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Improving the Health of Communities through Population Health Assessments

by Ron Deprez and Chloe Manchester

Abstract

This paper describes a comprehensive, science-based approach for conducting a *population health assessment* (PHA), a process for identifying upstream nonmedical, social and economic determinants of health in a community, including risk factors associated with poor health status. A PHA focuses on diagnosing and improving population health disparities using public, private, and community-based strategies and resources. The paper traces the evolution of PHAs from community health needs assessments and community benefits planning. It describes the PHA process, methods, data, and analytical techniques that permit the identification of specific underlying factors in a community that adversely affect health. It also suggests criteria to prioritize health issues and strategies that help communities implement sustainable policy, infrastructure, or services improvements.

be major programs or involve expensive medical technologies. Changes are intended to leverage existing capacities and resources. Delaying school start times to improve student participation or restocking vending machines with healthier options are examples of such approaches. Investments like these are more likely to be sustainable and able to adapt to changing trends.

Many signs suggest that investments in public health, especially preventive health, are needed to address the decline in health status in the United States. Compared to

our counterparts in other nations of similar economic status, US residents experience, on average, poorer health and outcomes. When it comes to life expectancy, a metric for general health, the United States ranks 25th for males and 26th for females (OECD 2015)—

INTRODUCTION

This paper describes a comprehensive, science-based approach for conducting a *population health assessment* (PHA). A PHA is a process for identifying both apparent and underlying nonmedical determinants of health in a community, including risk factors associated with poor health outcomes (Deprez and Thomas 2016). The PHA process described in this paper will help state and local decision-makers identify the specific factors in a community that affect health and the targeted policies and resources needed to improve health status. The goal of a PHA is to diagnose and improve health status using public, private, and community-based strategies. A PHA is different from a *community health needs assessment* (CHNA), which focuses on deficits in the health system rather than underlying drivers of, and solutions to, population ill health.

The value of a comprehensive PHA goes beyond understanding and identifying strategies to improve policy, infrastructure, or services. The process is also a tool to organize and engage community stakeholders, cultivate essential leadership, and help communities secure resources to improve the health and well-being of their populations. Strategies do not necessarily need to

WHAT IS POPULATION HEALTH?

Population health describes the health status of a population based on health-related data and indicators. It is focused on the overall health and well-being of a population or geographic area (Deprez and Thomas 2016) rather than medical diagnoses or treatments for individuals. Population health includes both governmental and private infrastructure, activities, policies, and services that address health. Population health can be assessed for the whole population or for a subgroup (race, ethnicity, gender, geography, workplace). Approaches to improving community health focus on populations and address the root causes of ill health. The solutions can be systemic and far-reaching—and often-times beyond the scope of a health system or facility.

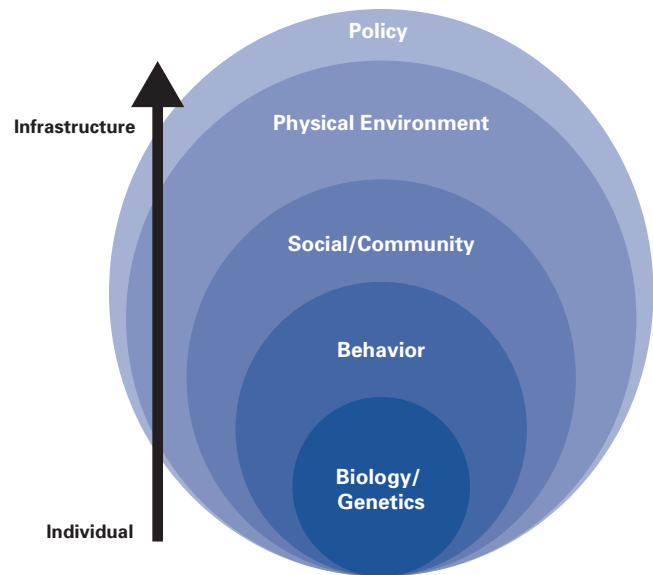
an average of 1.7 years less than other developed countries—despite proportionally higher (2.5 times higher) per capita spending on health care compared to healthier nations (Bezruchka 2012). Although many in the United States benefit from groundbreaking medical advancements and high-quality care, the country falls behind other developed nations on numerous health indicators: adverse birth outcomes, injuries and homicides, HIV/AIDS, drug-related mortality, obesity and diabetes, heart disease, chronic lung disease, and disability (NRC and Institute of Medicine 2013). This inconsistency is predominantly associated with a high level of socioeconomic disparity and a fragmented health system, along with poor health-related behaviors such as alcohol consumption and obesity, for which the United States ranks significantly higher than similar countries. These trends raise serious concerns about long-term mortality and morbidity for those living in the United States, as well as about the impact of health outcomes on economic and social progress. While there is no single (or simple) solution, many underlying causes can be traced back to social, economic, environmental, and behavioral factors.

A simple ecological model can be used to explain why a population health approach is necessary and how a range of factors or *determinants* affect health outcomes (Figure 1). Biological or genetic determinants, as well as some behaviors, are the traditional focus of the healthcare system because they are considered almost entirely dependent upon the individual. A population health approach recognizes that social and community-level influences, as well as physical environment and policies, have direct implications for population and individual health.

COMMUNITY BENEFITS PLANNING AND NEEDS ASSESSMENTS

According to the Centers for Disease Control, public health “is the science of protecting and improving the health of people and their communities. This work is achieved by promoting healthy lifestyles, researching disease and injury prevention, and detecting, preventing, and responding to infectious diseases” (<https://www.cdcfoundation.org/what-public-health>). Public health practice focuses on prevention and follow-up of health outcomes, such as disease outbreaks, for example, food contamination. Public health agencies, however, do not generally address social determinants.

FIGURE 1: Drivers of Population Health Status



Adapted from the Centers for Disease Control’s “Social-Ecological Model: A Framework for Prevention.” The model illustrates how factors at one level influence factors at another level while at the same time contributing independently to health.

<https://www.cdc.gov/violenceprevention/overview/social-ecologicalmodel.html>

The definition of public health has evolved over time. Since 1959 (IRS Ruling 56-185), nonprofit hospitals have been required to provide free or discounted care to those eligible (usually the uninsured or underinsured). The scope of nonprofit hospitals was further expanded in 1969 (IRS Ruling 69-545) to include a community benefit component. This ruling acknowledged that hospitals needed to provide services outside the facility, leading many hospitals to implement education and research activities for the first time.

In the late 1980s, the concept of CHNA appeared (Allen et al. 2003). Firms such as the Public Health Resource Group (PHRG) in Maine, the Lewin Group in Washington, D.C., and Professional Research Consultants of Omaha, Nebraska, developed planning models with the use of robust population-based epidemiological data that was becoming available. As the scope and reach of health systems expanded, the gap between the health needs of the community and the activities designed for community benefit became clear. Several states began mandating that nonprofit hospitals conduct and publish

the results of CHNAs; this mandate was later adopted by the federal government as part of the Affordable Care Act.

The migration from CHNAs to PHAs was the result of several realizations by community health

leaders and policy experts. One realization was that most CHNAs only identify the needs of health systems that by themselves do not address the underlying *upstream* health drivers. Another realization was that the health system alone cannot address sustainable and impactful population health improvements without involving other community-based organizations and institutions.

MAINE SHARED CHNA

Maine is one of a few states that conduct state-wide, county, and regional community health needs assessments (CHNA), which now include data on social determinants. The Maine Shared CHNA began in 2010 when the University of New England's Center for Community and Population Health was contracted to collaborate with the major health systems in the state (Eastern Maine Healthcare Systems, MaineGeneral Health, and MaineHealth) and the Maine Center for Disease Control and Prevention to produce the first shared health status profile and report.

The Maine Shared CHNA process consists of three stages:

- Health data profiles consisting of almost 200 indicators describing health outcomes, health behaviors, healthcare access and quality, and the social, community, and physical environments that affect health.
- Community forums and other outreach events scheduled by the hospitals. Forums are often followed by interviews with key informants and a community health survey. Outreach events obtain feedback on the data and identify health priorities and community assets.
- CHNA reports that include the health profiles, along with summaries from forums, interviews, and surveys are produced for the state, each county, and each public health district.

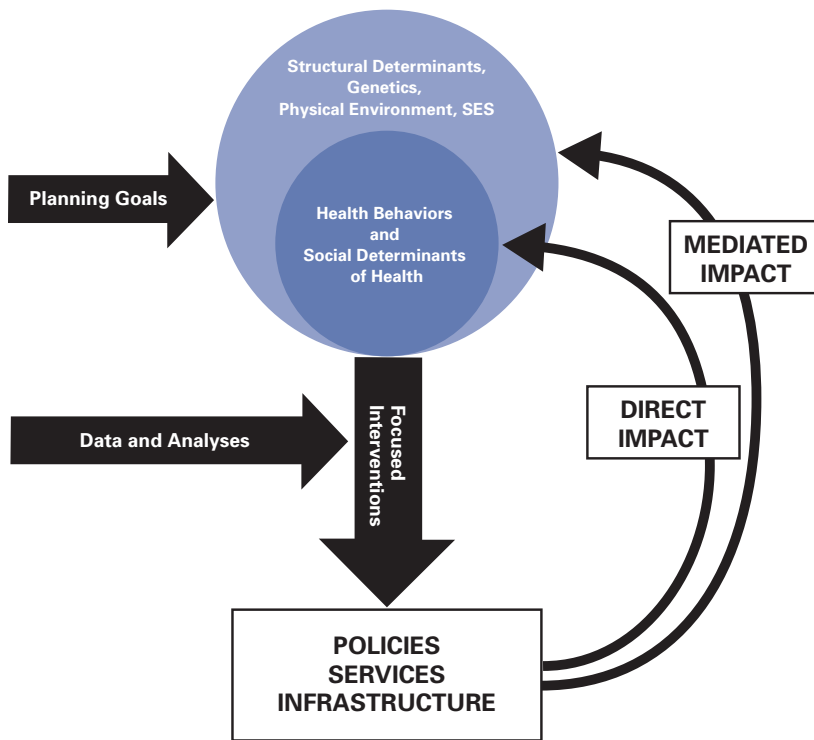
Missing from this process are analysis connecting the social determinants to specific health issues, multisector collaborations to design and implement change at the policy and infrastructure levels, and resources for these efforts. As we argue in this paper, the changes needed to affect health are rarely improvements to the health system. See <https://www.maine.gov/dhhs/mecdc/phdata/MaineCHNA/about-Maine-CHNA.shtml> for more information.

A POPULATION HEALTH ASSESSMENT APPROACH

A PHA approach (Figure 2) uses population-based indicators to describe, prioritize, and address specific health-related issues within economic, social, racial, environmental, or individual domains. PHAs focus on community-based solutions and include changes to the health system, environment and infrastructure, education, or policy. Health behaviors (such as smoking or driving without a seatbelt), biology (such as genetic disorders), environment (anything from tainted drinking water to cultural practices), socio-economic factors (such as, poverty or unemployment), and education may all be part of the scope of a PHA. Thus, improvements may fall under the jurisdiction of a community or service organization or require governmental policy changes. For this reason, PHAs require a certain level of multisectoral collaboration to be effective. Conducting a PHA is an important and necessary first step in connecting healthcare and community partners to address health issues.

Solutions derived from a PHA may have a direct impact on health; for example, a PHA may recommend creating a prevention program to reduce obesity in a population by changing personal nutrition habits. Or the PHA may have an indirect impact as in a community that builds walking or biking trails to promote increased physical activity.

The process discussed in this article places significant emphasis on the role of public and private stakeholders (i.e., health departments, hospitals, health systems, and community organizations). However to address population health issues, it is important to make use of a community's full range of assets, not just its healthcare organizations. Representatives from government, education systems, civic leadership, community-based cultural and social organizations, student groups, nonprofit agencies, and private businesses all have a responsibility and critical roles to play in a successful change process.

FIGURE 2: **Overview of Population Health Approach to Change**

ADDRESSING DETERMINANTS OF HEALTH

Determinants of health are a set of often interrelated factors causally associated with a person's health (<https://www.cdc.gov/nchhstp/socialdeterminants/definitions.html>). They can be central to the epidemiological state of disease and health outcomes in communities or specific populations. Determinants span a range of spheres, including biology and genetics, individual behaviors, social environment, physical environment, and the health system (see Figure 1).

A PHA concerns itself with both nonmedical and medical determinants of health. By taking a broader look at a population's health, the lens shifts away from the reasons for an individual's illness and focuses on questions related to overall trends. The PHA is concerned with upstream factors or causes of positive or negative health status and outcomes. Determinants of health reflect a broad continuum of biological, circumstantial, structural, and environmental factors, many (if not most) of which are well beyond the control of a health system. Many social factors associated with negative

health-seeking behaviors or outcomes require behavior change (Syme 2004), which calls upon interventions from outside the health system. Determinants broadly fall into five categories, all of which are crosscutting and interrelated:

- **Individual behaviors:** These can be health-seeking behaviors such as regular exercise or eating a balanced diet, or detrimental or high-risk behaviors such as smoking, alcohol and drug use, or unprotected sex.
- **Social environment:** Socio-economic factors such as income (poverty), social class, culture, religion, and gender impose many limitations upon health because they shape the ways in which communities interact. In general, communities with less disparity fare better because individuals have access to the same services.
- **Physical environment:** The conditions in which people live, work, or study contribute to health status. Exposure to harmful toxins or chemicals such as lead and asbestos, the lack of clean air or water, poor infrastructure, and the spread of zoonotic diseases are examples of risk factors in our physical environment.
- **Access to quality health services:** The extent to which people have access to and use health services influences quality of care for both treatment and prevention of health conditions. For example, the number of people who are uninsured or underinsured can affect access to and quality of care.
- **Biology and genetics:** Many of these factors do not have actionable population health solutions because genetic predispositions require individualized treatment and cannot necessarily be prevented. Nonetheless, biology also refers to age and gender, which are important considerations in any public health program or policy.

PHAs use evidence-based determinants, which link health outcomes to known differences and disparities in populations. The goal of the health assessment is to quantify each determinant's effect and identify the most significant determinants and the ways to address them.

In summary, the information collected as part of the PHA will first provide a situational representation of health status, and second, lead to the underlying causes based on what is already known about the potential determinants associated with each of these health outcomes.

Social Determinants of Health

Social determinants of health link the root causes of health outcomes to factors outside the health system context (Table 1). There are many characteristics about the way people live that influence health outcomes, either directly or through mediating factors. Social determinants are overlapping, interrelated, and not mutually exclusive. Inequity is an important driver of

negative social determinants. Poverty, social and physical environment, and education may be driven by “unequal power relationships interacting across four main dimensions—economic, political, social and cultural—and at different levels including individual, household, group, community, country and global levels” (Popay et al. 2008: 2).

DATA COLLECTION, METRICS, AND ANALYSIS

The first step in conducting a PHA is defining the study area, which may be a geographic jurisdiction or a select population. Data are then collected to create a comprehensive health status profile, illustrating the sociodemographic characteristics of the service area.

TABLE 1: **Examples of Major Social Determinants of Health**

Determinant	Causes	Health outcomes	How a determinant is measured	Measures to prevent negative health outcomes
Poverty	Social exclusion Being a single parent Economic conditions (external) Lack of education Environmental disasters Low-wage jobs Reduction in welfare support	Less favorable neighborhood conditions Childhood obesity Diabetes Hypertension Smoking-related illnesses Asthma Low birthweight	Pre-tax income against poverty threshold Consumption	Amenities to encourage physical activity Behavior change communication Social engagement Increased access to and affordability of healthy food Safe and attractive recreational facilities Nutrition programs Removal of barriers to healthy behavior Access to public library Skills development strategies
Unsafe or negative work conditions	Limited employment options Unemployment Work-related stress Extensive job strain Physical risks	Demands or restrictions of job Overly sedentary Unhealthy habits Coronary heart disease	Self-reported psychological job demands Decision latitude Social support at work	Enforcement of safe working conditions Identification of negative health conditions Workplace health promotion programs
Psychological stress	Anxiety Social isolation Financial insecurity (poverty) External crises	Diabetes High blood pressure Depression Metastases	Income or unemployment Social inclusion Self-reported	Stress management programs Support groups Stress hotlines Affordable counselling Training to identify high-risk groups Routine screening interviews at places of work, educational institutions
Low educational attainment	Poverty Location Poor nutrition Social inequities Parents’ educational attainment	Increased levels of stress Higher blood pressure Elevated cholesterol levels	Standardized testing Rates of college enrolment	After-school or summer programs Learning or skill-building opportunities at community centers Access to libraries or other learning tools Reducing obstacles to school participation Reducing barriers to attendance

Initially, a PHA requires quantitative data; later in the process, the data are mostly qualitative. The quantitative data rarely answer the question of what to do about the identified health issues. Rather, the data permit us to raise questions about what may be driving the health issues. The types of data are typically chosen to assess high-level health issues and are usually available from local, state, or federal governments (such as census, birth, and death records), health systems (such as use of health system, incidence of disease, and test information), and household or community surveys. The measures address risk factors (medical and nonmedical), disease or condition prevalence and incidence, access, availability, quality, and performance (care management). Health data are then analyzed with metrics on known determinants of health status such as education, poverty, and economic and social or cultural characteristics. This type of analysis identifies gaps in programs, policies, and services (either in the health care system or in the community) more efficiently than a typical CHNA does.

Once the scope of the PHA has been defined, the next step is to determine what data are needed to measure the goals and objectives of the assessment. A broad PHA requires a more comprehensive set of data than one aimed, for example, at better understanding the mental health status of a community subpopulation. A simple disaggregation of data is done for identification of trends, variations, and inequities at the state and local levels that might otherwise have been missed in larger units of measurement.¹

Quantitative and Qualitative Data

Compared to an epidemiologically focused CHNA, PHAs require enhanced data collection and organization methods. The planning process for a CHNA typically identified salient healthcare-related issues in the community through a systematic analysis of scientifically based health indicators and best practice information. Indicators are computed from an extensive set of health-related data. However, similar to community benefits planning, CHNAs were focused almost exclusively on health service needs and solutions (VHA Inc. 2002).

As in the CHNA process, PHAs starts with a comprehensive epidemiologically based health profile organized by domain or condition such as cancer, or cardiovascular, respiratory, or mental health. Indicators for most domains are further organized by risk factors, prevalence (or incidence) of disease or condition, care

DATA ANALYTIC METHODS

Health indicators are generally analyzed at various population levels and may be compared to state or local averages. Comparisons to national or local standards of excellence, guidelines, or goals are valuable ways to evaluate health outcomes. To identify whether a community's poor health outcomes can be traced back to determinants outside of the health system, we must first establish whether a community benefits from similar access to, use of, and quality of care. This epidemiologic approach identifies causes of poor health while highlighting differences within groups that are similar in other respects.

Indicators within each domain are produced as actual population rates or proportions. They are not adjusted for age, gender, or other population artifacts. This information is critical for health planning and is lost if rates are adjusted to an external population. To better understand the status of a health issue in a population, the actual rates are analyzed by the following subpopulations: gender, age groups, and/or race and ethnicity (provided the data are available and it is appropriate from a population health or clinical perspective). Indicators are analyzed separately and across policy, infrastructure, and service issues. PHAs generally do not test for statistical significance of rates between two or more populations. It is the pattern of indicators that, taken together and analyzed sequentially, determines whether and what follow-up analysis is warranted. Statistical testing may be considered in special circumstances to further examine a specific area of the population.

management indicators, and care outcomes. A PHA includes measures of social determinants of health that are both scientifically valid and evidence based in their relationship to health outcomes (Table 2). For example, research has shown that stress is associated with the incidence of certain cancers. Metrics that use several different indicators (such as socioeconomic status) are also useful for making inferences about a population's health or health-related status. The methodology also uses strategies to ensure the selection of appropriate geographic boundaries and representative comparative

TABLE 2: Examples of Population Health Status Indicators and Associated Public Health Responses

Health status indicators	Innovations or service implications
Socioeconomic; environmental	Economic or infrastructure improvements
Risk factors	
Prevalence or incidence	Economic or infrastructure improvements; screening or detection; access to or availability of care (workforce)
Care management (access, quality, effectiveness)	Economic or infrastructure improvements; evidence-based or culturally competent care
Poor or negative health outcomes	All of the above

TABLE 3: Sample Breast Cancer Indicators

Breast cancer health measures	Service area	Comparison area
Percentage females with high school education	75.00	90.00
Percentage female population in poverty	18.00	12.00
Percentage single head-of-household with children (stress)	2.00	20.00
Percentage underemployed	50.00	33.00
Percentage insured	78.00	85.00
Percentage mammography	65.00	80.00
Percentage self-breast exam	75.00	90.00
Rate* breast cancer incidence (females)	90.00	107.00
Percentage diagnosed breast cancer (early)	7.00	11.00
Percentage stage IV breast cancer (distant)	25.00	10.00
Rate* breast cancer mortality (females)	40.00	30.00
Ratio of breast cancer mortality to incidence	0.44	0.28

*Rates are per 100,000 female population

populations. The results—using a *pattern recognition analysis*—identifies priorities for follow-up.² The results point to both needs and strengths in a community's medical and nonmedical infrastructure and services that are affecting its health status.

Based on these findings, a PHA then uses structured interviews or community meetings to obtain a clearer understanding of the issues that need to be addressed to improve health. This analysis results in identifying priority issue areas and highlights differences or disparities within a population.

Using a PHA: An Example

Using breast cancer as an example, a PHA could be used to determine whether issues related to elevated incidence of breast cancer (cases) or poor outcomes (survival rates) are due to access to, or availability of, health care, education levels of the population, or some other factor. The PHA could focus on women with relatively low levels of education, increased stress, and proportionally less income and compare them to an otherwise similar population of women. In this example, one cohort of women accesses mammography services less frequently, yet experiences lower incidence of breast cancer but with a higher disease-specific mortality rate. In fact, women in this service area diagnosed with breast cancer are 16 percent more likely to die from the disease than those in the comparison group (Table 3).

These measures raise several challenging questions for the community: What is driving the elevated cancer mortality—lack of access to mammograms, poor education, insufficient preventive insurance coverage, late diagnosis, or some other factor?

Why are women in this community diagnosed so late—lack of access to mammograms, education about the value of mammograms, poverty, distance to test sites, or some other reason?

CONCLUSION

Although a PHA will identify a range of health issues, there are resource limitations (financial and organizational) affecting how many issues can be addressed at one time. Priority development allows for targeted goal setting so the PHA can focus on issues that either affect

THE PHA PROCESS

Once issues along with a set of key questions for each issue are identified for follow-up, there are several steps to take in developing potential solutions to the problem.

- Determine where follow-up interviews or focus groups are needed and with whom.
- Determine how to obtain community involvement in answering the questions. For example, hold community circles.
- Put together multisector collaborations to lead the improvement process.
- Perform an asset-mapping exercise: Identify community assets that could be used to address the solution, including those that currently address it.
- Conduct a capacity, cost, and administrative assessment of successful intervention.
- Develop specific recommendations for health improvement—successful (model) programs for adaptation to the area.
- Obtain resources, implement, and continuously evaluate results.

the largest proportion of people in a target population or contribute to a significant burden of disease in a disadvantaged population. While these are not the only parameters for establishing a health priority, it is most likely that community health interventions will seek to target efforts where need is greatest.

It is vital that stakeholders, community members, and implementation partners participate in identifying and validating these priorities to avoid duplication of efforts and encourage consolidation of assets. When setting priorities in this way, it may be challenging to build consensus, so it is helpful to establish criteria for determining if a community health need should be considered a priority. Examples of such criteria may include, but are not limited to the following:

1. A health priority should be one that results in the greatest proportion of morbidity, mortality, disability, and years of productive life lost within the target population.

2. There should be opportunities for prevention-based interventions rather than just care and treatment.
3. Solutions to health needs should be actionable and involve the entire community, rather than limited to those who are directly affected. There will be greater sustainability and buy-in if the target population has a stake. Even if programs are targeted to reach certain groups, there will be benefits for the whole community.
4. Conditions or health needs should have a measurable impact.
5. Limitations, parameters, restrictions, and opportunities should all be considered and balanced appropriately when considering interventions and setting priorities. This can be done through an asset-mapping exercise or creating an inventory of all the resources and gaps available:
 - Physical resources and infrastructure (e.g., schools, exercise areas or classes, educational opportunities, community spaces)
 - Financial resources (e.g., budget restriction, potential grant support)
 - Human capital and capacity (such as community organizations, civic groups, businesses, school districts)
 - Policies (both health and nonhealth related).

Asset mapping will provide a current picture of assets that can be used to improve the community and population health outcomes. Examining programs or policies that were implemented in the past is part of this exercise, so that past experiences can inform new approaches. The objective of an asset-mapping exercise is to develop a list of relevant community resources or services that address the health needs of the community and the gaps that remain, including infrastructure and policies. An additional benefit of the exercise is to identify groups or individuals within the community who should be involved in the development and implementation of interventions.

Once assets are understood and gaps have been identified, it is important to take stock of the limitations that exist. In many cases, the limitations are financial constraints. Other limitations to consider, however, include culture and political climate. Multisector groups made up of representatives from government, businesses, school districts, and volunteer agencies, need to be

involved in the planning process. These groups make a difference in seizing opportunities and overcoming limitations. In many cases, a great deal can be done even without large budgets or major policy changes. 🐼

ENDNOTES

- 1 It is always a challenge to determine the level of granularity needed in contrast to the scientific validity of the measures produced. There is no right answer; it depends on what one is trying to measure and the level of data available.
- 2 **“Pattern recognition** can be defined as the **classification** of data based on knowledge already gained or on statistical information extracted from **patterns** and/or their representation” (<https://www.geeksforgoeks.org/pattern-recognition-introduction>). Applied to health, pattern recognition is used to analyze clusters of related measures, such as specific risk factors including social determinants, disease prevalence, disease management, early diagnosis, and health outcomes. The process aids decision-making on what is driving health status and outcomes and subsequently identifies specific activity for health improvement.

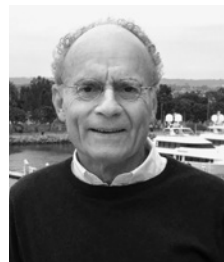
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