Population-Based Health Care

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Introduction

What Is Population Health?

The term "population health" is often attributed to David Kindig and Greg Stoddard, who defined it in 2003 as *"the health outcome of a group of individuals, including the distribution of such outcomes within the group."* Since then, definitions have expanded beyond a narrow focus on outcomes. Many definitions now connect health status and health outcomes to better healthcare and chronic disease management. Additionally, population health has also come to mean promoting health behavior change and addressing social determinants of health. Public Health and population health are closely linked but different. The

Centers for Disease Control and Prevention (CDC) makes a distinction between public health and population health, noting public health's emphasis on primary prevention and infectious disease control. This is in contrast with population health, for which they quote George Washington University's Milken Institute – population health provides *"an opportunity for health care systems, agencies and organizations to work together in order to improve the health outcomes of the communities they serve* [1].*"* Public health focuses on ensuring conditions in which people can be healthy. Population health focuses on health outcomes and the determinants that influence those outcomes [2].

In practical terms, population health is the discipline of working to improve the health of groups of people rather than just individual patients. It takes different forms depending on the target population and the Family Physician's role. A state or county public health director is focused on prevention and other interventions to improve health outcomes across the entire population of a geographic area or jurisdiction. The discipline of community health focuses on neighborhoods or small communities, sometimes focusing on specific high-disparity populations. The managed care medical director may work through provider networks to influence health outcomes of hundreds of thousands of covered lives, while physicians in an Accountable Care Organization (ACO) may share financial risk for the health outcomes of thousands of patients attributed to their practice. At the individual Family Physician level, there is a panel of patients (often multiple panels connected to different payers) whose outcomes require intentional, team-based care management. However, population health from the Family Physician's perspective must take into consideration that which occurs beyond the four Walls of the office space, such as the influence of social, economic, political, and physical environments that affect the health of their patients and families [3].

Why Population Health?

US healthcare in the twenty-first century underperforms relative to the health systems of many other nations. Our costs are higher and our outcomes are worse. Meanwhile, there is increasing consumer demand for a better patient experience. In 2006, the Institute of Medicine's *Crossing the Quality Chasm* report presented six Aims for Improvement, calling for care that is safe, effective, patient-centered, timely, efficient, and equitable.

In 2006, John Whittington and Tom Nolan at the Institute for Healthcare Improvement (IHI) encouraged the move beyond care delivery to focus on outcomes, framed as the Triple Aim – (1) better health outcomes at (2) lower overall cost with (3) a higher quality of care defined from the patient's perspective, that is, a better experience of care for each patient. The Triple Aim concept was eventually woven into the Medicare program and into our national consciousness. In 2014, the Triple Aim was expanded to the Quadruple aim [4], adding wellness of the health care workforce and *"the joy of practice"* as an essential foundation for delivering high quality health care.

Taking these concepts to scale meant reorganizing practices and healthcare systems in order to demonstrate improvements across large groups of patients (practice panels and payer populations). It also meant changing the way providers would be paid, using all the financial force of the US Medicare program to actively promote a shift away from the volume-based, fee-for-service model to value-based models. CMS began promoting value-based models which would reward reductions in hospital admissions (starting with readmissions), emergency visits, and overall cost of care. Other health insurers and large self-insured corporations quickly followed suit. This also importantly meant that the wellness of the health care provider had to be incorporated into models of care that allowed for better efficiency of provider time, use of the electronic health record, tools to assist in quality delivery, promotion of resilience, and attentiveness to work-life balance.

Population Medicine

Individual Providers and Practices

At the level of the individual provider or practice group, the patient panel can be considered your "population" with regard to clinical outcomes and

costs. For this reason, empanelment is a core element of population medicine at the primary care level. Empanelment is the act of assigning each patient to a primary care provider or team. Empanelment has the dual purpose of assigning responsibility between patient and a specific provider or team, but also establishing a denominator for measuring rates for quality, utilization, and outcome indicators. Effective care teams establish a long term provider-patient bond, continuity of care, and optimal, personalized care, in order to improve management and outcomes of chronic conditions, as well as providing evidence-based preventive care. Payers see this as a path to reducing costs by eliminating duplication of services and managing medical problems in the most appropriate setting. Physicians must know and track their panel size, keeping up with growth, attrition, and risk level, in order to assure that they have the resources necessary to meet the needs of their panel.

Defining the panel starts with identifying patients who have been seen in the practice within a certain time frame, such as within the past two years. The process is then refined with various inclusion or exclusion criteria. The spouse of a patient may identify him/herself as a patient of the practice, even if they have never had a visit, and the practice may choose to include them in their panel if so attributed by the payer. On the other hand, a practice may not want to include in their panel a patient who, for example, was seen once for a sprained ankle, missed several scheduled follow-up appointments, and has no intention of returning to the practice.

Defining the denominator population is essential for calculating outcomes such as hospitalization rates, emergency visit rates, and cost of care per thousand patients (often referred to by insurers as per thousand covered lives). Defining this population is also essential for building a pool for risk stratification and for monitoring outcomes and addressing needs of patients whether or not they choose to come for an office visit.

The team also must establish metrics of performance for managing their panel. Health care providers often prefer quality metrics over which they have a higher-level of control, such as the rate of performing in-office preventive services (e.g., Pap smears and flu shots). However, as the measures move from process to intermediate outcomes, such as rates of blood pressure or glycemic control, clinicians very quickly observe that they are being held accountable for metrics over which they only have partial control. While clinical inertia and the failure to intensify antihypertensive or diabetic regimens may trace back to clinician behaviors, patients are ultimately responsible for their own medication adherence, diet, and exercise. The responsibility and locus of control may shift even further from provider to patient when we consider utilization-based outcomes, such as hospital admissions, bed-days, re-admissions, emergency visits, and total health care costs per patient. Still, in a world of value-not-volume reimbursement, the clinician is responsible, if not financially at-risk, for managing these very outcomes. So, a core concept of outcomes-driven, panel-based care management is that while we cannot *control* patient behaviors or outcomes, we can *influence* those behaviors and outcomes. And while we cannot guarantee a good clinical outcome or lower costs for every individual patient, we can achieve predictably better results on group outcomes spread over a large enough panel of patients.

Chronic disease care management is another core element of the practice of population medicine, influenced strongly by Wagner's chronic care model (Fig. 1).

The foundation of the chronic care model is the dyad of an informed, activated patient and a prepared practice team. The model includes six functional elements: (1) self-management support, (2) delivery system design, (3) decision support, (4) clinical information systems, (5) organization of health care, and (6) community resources and policies [5].

Early iterations of care management were focused on single diseases rather than whole patients and started with disease registries. The paradigm of disease management shifted fairly rapidly to population health management when it became obvious that most patients did not have just one disease at a time. Patients in the diabetes registry often overlapped with those in the hypertension/cardiovascular disease registry, who also overlapped with those in the depression registry.
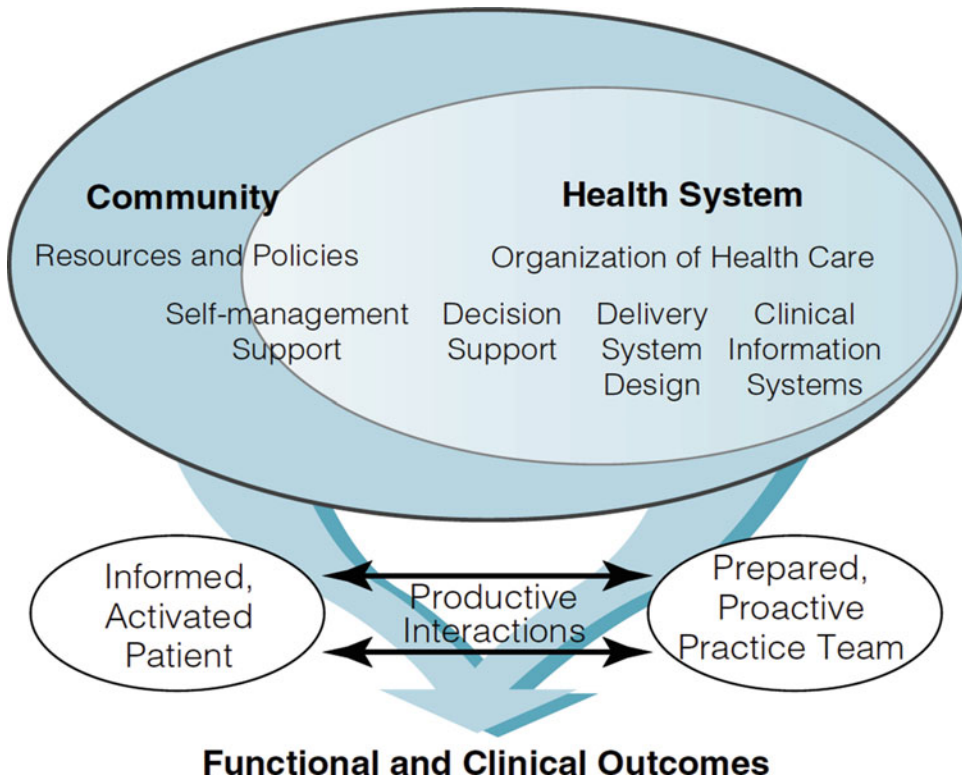
Fig. 1 Wagner [5]. (Used with permission)

In fact, the patients with multiple co-morbidities or multimorbidity turned out to be the patients who most needed to receive the on-going monitoring, care coordination, health education, patient navigation, medication reconciliation, and frequent follow-up contact that could improve clinical outcomes. Thus, disease management rapidly turned into care management at the practice level and into risk-stratified population health management at the levels of health systems and payers.

The core activities of patient empanelment and monitoring clinical metrics and care management are dependent on effectively using an electronic health record not just as a record of day-to-day patient care, but as a relational database that can be queried and produce actionable information in the care of individual patients as well as aggregate reporting on all patients or on subsets of the panel. This was the goal of the 2009 Health Information Technology for Economic and Clinical Health Act

(HITECH Act) that mandated and incentivized adoption of electronic health records and established milestones of meaningful use. Querying the EHR data, producing aggregate reports, and creating real-time dashboards that track progress on clinical outcomes for the panel are additional competencies that will be required of every value-based primary care practice [6]. The key is to produce actionable information, to which the practice team can respond both for individual patients and for overall practice performance on panel-based outcomes. This requires dynamic interventions and the rapid-cycle feedback loops known in quality improvement circles as PDSA-cycles (plan-do-study-act).

In this century, primary care panel-based care management which is outcome driven is a team sport. Medical assistants are now engaging in expanded roles, including scribing and algorithm-driven preventive services. Registered nurses engage patients directly in care

management, health coaching, and health system navigation. Psychologists, social workers, and licensed counselors can add capacity for full behavioral health integration in the practice. Peer counselors are increasingly recognized as having a powerful position on the healthcare team, with neighbor helping neighbor to achieve positive health behavior change and effective self-management. In multicultural settings, these may also be defined as community health workers or *promotoras*.

Some payers have begun specifically paying or rewarding primary care practices for "transforming" into patient-centered medical homes (PCMH). The concept of PCMH very much aligns with the principles of Population Health management. For more detail, please see ▶ Chap. 134, "Patient-Centered Medical Home".

All of these elements of population health management at the local practice level have been incorporated by Grumbach, Bodenheimer, and others into the comprehensive approach broadly described as *practice transformation*. The core building blocks of practice transformation are shown in Fig. 2 [7].

Population medicine becomes an essential part of a family physician's practice when the business model shifts from a fee-for-service practice to capitated or other value-based contracts. Simple primary care capitation fees pay the physician/practice a recurring payment per member per month (PMPM), regardless of whether or not the patient has a visit or receives other services. The practice takes on some financial risk in the sense that the cost of patient care in the practice must be covered by the monthly capitated revenue, but also gains tremendous freedom in building their team model to best focus on patient outcomes, rather than generating patient volumes. Care that can be managed by phone(telemedicine) or in group visits, for example, no longer requires that a billable service be provided in order to generate revenues.

Fig. 2 Chronic Care Model, Brumbach, and Bodenheimer. The core building blocks of practice transformation. Bodenheimer et al. [7]. (Used with permission)
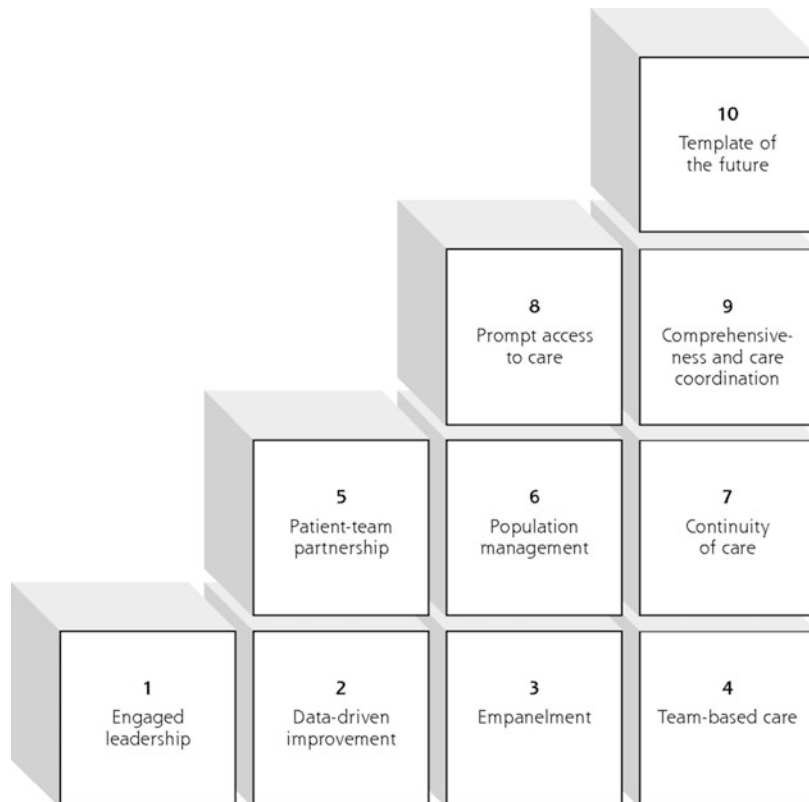
This re-defines the business model of primary care and requires the primary care practice to know their own costs per empaneled patient rather than just knowing their own charges and collections minus costs per visit. In a sense, negotiating value-based payor contracts means that the practitioner must understand what drives the payer's costs and where the potential savings might come from improving patient outcomes.

Engaging in population medicine can have broad benefits for an entire patient panel and community. Increasing influenza vaccination rates in the practice through standing orders and patient reminders can decrease adverse clinical outcomes and increase "community immunity." At the same time, engaging in population medicine as a business model for primary care practice quickly draws attention to the 80–20 rule, that is, 20% of patients may generate up to 80% of the hospital bed-days and total cost of care. For this reason, payers engaged in population health management will use sophisticated "predictive analytics" to identify which patients are likely to be their high-cost high-utilizers and may seek to engage the primary care practitioner in more intensive care management of these patients. Patients risk-stratified as potentially high-utilizers may require "high touch" strategies to assure their healthcare needs are being met, even if they do not choose to come in for regular visits. Such patients may require various engagement or support strategies, such as emails, texts, or phone calls, weekly telehealth encounters, care navigation, home health services, mental health support, or even social work assistance with housing or transportation issues.

Population Health Management

Health Systems, Provider Networks, and Accountable Care Organizations

The continuum of population health blurs the boundaries between payers, networks, and providers. Increasingly, health care networks and hospital-based health systems engage in value-based care models, which create a distinctly different business model and care model than fee-for-service medicine. One example of population health management at the health system level is the Southcentral Foundation, an Alaska Native-owned, nonprofit health care organization. It emphasizes family-centered, relationship-based care for customer-owners who are at the center of all healthcare decision-making. They practice integrated behavioral and primary care in healthcare teams that also include culturally relevant native healers. The Southcentral system has demonstrated a rigorous ability to focus on outcomes and process measures in continuous data feedback loops to achieve transformational outcomes. A 40% drop in ER visits and a 36% drop in hospital stays represent not only less human suffering events, but also a strong impact on economic cost trends.

Hospital health systems and their network of affiliate physicians may now coalesce into accountable care organizations (ACOs), one form of what CMS refers to as advanced payment models. ACOs accept payments and enter into financial risk sharing agreements, initially with Medicare but often expanding into similar arrangements with Medicaid or with commercial payers. The formation of an ACO demands additional capacities including more sophisticated data management capabilities for feeding back outcomes such as emergency department visits to provider care management teams in real-time, alongside population health data management techniques including defining the denominator population (*attribution*), defining clinical and financial outcome metrics, understanding the utilization and cost variables that drive financial outcomes. Data are also needed on clinical risk factors and comorbidity profiles that drive adverse clinical outcomes (*predictive analytics*), and matching "touch levels" of how often and how frequently the practice calls, visits, or communicates with patients to their level of risk for adverse clinical outcomes, high utilization, and costs.

Predictive analytics not only allow for actuarial projections of utilization and financial risk, but also help to define risk stratification tiers and potentially preventable adverse outcomes. The aim is to determine the financial impact and

resource utilization that a patient will have on the system.

There are a plethora of risk adjustment models that exist for this purpose [8]. In one study that compared the Acute Physiology and Chronic Health Evaluation, Sequential Organ Failure Assessment score, Charlson co-morbidity index, Model for End-Stage Liver Disease score and Simplified Acute Physiology Score (SAPS), SAPS appeared to perform best for predicting short term mortality. Otherwise, all of the methods seemed to perform similarly [9]. However, comorbidity scores created (and validated) for predicting in-hospital mortality are giving way to often-proprietary risk-scoring tools validated for predicting risk of hospitalization and/or total cost of care, such as the Ambulatory Care Grouper (ACG). Schneeweiss compared six approaches based on demographic and comorbidity profiles to find distinct differences in their accuracy regarding predicting utilization, and each of these methods was enhanced by adding data on numbers of prescribed medications [10].

To some extent, however, managing population health outcomes even at the ACO or health system level still depends on the power of the Family Physician and patient dyad, as well as the primary care team's effectiveness in helping its panel of patients to achieve optimal health outcomes. Combining this front-line connectedness with rapid-cycle data feedback loops that provide real-time information on patient utilization (emergency department visits, failure to refill needed medications, polypharmacy from seeing multiple providers, etc.) can enhance even further the effectiveness of the primary care team.

Population Health

Community Health and Social Determinants

Beyond population medicine or population health management, that is, the effort to manage healthcare delivery and health outcomes for groups of identified patients, is the broader notion of population health. While in population medicine or population health management, the population is typically defined by insurance payer source, health system, medical provider, or sometimes disease state (e.g., mental health carve-outs) [11], community health typically defines its population by geography (e.g., neighborhood or zip code) or by jurisdiction (parish or county) or by a vulnerable subset of a local population (e.g., homeless, migrant farmworkers) or by high-disparity racial sub-groups (e.g., the black or African American community). In the 1940s, two family physicians (Drs. Emily and Sidney Kark) began developing the conceptual framework of Community-Oriented Primary Care in partnership with communities, establishing more than 40 community health centers across South Africa. They describe their model in terms of "community medicine and primary health care as a unified practice," using the primary care practice as a base of operations, but focusing outward on the identification of community needs and the development of potential interventions in partnership with the community, followed by the implementation of interventions and re-assessment of targeted outcomes to dynamically improve the intervention with each iteration (Fig. 3) [12].

Ultimately, we seek to move beyond measuring disease-specific morbidity and mortality and to more generally assess the *health* of the community.

Population health cannot be assessed and fully addressed without taking into consideration the drivers and determinants of health outcomes, social determinants of health and health equity. Williams and others have framed this by saying that *"your zip code is more important than your genetic code in determining health outcomes."* The determinants of health are the conditions in which people live, work, move, breathe, and play that influence overall health. Environment significantly contributes to each individual's health not just at one moment in time, but in all places (whether physical, mental, emotional, social, spiritual, financial, or intellectual) with which one interacts in their socioeconomic and cultural contexts over time.

Many factors impact the health of populations over the course of life. Factors at the individual,
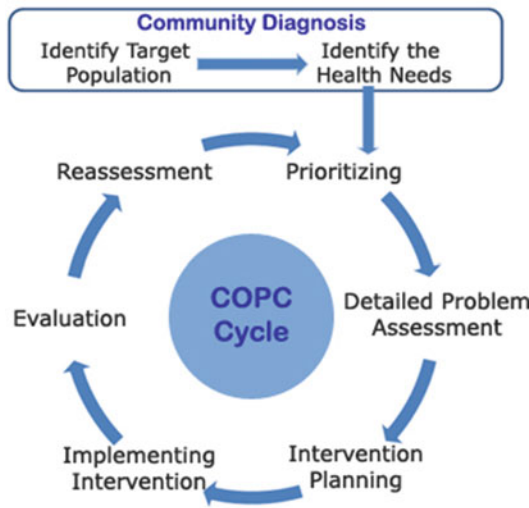
Fig. 3 Community-oriented primary care Model. Integrating Primary Care and Public Health: Learning for the Community-oriented Primary Care Model [12]. (The figure derived from the original version published in 2003 was created by Dr. Joo et al. at Columbia university. Primary Care Online Resources and Education. Prevention – Community Oriented Primary Care [Internet]. Columbia NY: Columbia University [cited 2020 July 11]. Available from: PCORE website. Used with permission)

family, community, systems, and policy level create environments that promote healthy lifestyles and facilitate access to nutritious food, clean water, clean air; primary care including preventive services and behavioral health; quality education from early childhood; good jobs with fair pay; and minimize toxic stress, discrimination, and racism. The opposite is quite true – that if someone is exposed to unhealthy living spaces, stressors early on and over time, that individual is more likely to carry a substantial allostatic load that is associated with endovascular and neurohormonal pathology. They may also be more likely to engage in health risk behaviors, and experience poor health choices early in life with subsequent increased risk of chronic diseases, mental health problems, and premature death [13].

Family physicians recognize that health as not merely the absence of disease, but as wholeness in multiple domains, such that people and communities have the opportunity to live well and thrive. The practice of population medicine and population health calls us to return to a commitment to

treating patients in the context of family and community.

The complex causation of health behaviors, health disparities, and adverse health outcomes at the community level requires multidimensional interventions to achieve even simple outcomes. For example, improving rates of initiation of breastfeeding in a community might start with creating a culture of normalization and encouragement of breastfeeding in the workplace and other public areas, offering private areas to breastfeed that are well publicized and accessible, and providing an area to pump and store milk in the workplace. Family physicians can be leaders in incorporating these elements into their practices, while also offering brief breastfeeding education to every pregnant patient at each prenatal visit. At a community level, breastfeeding coaches can be trained and supported, faith communities can provide both messaging and social support, and media (both traditional and social media) can be engaged in broader public campaigns.

To be effective in achieving collective impact requires a re-thinking of our practice role, as well as a new understanding of our communities. Too often, high-disparity neighborhoods have been characterized by deficits or needs-assessments, including degrading terms such as poverty, deprivation-index, or broken-windows index. Community health development models such as asset-based community development (ABCD) require a balanced approach that also sees the strengths and resiliency of communities and works to inventory and build on their resources and assets. This is not work that can be done at a distance. It is foundationally built on trust-based relationships with members of the community who also have trust-based relationships with other members of the community. The person who claims to be a community leader may not indeed "speak for the community." Only relational trust developed over years will be effective across the diversity and within-group heterogeneity that is characteristic of community populations.

Community health centers (CHCs), migrant health centers, and federally qualified health centers (FQHCs) are community-led organizations

which receive federal grant funding from the Health Resources and Services Administration (DHHS/HRSA). While many serve primarily as a comprehensive, culturally relevant healthcare delivery system for uninsured and underserved patient populations, their origins were in community health development for the purpose of transforming the health of communities themselves.

Public Health

Public health can be defined broadly as all the "public, private, and voluntary **entities**" working together to achieve health of the public in a geographically (or jurisdictionally) defined population. The dependence on an interconnected web of agencies and stakeholders is illustrated in Fig. 4 [14].

However, a subset of public health is a set of highly structured activities conducted through formally defined agencies at various levels from county or parish health departments and state health departments, which are in turn connected

with federal activities such as the Centers for Disease Control and Prevention.

While these agencies may differ substantially from one community to another in structure and in the extent to which they provide direct services (versus "assuring" that services are being offered in the community), their role has been summarized in these ten essential functions of public health (Fig. 5) [14].

Some health departments offer primary care, although less so in recent years. More often, direct patient care may be provided in categorical services, tied to specific lines of state or federal funding. These might include family planning and immunization programs, for example.

Public health departments also have a specific focus on communicable diseases – treating and tracking individuals with some historically high-impact infectious diseases such as tuberculosis and syphilis to protect the public. When new conditions emerge, as did HIV/AIDS in the 1980s, or COVID-19 in 2020, public health agencies are on the front lines of identifying cases, surveilling for outbreaks, tracing contacts, and
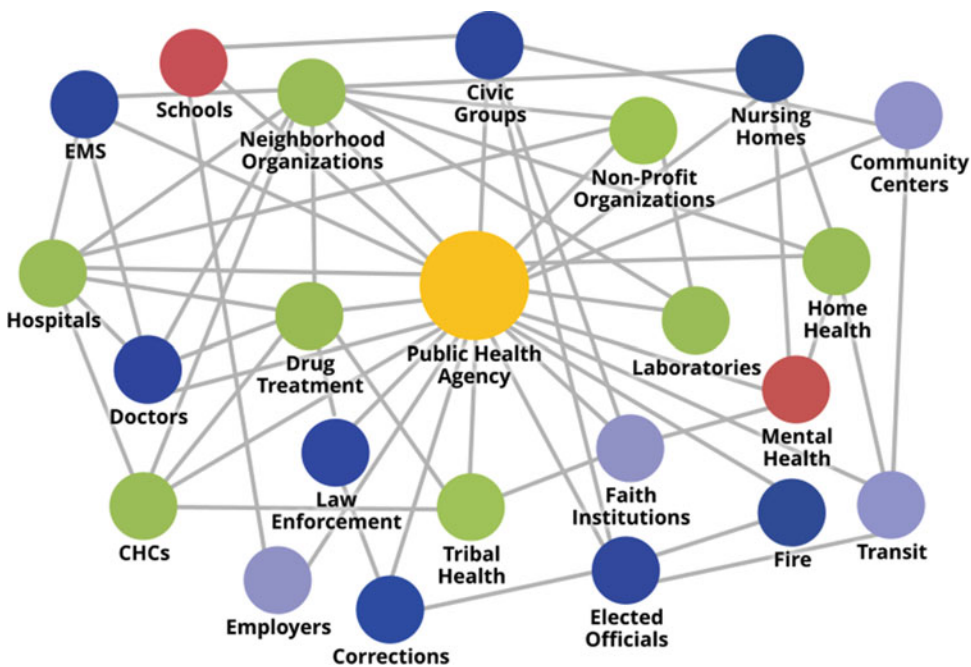

Fig. 4 The dependence on an interconnected web of agencies and stakeholders (CDC). Centers for Disease Control [14]. (Used with permission)

Fig. 5 The 10 Essential Public Health Services. Centers for Disease Control [14]. (Used with permission)

even enforcing isolation for infected patients or quarantine for those exposed.

Public health may be contrasted with population health management by its focus on primary prevention, in areas such as encouraging healthy lifestyle, diet, and exercise. They may specifically engage in obesity prevention, tobacco programs, HIV prevention, and community health education. Public health may also focus on key health status indicators, such as infant mortality, and may direct specific attention to disparities in outcomes. The black-white infant mortality gap, for example, can be measured for public awareness and the development and assessment of interventions by broader community coalitions. This primary prevention focus contrasts with managed care population medicine, which tends to focus on secondary and tertiary prevention for persons with significant health issues and multimorbidity.

Health Policy

It is easy to see the direct connection between the health of the US population and health policy interventions such as the Affordable Care Act (ACA), or the state-level decisions to expand (or not expand) Medicaid coverage to all persons with incomes below 138% of the federal poverty level. Not only did the ACA expand affordable

health insurance coverage to millions of Americans, it expanded on previous legislation such as the Mental Health Parity Act of 1996 (MHPA), which provided that large group health plans could not impose limits on mental health benefits any greater than those imposed on medical/surgical benefits. This was further extended by the Mental Health Parity and Addiction Equity Act of 2008 (MHPAEA) to cover substance abuse treatment parity.

In the prevention realm, initiatives such as the Vaccines for Children program have an obvious connection to health, but safety legislation such as the 1966 National Traffic and Motor Vehicle Safety Act and the related Highway Safety Act have also had a major health impact, reducing automobile-related fatality rates (which by 1965 had become the leading cause of death for adults under age 40) by over 50%.

Further, our increasing awareness of the social determinants of health leads to a much broader understanding of how policy and legislation can drive health outcomes. Both state and federal policies related to crime and the "war on drugs" led to mass incarceration, disproportionately affecting persons of color despite relative equality in actual use of drugs across racial-ethnic groups. Having a prison record dramatically affects employability and long-term economic opportunities, which are directly tied to a person's opportunity to achieve and maintain optimal health. Homelessness has a profound effect on health, leading some communities to adopt a "housing first" approach to helping the homeless and others to seek larger-scale solutions to affordable housing.

Structural, institutional racism affects individuals in such diverse ways as harsh inequality of public schools across racially defined neighborhoods, which often followed from residential segregation and the redlining of neighborhoods, which is tied to the profound racial wealth gap that far exceeds the more well-publicized problem of income inequality. Examples abound –neighborhoods of color are often centered in food deserts, and food insecurity is closely associated with long-term obesity. Toxic waste sites are geographically situated in low-income communities, as are point sources of industrial air pollution,

giving rise to an entire field of advocacy known as environmental justice.

At local and state levels, this understanding has led to a demand for "health in all" policies, starting with a requirement that health impact assessments be undertaken for any new development or project, whether a new highway or new business construction, or new crime legislation. A health-in-all approach to the effects of incarceration as a societal means for addressing issues of substance abuse or mental illness might lead to more aggressive efforts at diversion such as mental health courts or drug courts, as well as an increased devotion of resources to child mental health services as an alternative to the juvenile justice system.

Family Physicians often have the ideal combination of training, knowledge, experience, and front-line observations to be effective advocates for "health-in-all" policies in their own community, as well as at the state and national levels. Discipline is required to advocate for and with members of our community on behalf of our patients, rather than on behalf of our profession.

Even as this chapter is being written, a worldwide pandemic of the novel Coronavirus designated as COVID-19 is overwhelming healthcare delivery systems and dramatically impacting population health outcomes (morbidity and mortality) across the United States and across the world. In this moment, we begin to understand that the health of all people in our nation and in our world is *our* health. We are all interconnected. Individual health outcomes not only add up to aggregated population health indicators, but population health factors can affect our own individual health.

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