstrating that well-executed economic and social policy could improve health and health equity (Commission on Social Determinants of Health, 2008, Friel and Marmot, 2011). They found that marked health inequities exist between regions, between countries, and within countries, and that reducing these inequities requires attending to the unfair distribution of power, money and resources, and the conditions of everyday life. One review examined the role of governance mechanisms and health outcomes in low- and middle-income countries (Cicccone et al., 2014) and discovered that the association between governance mechanisms and health varied (direct, modified, moderating, and mixed). The quality of government (e.g., rule of law, government effectiveness, perceived level of corruption) was positively associated with healthy life expectancy, life expectancy at birth, and self-reported health status, and negatively associated with child and maternal mortality. Public spending on child mortality had a stronger effect in reducing child mortality in countries with lower levels of corruption and high institutional capacity. Higher levels of democracy reduced the impact of unfavorable economic and trade policies (detrimental effects associated with exports, multinational corporations, international lending institutions) on infant mortality. Four mechanisms by which governance might influence health in these countries are health system decentralization that enables responsiveness to local needs and values; health policymaking that aligns and empowers diverse stakeholders; enhanced community engagement; and strengthened social capital.

In general, the empirical literature linking governance to health is relatively sparse. Both nationally and abroad, policies that lead to improvements in social conditions—such as housing mobility policies, income supplements, early childhood academic achievement, and the Civil Rights Movement/Act—also affect health (Williams et al., 2008).

Challenges and priorities

There are several challenges to studying upstream SDOH:

- SDOH’s impacts on health often occur through complex relationships that play out over long periods of time and involve multiple intermediate outcomes that are subject to “effect modification” by characteristics of people and settings along the causal chain. For example, neighborhood socioeconomic disadvantage and higher concentration of convenience stores have been linked to tobacco use (Chuang et al., 2005) and lower availability of fresh produce, which—combined with concentrated fast-food outlets and few recreational opportunities—can lead to poorer nutrition and less physical activity (Cummins and Macintyre, 2006, Gordon-Larsen et al., 2006). However, the health consequences of the chronic diseases related to these conditions will not appear for decades, and longitudinal studies are expensive.
- The complex multifactorial causal pathways do not easily lend themselves to testing with randomized experiments, and we have limited ability to measure upstream determinants, given that current measures do not fully capture or tease out distinct effects of income, wealth, education, and occupation. With some notable exceptions [e.g., adverse childhood experiences in early life; moving to opportunity housing experiment (Robert J. Sampson, 2008); natural experimental conditions (Ludwig et al., 2011)], this challenge leads to a gap in knowledge about when, where, and how to intervene to address social factors to improve health and reduce health disparities.
- Research funding focused on single diseases (as opposed to focusing on causal/contributory factors with effects across multiple diseases) potentially puts SDOH research at a disadvantage.
- There needs to be a recognition of buffers and community assets that can mitigate the effect of unfavorable upstream SDOH, since not every individual or community exposed to adversity develops disease and poor health. This is particularly important when engaging in community-based participatory research and other stakeholder-engaged research initiatives and in examining the impact of resilience.

Despite these challenges, there are several priority areas for SDOH research (Braveman et al., 2011).

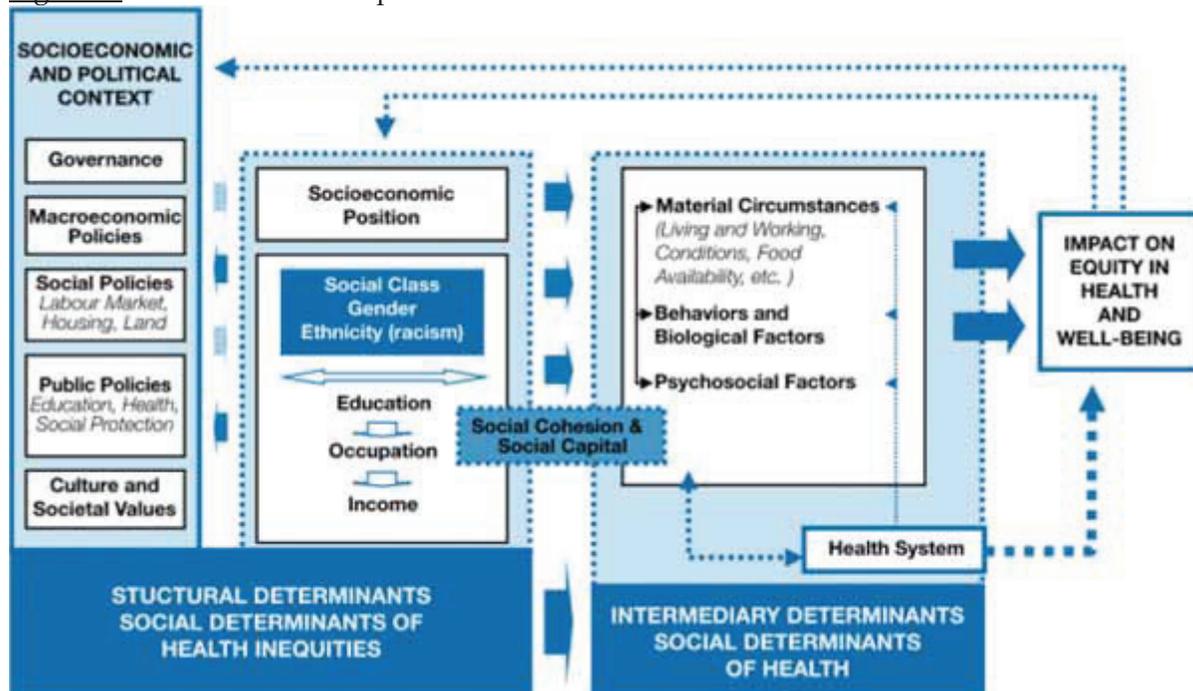
1. *Descriptive studies and monitoring* for changes over time in the distribution of key upstream social factors (income, wealth, education) across groups defined by race/ethnicity, geography, gender, and their association with health outcomes in specific populations and settings.
2. *Longitudinal research*, including studies to build public-use databases with comprehensive information on both social factors and health collected over multiple generations using a range of methodological techniques – multiple regression, instrumental variables, matched case-control designs, and propensity score matching – to reduce bias and confounding due to unmeasured variables.
3. *Link knowledge to elucidate pathways and assess interventions*, or build the knowledge base incrementally by linking a series of distinct studies that examine specific segments of the pathway connects A (upstream determinant) to Z (ultimate health outcome). Once the links in the causal chain are documented, a similar incremental approach could be applied to study the effectiveness of interventions, e.g., testing the effects of an upstream intervention on an intermediate outcome with established links to health.
4. *Test multidimensional interventions versus seeking a magic bullet*. Knowledge of pathways can point to promising or at least plausible approaches, but generally cannot indicate which actions will be effective and efficient under different conditions; that knowledge can come only from well-designed intervention research, including both randomized experiments (when possible and appropriate) and nonrandomized studies with rigorous attention to comparability and bias.
5. *Expand research funding beyond single disease and/or biomedical factors exclusively*. This would also include extending the timeframe to evaluate programs or policies.
6. *Develop political will to translate knowledge to action*. This includes developing a workforce to understand and address SDOH, as well as providing evidence to design social/health policies and evaluating social policies impact on health and health equity.

APPENDIX: INSTITUTIONAL FRAMEWORKS FOR UPSTREAM SDOH

In this appendix, we briefly describe and illustrate institutions and frameworks examining upstream SDOH.

World Health Organization – The WHO Commission for Social Determinants of Health (WHO CSDH) conceptual framework (Figure 2) is grounded in established theoretical traditions (material/structuralist theory, psycho-social model, social production of health model, eco-social theory) and assumes that health is a social phenomenon. The framework distinguishes “structural determinants” that include all social and political mechanisms (governance, macroeconomic policy, social policy, public policy, and social and cultural values) that generate, configure, and maintain socioeconomic position (social class, gender, or ethnicity) and “intermediary determinants” including not only working and living conditions, but also behavioral, psychosocial, and biological factors and the health care system per se. Interactions between structural and intermediary determinants then result in differentiations (inequities) in health and well-being. Evidence to support the case for addressing SDOH is divided into 5 action areas and 9 themes. The action areas are (i) adopt better governance for health and development; (ii) promote participation in policymaking and implementation; (iii) further reorient the health sector towards reducing health inequities; (iv) strengthen global governance and collaboration; and (v) monitor progress and increase accountability. The nine themes are employment conditions, social exclusion, public health conditions, women and gender equity, early childhood development, health systems, globalization, measurement and evidence, and urbanization. (Commission on Social Determinants of Health, 2008).

Figure 2: WHO CSDH conceptual framework



Source: (Solar and Irwin, 2010). *World Health Organization*. Used with permission.

Centers for Disease Control and Prevention - Healthy People 2020 provides a comprehensive set of 10-year national goals and objectives for improving the health of all Americans through more than 1,200 objectives that span 42 distinct health topics. Their SDOH approach uses a “place-based” organizing framework that reflects 5 key areas of SDOH (and their underlying factors; see Figure 3): economic stability (poverty, employment status, access to employment, housing stability); education (high school graduation rates, school policies that support health promotion, school environments that are safe and conducive to learning, enrollment in higher education); social and community context (family structure, social cohesion, perceptions of discrimination and equity, civic participation, incarceration/institutionalization); health and healthcare (access to health services, access to primary care, health technology); and neighborhood and built environment (quality of housing, crime and violence, environmental conditions, access to healthy foods).

Figure 3: SDOH area for Healthy People 2020 (Healthy People 2020, 2014)

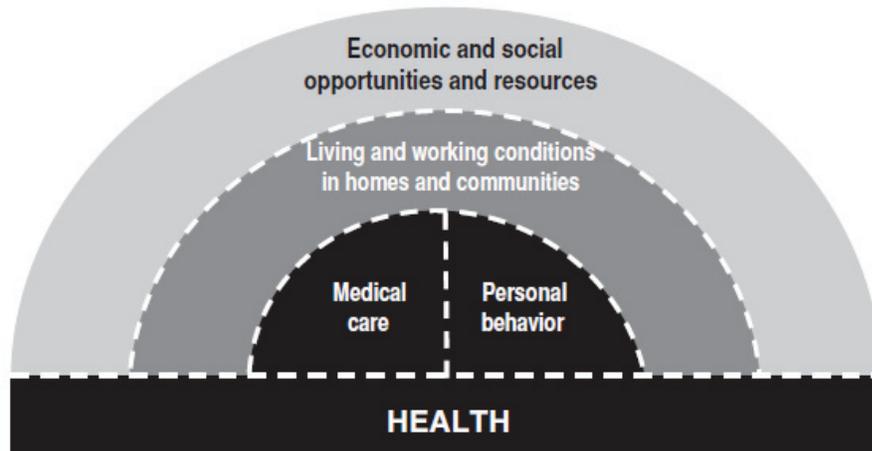


Source: Healthy People 2020. 2014. *U.S. Department of Health and Human Services*. Used with permission.

Robert Wood Johnson Foundation (RWJF) – The Commission to Build a Healthier America framework shows that health-related behaviors and receipt of recommended medical care (key downstream determinants of an individual’s health) do not occur in a vacuum, but are shaped by upstream determinants related to the living and working conditions that influence health directly (e.g., through toxic exposures or stressful experiences) and indirectly (e.g., by shaping health-related choices). Those conditions are shaped by the economic and social opportunities and resources of individuals and populations (Figure 4). The Commission, convened in 2008, identified 8 key social factors (early life experience, education, income, work, housing, community, race and ethnicity, and the economy), and issued 10 recommendations to improve the nation’s health that spanned the areas of nutrition, physical activity, tobacco, early

childhood, healthy places, and accountability (RWJF Commission to Build a Healthier America, 2009). In a recent re-convening, the Commission prioritized three goals: 1) invest in the foundations of lifelong physical and mental well-being in our youngest children; 2) create communities that foster health-promoting behaviors; and 3) broaden health care to promote health outside of the medical system (RWJF Commission to Build a Healthier America, 2014).

Figure 4: RWJF Commission (RWJF Commission to Build a Healthier America, 2009)

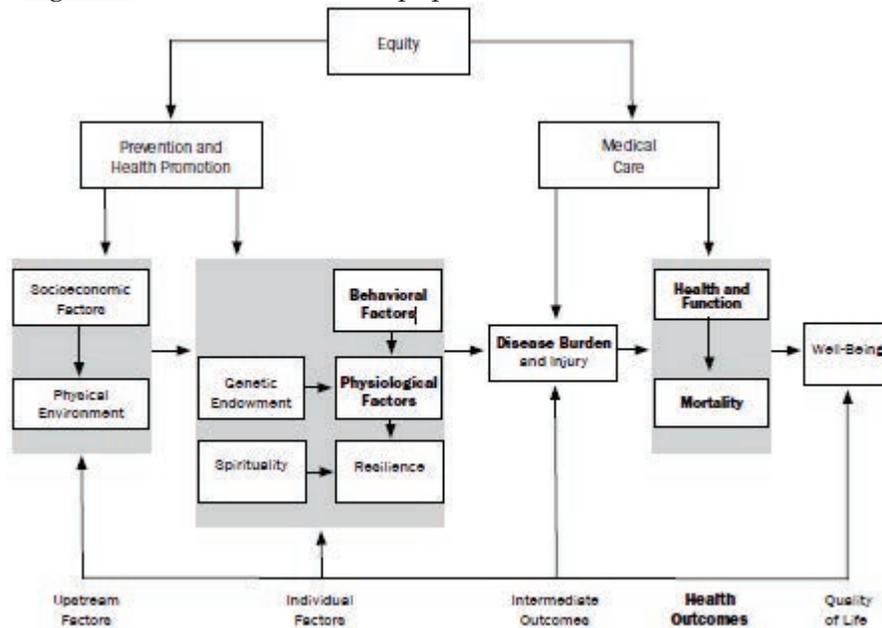


Source: Braveman P, et al. 2011. *Annu Rev Public Health*. 32:381-98. Used with permission.

Institute for Healthcare Improvement (IHI) – The IHI conceptualizes socioeconomic factors and physical environment as upstream factors in population health that impact individual factors (behavioral, physiologic, resilience). Individual factors, in turn, have an effect on an individual’s potential for disease/injury, health status, and overall quality of life or well-being (Stiefel and Nolan, 2012) (see Figure 5).³ Health care organizations (e.g., Kaiser Permanente Healthcare System) often use this framework in population health efforts. For example, trauma has been linked to chronic diseases, and Kaiser Permanente has a program to identify patients with trauma (emotional or social) and to engage them with community resources to disrupt the cycle.

³It is noted that the IHI Model of Population Health is based on the model by Evans and Stoddart (1990).

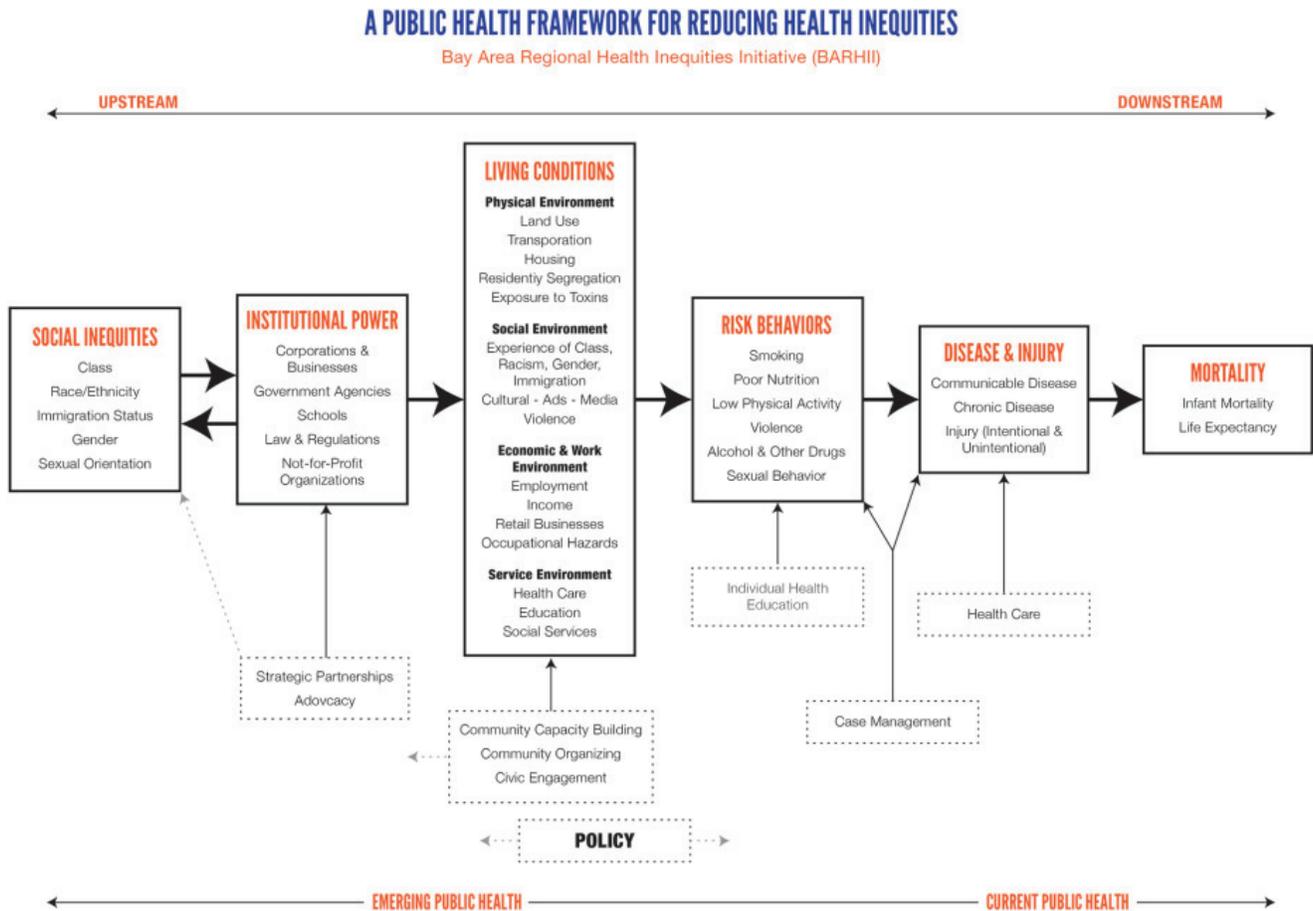
Figure 5: IHI Framework for population health determinants



Source: Stiefel M, Nolan K. 2012. IHI Innovation Series white paper. Cambridge, Massachusetts: Institute for Healthcare Improvement. Used with permission.

Bay Area Regional Health Inequities Initiative (BARHII) – A group of health departments in San Francisco developed a conceptual framework that illustrates the connection between social inequalities and health. This framework has been used widely as a guide to health departments undertaking work to address health inequities. The initiative has been formally adopted by the California Department of Public Health as part of their decisionmaking framework.

Figure 6: BARHII (Bay Area Regional Health Inequities Initiative (BARHII))



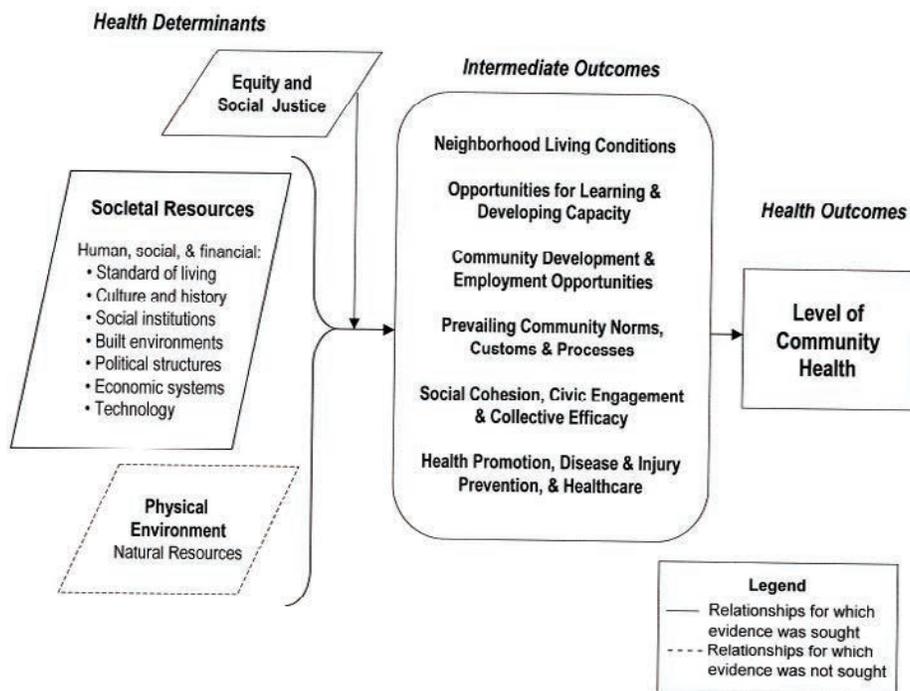
Source: BARHII. <http://barhii.org/framework/>. Used with permission.

MacArthur Research Network on SES and Health: This is a collaborative group of investigators whose research is organized around an integrated conceptual model of the environment and psychosocial pathways by which SES alters the performance of biological systems, thereby affecting disease risk, disease progression, and ultimately mortality (Adler et al., 2007). The model addresses several factors: 1) there is a strong, two-directional association between socioeconomic status and health (they have developed a subjective measure of perceived social status); 2) with a few exceptions, disease is more prevalent and life expectancy shorter, the lower an individual is in the SES hierarchy; 3) the effects of poverty and extreme adversity alone do not explain the association of SES and health (they attempt to assess the graded relationship between SES and health); 4) the association of SES and health begins at birth and extends throughout life, but the strength and nature of the relationship can vary at different stages of life (they examine trajectories of SES along with trajectories of risk); 5) there are multiple pathways by which SES may affect health, including access and quality of health care, health-related behaviors, individual psychosocial processes, and physical and social environments; 6) socioeconomic status and race/ethnicity interact in their associations with health; and 7) SES gradients can be seen in pre-disease indicators such as blood pressure, cortisol patterns, central adiposity, and carotid atherosclerosis (summary scores of these

indicators appear to be better predictors than conventional risk factors of certain diseases, cognitive and physical decline, and mortality).

The Task Force on Community Preventive Services (HHS): This conceptual model links social environmental interventions to health outcomes. The premise is that access to societal resources determines community health outcomes. Societal resources to sustain health include standard of living, culture and history, social institutions, built environments, political structures, economic systems, and technology (figure 7). These resources impact 6 intermediate outcomes to community health: neighborhood living conditions; opportunities for learning and developing capacity; community development and employment opportunities; prevailing community norms, customs, and processes; social cohesion, civic engagement and collective efficacy; and health promotion, disease and injury prevention and healthcare.

Figure 7: The Community Guide’s social environment and health model (Anderson et al., 2003)



Source: Anderson LM, et al. 2003. *Am J Prev Med.* 24(3):25-31. Used with permission.

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