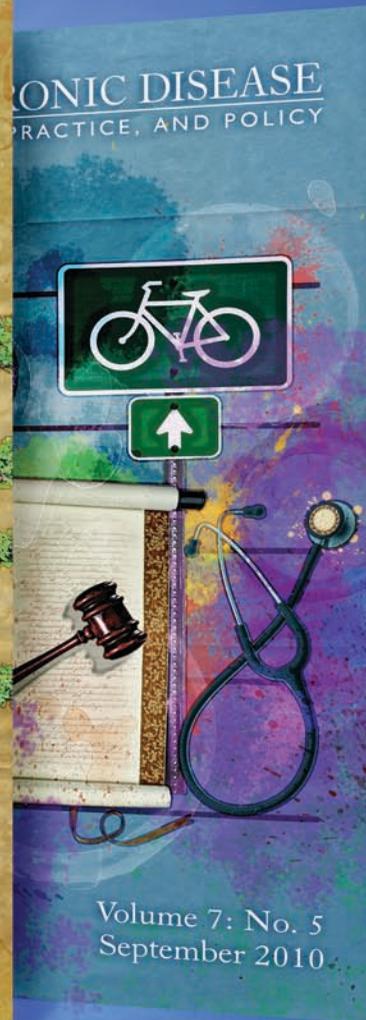
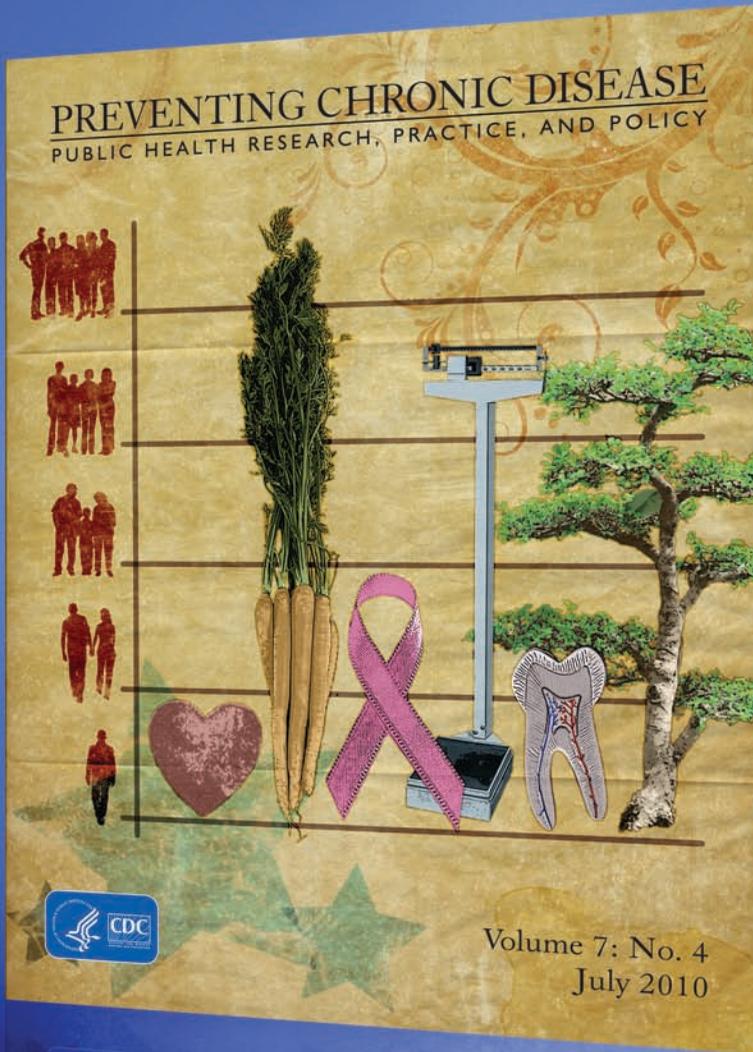


PREVENTING CHRONIC DISEASE

PUBLIC HEALTH RESEARCH, PRACTICE, AND POLICY



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Mobilizing Action Towards
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PREVENTING CHRONIC DISEASE

PUBLIC HEALTH RESEARCH, PRACTICE, AND POLICY

Mobilizing Action Toward Community Health (MATCH) – JULY 2010

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ESSAY

Mobilizing Action Toward Community Health (MATCH): Metrics, Incentives, and Partnerships for Population Health

David A. Kindig, MD, PhD; Bridget C. Booske, PhD; Patrick L. Remington, MD, MPH

Suggested citation for this article: Kindig DA, Booske BC, Remington PL. Mobilizing Action Toward Community Health (MATCH): metrics, incentives, and partnerships for population health. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/10_0019.htm. Accessed [date].

How are we doing — and how can we do better? These are perhaps the most basic questions a community can ask regarding the health of its residents. Yet communities have not been given the necessary tools to answer these questions with validated, consistent measures, evidence-based policies and practices, and incentives for improvement.

In response to this need and with funding from the Robert Wood Johnson Foundation, we initiated a project called Mobilizing Action Toward Community Health (MATCH) at the University of Wisconsin-Madison Population Health Institute (1). We created a logic model (Figure) that guides our work and demonstrates the principal activities of 1) producing county health rankings in all 50 states, 2) examining partnerships and organizational models to increase involvement and accountability for population health improvement, and 3) developing incentive models to encourage and reward communities that implement evidence-based programs and policies that improve population health.

We believe that together these efforts will increase awareness of the multiple determinants of health, promote engagement by a more diverse group of stakeholders, and stimulate development of models that promote evidence-based programs and policies — eventually leading to improved health outcomes and reduced health disparities.

The most visible product of this effort so far is the county health rankings (2) released in early 2010. Several other components of our project, based in part on a proposed “pay-for-population-health” performance system advanced in 2006 (3), are aimed at understanding how we might best support population health improvement at the community level. To that end, we commissioned 24 essays to

critique the assumptions underlying such a system and to suggest approaches for overcoming potential barriers to its implementation. We worked with these authors, MATCH and Robert Wood Johnson Foundation staff, and several guests in a 2-day meeting in late 2009 in Madison to discuss the essays and develop an agenda for future practice and research activities for

improving population health.

In this issue of *Preventing Chronic Disease*, we present the 7 essays on population health metrics (4-10), introduced by 2 commentaries (11,12). These essays describe the types of tools that can be used to measure and

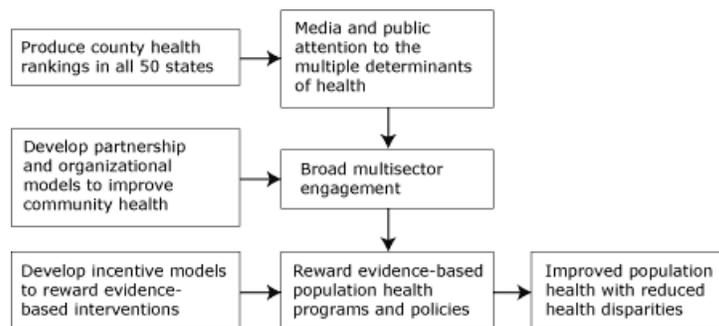


Figure. The Mobilizing Action Toward Community Health (MATCH) logic model. This model shows how incentives can be used to improve population health and reduce health disparities.

monitor the health of populations and are the first of 3 sets of essays to appear in this and the next 2 issues.

The next set of essays will describe incentives that can be used to promote programs and policies that improve population health, and the role for population health partnerships in these efforts. The final set will summarize the discussion of the 2009 meeting and outline cross-cutting themes and priorities for research and practice in population health improvement. We hope that the essays will stimulate discussion and mobilize action that improves population health outcomes in the coming decade.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation. We thank the Robert Wood Johnson Foundation for its financial and conceptual support, the authors for their hard work, Erika Cheng and Joan Fischer for editorial assistance, and the editor of *Preventing Chronic Disease* for his support and encouragement in presenting this series of articles.

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ESSAY

Evaluating Metrics to Improve Population Health

Linda T. Bilheimer, PhD

Suggested citation for this article: Bilheimer LT. Evaluating metrics to improve population health. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/10_0016.htm. Accessed [date].

Introduction

The 7 metrics articles in this issue of *Preventing Chronic Disease* address the following topics: public health policy (1), health care access and quality (2), social and economic determinants (3), health behaviors (4), environmental metrics (5), population health outcomes (6), and health inequalities (7). The articles differ in the degree to which they establish a conceptual framework for linking metrics to rewards to improve population health. Their different perspectives raise questions of whether these metrics should meet certain criteria, regardless of domain, or whether some flexibility in the criteria for assessing metrics is necessary and desirable. Questions that arise in establishing such criteria relate to structure and function as well as data availability.

Structure and Function of Population Health Metrics

In establishing a framework for linking performance incentives to population health metrics, researchers must answer multiple questions.

Are the measures actionable? If so, at what level and by whom? Although these articles focus on community-level interventions, not all the suggested metrics seem to be actionable at that level. Nor would they necessarily be applicable for the range of organizations and agencies that affect population health in communities. A related

question is whether all metrics should be actionable. Some of the suggested metrics — such as those in the socio-economic domain — are contextual variables that influence health status and health care access and use and should be taken into account in assessing community-level performance. Such metrics may be actionable at the state or national levels, rather than the community level.

Are the measures sensitive to interventions? If so, within what time frame? A system for rewarding initiatives to improve population health needs metrics that not only respond to interventions but also do so in a realistic time frame for incentives to be meaningful. As the population health outcomes article points out, for example, life expectancy and age-adjusted mortality are measures of population health that are amenable to intervention, but not necessarily in a realistic time frame (6). Also important is whether metrics are sensitive to interventions at different levels: upstream, midstream, and downstream. Those terms may have different meanings in different contexts and domains. The authors of the public health policy article (1), for example, describe upstream approaches as those with the potential to affect large populations through regulation, increased access, or economic incentives. They classify interventions in organizations, such as worksite health improvement programs, as midstream, and individual-level behavioral approaches as downstream. The environmental metrics article (5) contrasts environmental factors, such as air quality, that affect human health directly and proximately with upstream factors, such as a community's energy sources, that affect health indirectly. In the social and economic determinants article (3), upstream refers to the social determinants of health.

Are the measures affected by population migration? This question is of particular relevance for analyzing community-level health metrics, especially longer-term,

because the composition of local populations can change substantially. Changes in life expectancy over time at the community level, for example, will reflect changes in population composition as well as changes in underlying health status.

Are the measures easily understood by collaborating organizations, policy makers, and the public? The need for simplicity and easy comprehension is a common theme in several of the articles (1,5-7). When complex measures — such as the univariate inequalities measure, which assesses overall inequality across a population, regardless of association with other attributes (7) — are proposed, one question that arises is whether an effective communications strategy could facilitate understanding. Although metrics linking workforce health status and productivity have been established, the business case for addressing the health of communities may be less clear (8).

Is the meaning of an increase or decrease in a measure unambiguous? For most of the suggested measures in the articles, a change in a given direction can be readily interpreted as positive or negative. For some measures, however, the implications of a change in a particular direction may be unclear. In the case of participation in social welfare programs, for example, higher participation rates may reflect increased economic hardship in a community (negative), more effective outreach to the low-income population or more generous eligibility criteria (positive), or both.

Do the measures stand alone or are they aggregated into an index or summary measure? The articles differ in the extent to which they recommend aggregation. The outcomes and inequalities articles (6,7) promote the use of summary measures — exclusively in the case of inequalities — and the socioeconomic determinants article (3) suggests the possibility of using an index or identifying complex measures by using factor or principal component analyses. A major advantage of a summary measure is parsimony; having a large number of metrics can lead to loss of focus, which a single measure avoids. In the case of a weighted measure, however, reaching agreement on the appropriate weights may be difficult and ultimately subjective. Several of the previous questions, moreover, have particular bearing on these more complex types of measures. Is their meaning clear to users? Are they readily actionable? Are they responsive to interventions? Does a change in a given direction have an unambiguous inter-

pretation? The answers to those questions depend in part on whether a complex measure can be disaggregated into meaningful components. In that regard, the inequalities article (7) provides an example of how to isolate the contributions of different attributes to an overall measure of inequality, thereby guiding intervention priorities.

Are the measures uniform across communities? Although measures need to be comparable across communities, some flexibility may be necessary. In the case of health determinants, the particular domain is pertinent. One could make a case for standard measures of behavioral risks, for example, because such risks are not community-specific. However, environmental issues vary widely among communities, leading those authors to suggest that communities should be involved in both defining and using environmental metrics (5). A possible approach, at least for some domains, is to have a core set of standard measures, with additional measures selected by the community.

To what extent do measures address disparities as well as overall burden? The articles adopt different perspectives toward disparities. The health care article (2) proposes a single measure to track disparities, whereas others (1,5,6) suggest that the ability to identify and monitor disparities should be an integral feature of all measures. However, the health policy article (1) points out how disparities assessment is limited in that domain. Notably, most of the articles assume a bivariate approach to disparities measurement rather than the univariate approach that the inequalities article (7) recommends.

Can unintended consequences be tracked? None of the articles mentions the potential for unintended consequences that may result from the use of certain metrics in an accountability-based system — an issue that has arisen in the clinical setting. If incentives reward improvements in specific population health measures, tracking additional metrics may be necessary to ensure that any improvements do not come at the cost of deterioration in other population health domains.

Data Availability for Population Health Metrics

Having reliable and valid measures to provide incentives to improve population health depends on the availability

of high-quality, timely data. A consideration is whether data availability should drive the choice of metrics or whether alternative data strategies should be explored. The articles have different perspectives on this issue, reflecting the variation in data availability in domains, which in turn reflects such factors as changing survey technologies (including the shift to multimode surveys), the rapid development of health information technology, the extent of administrative data systems, data linkage and integration, and the potential for modeling. Several questions have bearing on data decisions and choice of metrics.

Do the available data correspond to the geographic level of the intervention? This question is particularly relevant to community-level interventions because many national surveys do not have sufficient sample sizes to produce local estimates. As the health behaviors article points out (4), even if local estimates can be produced, the standard errors may be so large that they make responses to interventions difficult to detect. For the same reason, cross-sectional differences among communities may also be difficult to identify, and community rankings based only on point estimates may be quite misleading. The heavy microdata demands of the univariate approach to disparities measurement that the inequalities article promotes (7) would make that approach particularly difficult to implement at the local level.

How timely are the data? Rewarding performance requires recent data that are released on a regular basis. The need for current data may affect strategies for addressing small sample sizes in communities; aggregating data over several years to boost sample size limits the sensitivity of a measure to detect changes in response to an intervention.

Are the measures reliable and valid? Although the articles mention the need for reliability and validity, they do not indicate how they would assess the measures that they propose.

Can the measures be produced for population subgroups? Tracking racial/ethnic, socioeconomic, and other disparities requires far more extensive data and much larger survey sample sizes than does monitoring population health overall. These data demands pose substantial challenges for identifying and tracking disparities at the community level.

Are indirect methods of estimation appropriate?

New tools for indirect estimation, including data integration and linkage, Bayesian estimation, and systems modeling, offer potential strategies for developing community-level estimates, including estimates for subpopulations. The environment article (5) provides an example, highlighting the role of geographic information systems in linking health determinants and outcomes over spatial scales. Concerns include how to assess the reliability and validity of indirect estimates and how to communicate findings effectively. Skepticism about modeled estimates may limit their use for policy decisions.

Should data reporting be part of an incentive-based population health improvement system? This idea was raised in a recent Institute of Medicine report on addressing disparities in health care quality (9) and deserves discussion in a population health context.

Conclusion

As policy makers consider strategies to promote improvements in population health, measurement may provide powerful incentives for change, but selecting reliable and valid health metrics that can be tracked consistently across communities is challenging. The 7 articles in this issue illustrate many of the complexities that policy makers must consider in selecting such metrics, and the articles lay the groundwork for ongoing discussions on this topic.

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ESSAY

Using Metrics to Improve Population Health

Robert M. Pestronk, MPH

Suggested citation for this article: Pestronk RM. Using metrics to improve population health. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/10_0018.htm. Accessed [date].

Introduction

The Mobilizing Action for Community Health (MATCH) project proposes an incentive system that would reward improved health at the population level. Such incentives depend on metrics, but how should metrics be selected?

A logic model with theoretical, philosophical, or political grounding is an essential first step. A model conceptualizes the production of population health, and metrics are chosen on the basis of that conceptualization. To achieve population health, for example, should we seek improvements in access to care, in medical or disease conditions, or in the social, political, and economic underpinnings of society itself? Metrics are the yardstick by which assumptions in the model will be tested. They measure evidence of actual inputs, outputs, and outcomes. When choosing metrics associated with incentives, we must decide what type or magnitude of change we seek.

What population's health should improve? Metrics can be applied to many units of analysis: a random collection of people; a family; an economic class or racial group; a neighborhood, city, region, or country; a commercial enterprise; or a subpopulation in any of these populations. Data must be available for the unit of analysis.

Although we can envision models (and metrics) that account for the range of political, social, and economic constructs thought necessary to improve population health, we must decide whether metrics should be selected for all

constructs — or whether it is even politically possible to apply incentives across a broad range of areas. American culture is highly pluralistic and politically resistant to such a large-scale, comprehensive approach. No single body controls all these aspects of American public, private, personal, and organizational life enough to hold accountable all entities to which potential incentives apply.

It may be wiser to choose metrics associated with better health for a specific economic, racial, or ethnic group, for example, than for all groups collectively. Even this narrower focus on one group's health can be politically challenging if it is seen to be at the expense of another group or stigmatizes that group.

The Essays

The essays in this issue of *Preventing Chronic Disease*, solicited on behalf of the MATCH project, describe the characteristics of metrics and provide advice, support, and caution regarding their selection. They characterize the ideal metrics as having the following characteristics:

- simple, sensitive, robust, credible, impartial, actionable, and reflective of community values (1)
- valid and reliable, easily understood, and accepted by those using them and being measured by them
- useful over time and for specific geographic, membership, or demographically defined populations (2)
- verifiable independently from the entity being measured
- politically acceptable
- sensitive to change in response to factors that may influence population health during the time that inducement is offered
- sensitive to the level and distribution of health in a population (2,3)

- responsive to demands for evidence of population health improvement by measuring large sample sizes (4)

Metrics associated with structure (inputs or activities in the logic model framework, eg, the number of people employed or the number of people who have received training in some aspect of their work) or process (eg, the number of activities undertaken in the service of an outcome) could be considered if theory or practice associates these metrics with population health or precursors to population health. “Outcome” metrics measuring specific aspects of clinical health or the cultural foundations that influence clinical health may be desirable, but change in the outcome(s) of interest may not be achievable soon enough for reasonable incentives to be applied.

Measures of people (demographics), the things they do (behaviors), the things that are “done” to them (policy and practice), or their context may be of interest (5,6). A model that recognizes interconnectedness argues for one or more metrics for each of these domains of influence and may reward the type of collaboration and accountability necessary for sustained improvement. Metrics associated with collaboration and accountability can be selected. Increasing evidence indicates that social and economic environments shape resources, opportunities, and exposures, which themselves are outcomes subject to influence and, therefore, rich as a source of metrics (6).

Measurable health outcomes are not just influenced directly (6). For example, health outcomes are subject to changes in crime, environmental hazards, or socially patterned sources of toxic exposures such as landfills, power-generating facilities, truck idling lots, or congested roadways near neighborhoods. Changes in such place-based attributes may be measured in the short term as ends in themselves or as associated in the longer term with measurable clinical outcomes. Aspects of neighborhood (crime, poverty, social distrust, and discrimination) are stressors that can lead to disease through direct neural, neuroendocrine, and immune system pathways. Other indirect pathways include access to housing, food, health care services, or employment opportunities, which themselves are measurable.

Individual or composite metrics can be selected (3). Individual metrics measure a single factor (one contributing to an outcome, eg, the number of people receiving a particular service or benefit) or an outcome itself (eg, num-

bers or rates of obese people). Composite metrics combine many individual metrics into an aggregate metric thought to better represent the totality of effort. Rankings of the best colleges or communities often reflect this approach. Composite metrics add an element of subjectivity because they ultimately depend on how each component in the aggregate is weighted. These weightings present a political challenge. The entities being offered incentives should concur that the weightings are realistic or relevant.

A successful population-based health incentive system will use metrics that account for the object of the incentives, that can identify change in the timeframe during which the incentives are available, that are realistic for the resources in hand to effect the change desired, and that can be measured effectively (7). We can choose metrics on the basis of what is known to work or allow experimentation. Quality improvement culture demands experimentation, but on the other hand, using proven metrics can force standardization of process before that practice is known. Metrics that ignore countervailing conditions, insufficient time, or political obstinacy can lead to inappropriate reward or penalty.

Lasting interventions that affect population health occur at multiple levels: upstream with large population effect (eg, regulation, taxation, access, economic incentives), midstream (eg, worksite programs), and downstream (eg, individual approaches) (3). Ideally, metrics would be chosen to reflect each of these levels. Such a metric-based performance improvement process would encourage cross-sector collaboration and recognize the systemic precursors to population health.

Summary

The following guidelines can help ensure that metrics are applied in meaningful ways for rewarding improved population health:

- Determine the problem that needs to be solved.
- Create a visual model that explains the causes of the problem and potential solutions.
- Use an acceptable metric to measure the problem over time so that change can be objectively documented.
- Approach selection of the problem, the solutions to be attempted, and the methods associated with each keeping continuous quality improvement in mind.

- Use a metric that can quantify the problem in real time at the beginning and end of the incentive period.
- Choose a characteristic to measure that is amenable to change.
- Choose a reward or penalty associated with the metric that is of sufficient value to induce the intended change.
- Ensure that the entity being offered the incentive has sufficient control over itself and others to change in ways and magnitudes measureable by the metric.
- Ensure that the entity has sufficient resources (eg, staff, funding, influence, authority) to effect the change.
- Determine when the incentive will be awarded (eg, at the start of the effort to effect change, throughout the effort to produce change, or withheld pending final measurement).
- Assure that the incentive associated with the metric will be awarded.
- Plan to develop new metrics if present metrics prove inadequate.

The challenges associated with choosing the right metrics are many and in some sense antithetical to the ways American political, social, and economic systems work. We often chafe under regulatory and financial frameworks and game such systems to our own advantage. We can be oriented to self rather than to the “public.” Nevertheless, it is possible over time to build the broader consensus necessary to improve population health. After all, as a society, we have reduced exposure to tobacco, built sanitary sewer and water systems, achieved nearly universal childhood vaccination, and met other population health goals that were once considered unlikely. Metrics are the means through which we can continue to help communities see the value of working collaboratively for the health of their residents.

Acknowledgment

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Measuring Population Health Outcomes

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Suggested citation for this article: Parrish RG. Measuring population health outcomes. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/10_0005.htm. Accessed [date].

activities undertaken by national or regional health systems are unimportant; quite the contrary. But our understanding of their roles and importance is more appropriate if guided by the real “bottom line,” namely their influence on population health.

PEER REVIEWED

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Abstract

An ideal population health outcome metric should reflect a population's dynamic state of physical, mental, and social well-being. Positive health outcomes include being alive; functioning well mentally, physically, and socially; and having a sense of well-being. Negative outcomes include death, loss of function, and lack of well-being. In contrast to these health outcomes, diseases and injuries are intermediate factors that influence the likelihood of achieving a state of health. On the basis of a review of outcomes metrics currently in use and the availability of data for at least some US counties, I recommend the following metrics for population health outcomes: 1) life expectancy from birth, or age-adjusted mortality rate; 2) condition-specific changes in life expectancy, or condition-specific or age-specific mortality rates; and 3) self-reported level of health, functional status, and experiential status. When reported, outcome metrics should present both the overall level of health of a population and the distribution of health among different geographic, economic, and demographic groups in the population.

By far, the most fundamental use of summary measures of population health is to shift the centre of gravity of health policy discourse away from the inputs . . . and throughputs . . . of the health system towards health outcomes for the population. This is not to imply that the resources used and

Definitions and Introduction

The World Health Organization defines health as “the state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (2). To achieve this vision of health for its members, a healthy society must establish and sustain conditions, including a healthful natural and built environment, and equitable social and economic policies and institutions, that ensure the “happiness, harmonious relations, and security of all [its] peoples” (2,3). Positive health outcomes for people include being alive; functioning well mentally, physically, and socially; and having a sense of well-being.

The level and distribution of health outcomes in populations result from a complex web of cultural, environmental, political, social, economic, behavioral, and genetic factors (Figure). In this causal web, diseases and injuries are intermediate factors, rather than outcomes, that may influence a person's health. Lung cancer, for example, has a substantial effect on physical function and life-span, while first-degree sunburn has little effect. Health outcome metrics are standards for measuring health outcomes. Recommending a set of metrics for monitoring a population's health outcomes — as opposed to a person's health outcomes — is the objective of this essay.

Three approaches to measuring population health

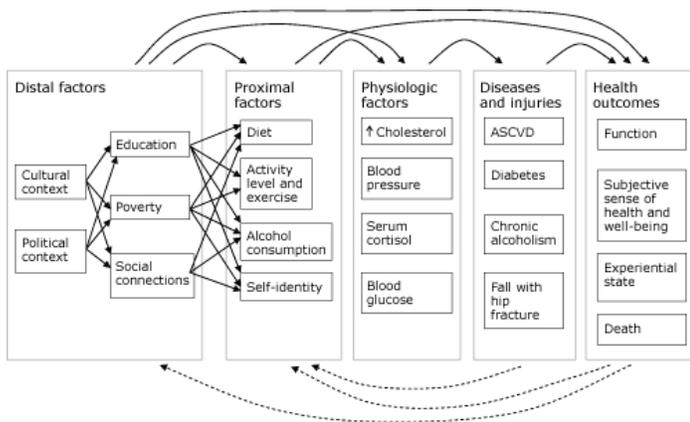


Figure. A causal web that illustrates various factors influencing health outcomes and interactions among them. Solid arrows represent potential causal relationships between factors, diseases, and outcomes. Dashed arrows represent potential feedback from outcomes and diseases on proximal and distal factors. Distal and proximal factors operate through both intermediate factors and directly on health outcomes. For example, a person's level of education can directly influence his or her subjective sense of health and level of social function and also influence intermediate factors, such as diet and exercise. Similarly, the understanding that death or loss of function may occur as the result of a person's lifestyle or social and economic factors, such as education and poverty, may influence those factors through either behavior change or changes in social or economic policy. Examples of factors, diseases, and injuries were chosen to provide a sense of the breadth of available factors. To improve readability, the relationships among proximal factors, physiologic factors, diseases and injuries, and health outcomes have been simplified. Adapted from references 4-6. Abbreviation: ASCVD, atherosclerotic cardiovascular disease.

outcomes are available: 1) aggregating health outcome measurements made on people into summary statistics, such as population averages or medians; 2) assessing the distribution of individual health outcome measures in a population and among specific population subgroups; and 3) measuring the function and well-being of the population or society itself, as opposed to individual members. According to the definition of a healthy population, the third approach is the most appropriate because it focuses on how well the population produces societal-level conditions that optimally sustain the health of all people. These societal-level conditions, although not yet fully characterized or understood, most likely include an equitable distribution of power, opportunity, and resources among a population's members; social connections and interactions built on norms of reciprocity and trustworthiness (3); and environmental policies and practices that sustain the quality of the population's land, water, air, native vegetation, and animal life. These societal-level conditions may be viewed as social, economic, political, and environmental

determinants of health, rather than as health outcomes, and as such are addressed by other articles in this issue of *Preventing Chronic Disease*. I focus on approaches to assessing population health outcomes in which measures of population health are constructed from the aggregation of individual-level health measures, such as mortality, functional status, and self-perceived health.

Basic Outcome Metrics for Population Health

Measures of mortality, life expectancy, and premature death

People and societies value life and health, although the relative value placed on long life versus well-being during life varies. Mortality and life expectancy are 2 basic measures of population health (Box 1).

The number of deaths that occur in a population during a period of time (usually 1 year) divided by the size of the population is the population's crude mortality. Because age is such a strong predictor of death and the age distributions of members of different populations vary, a population's mortality rate is commonly adjusted by using a standard age distribution to produce an age-adjusted mortality rate. The age-adjusted mortality rate allows comparison of mortality across different populations. One may also calculate mortality rate for a group in a population on the basis of a specific characteristic, such as age, sex, or geographic area, to yield a characteristic-specific mortality rate. Another method of assessing the effect of mortality on a population is to calculate the life expectancy of its members. Typically, this is calculated as the life expectancy at birth, although it may be calculated as the remaining life expectancy for any given age. Measures of premature death, including years of potential life lost and the premature mortality rate, quantify mortality among people younger than a particular age, typically 65 or 75 years.

Although these measures provide information about mortality and longevity, they provide no information about the contribution of specific diseases, injuries, and underlying conditions (for example, water quality, poverty, social isolation, and diet) to death, for which actions might be taken to prolong life. For this reason, disease-specific mortality rates are frequently used to

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Box 1. Examples of Population Health Outcome Metrics Based on Mortality or Life Expectancy
Mortality
Crude mortality rate
Age-adjusted mortality rates (AAMR)
Age-specific mortality rate
Neonatal (<28 d)
Infant (<1 y) (infant deaths per 1,000 live births)
Under 5 y
Adult (15-60 y)
Other characteristic-specific mortality rates
State- or county-specific
Sex-specific
Race-specific
Condition-specific mortality rates and similar measures
Disease-specific mortality rate
Injury-specific mortality rate
Leading causes of death
Smoking-attributable mortality (number of deaths)
Maternal mortality ratio
Occupational class-specific mortality rate
Life expectancy
Life expectancy at birth
Life expectancy at age 65 y
Premature mortality
Years of potential life lost
Premature mortality rate
Summary measures of population health
Health-adjusted life expectancy at birth (y)
Quality-adjusted life expectancy
Years of healthy life
Healthy life years
Disability-adjusted life years
Quality-adjusted life years
Inequality measures
Geographic variation in AAMR among counties in a state (standard deviation of county AAMR/state AAMR)
Mortality rate stratified by sex, ethnicity, income, education level, social class, or wealth
Life expectancy stratified by sex, ethnicity, income, education level, social class, or wealth

Box 2. Examples of Population Health Outcome Metrics Based on Subjective (Self-Perceived) Health State, Psychological State, or Ability to Function^a
Health state
Percentage of adults who report fair or poor health
Percentage of children reported by their parents to be in fair or poor health
Mean number of physically or mentally unhealthy days in the past 30 days (adult self-report)
Mean number of mentally unhealthy days in the past 30 days (adult self-report)
Mean number of physically unhealthy days in the past 30 days (adult self-report)
Experiential and psychological state
Percentage of adults with serious psychological distress (score ≥ 13 on the K6 scale)
Percentage of adults who report joint pain during the past 30 days (adult self-report)
Percentage of adults who are satisfied with their lives
Ability to function
Percentage of adults who report a disability (for example, limitations of vision or hearing, cognitive impairment, lack of mobility)
Mean number of days in the past 30 days with limited activity due to poor mental or physical health (adult self-report)
^a Categories adapted from reference 9.

illustrate the contribution of specific diseases to population mortality. Recent work extends this concept and proposes methods and measures for estimating the contributions of more fundamental causes to mortality, such as the distal and proximal factors exemplified in the causal web of the Figure (5,7,8).

Measures of health, function, and subjective well-being

Societies and their members typically value health both subjectively (freedom from pain and suffering, joy, happiness, sense of self-worth and value to others) and objectively (ability to perform physical, mental, and social tasks) (Box 2). Measuring health in a standardized way that allows comparisons among people, countries, and cultures and over time is challenging. Various approaches, some of which have proved controversial, have been developed and used in the past 40 years. They include methods to assess and classify the health, function, and

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disability of members of a population, for example, the International Classification of Functioning, Disability, and Health (10), and methods to estimate the overall health of populations.

Measurements of self-perceived or “self-rated” health, functional status, and experiential state typically rely on population health surveys, such as the National Health Interview Survey (NHIS) and the Behavioral Risk Factor Surveillance System (BRFSS) in the United States, the European Union’s Statistics on Income and Living Conditions, and the World Health Organization’s World Health Survey. Care must be taken, however, when comparing metrics derived from different surveys: the nature and wording of questions and the time period covered may differ. Furthermore, the interpretation of health categories, such as “good” and “poor,” may vary culturally among countries or even among different populations in a country. The authors of a recent study of 4 US national surveys even questioned whether self-rated health is a suitable measure for tracking population health over time because of inconsistencies in self-ratings over time among surveys and certain population subgroups (11).

Health-related quality of life (HRQL) indices are also used to quantify health and to analyze cost-effectiveness. These indices are based on interviewer- or self-administered questionnaires that address various health dimensions or domains, such as mobility, ability to perform certain activities, emotional state, sensory function, cognition, social function, and freedom from pain. Six such indices, several of which are proprietary, are used in the United States: the EuroQol EQ-5D; the Health Utilities Index Mark 2 and Mark 3; the Quality of Well-Being Scale, self-administered form; the SF-6D; and the HALex (12). More detailed descriptions of these indices are available (9,12). The Centers for Disease Control and Prevention has also developed HRQL measures that are used in BRFSS and the National Health and Nutrition Examination Survey (NHANES); these measures were recently validated against the SF-36v2 (13,14).

Although not direct measures of health and well-being, the incidence or prevalence of specific diseases and rates for accessing and using health care are frequently used as surrogates for disability, loss of function, or lack of well-being. Ascertaining the incidence and prevalence of disease may be accomplished through the use of disease registries, health records, and population surveys.

Summary measures of population health

Summary measures of population health have been developed in the past 40 years as an alternative to or extension of the basic metrics described above. The purpose of these summary measures is to “combine information on mortality and nonfatal health outcomes to represent the health of a particular population as a single numerical index” (15). These summary measures are based on reductions in life expectancy to account for disability or other measures of poor health; they provide estimates of either the expected number of future years of healthy life at a given age or the number of years that chronic disease and disability subtract from a healthy life.

In 1971, Sullivan described techniques for calculating 2 summary health indices — life expectancy free of disability and disability expectancy — by combining mortality rates from period life tables and survey-based disability rates (16). Subsequent work has produced other summary population health measures, including health-adjusted life expectancy, quality-adjusted life expectancy, years of healthy life, healthy life years (also known as disability-free life expectancy), disability-adjusted life years, and quality-adjusted life years. These measures vary by whether they use the actual or an idealized life expectancy for the population; whether they value all years of life and disability equally or discount certain years, such as childhood and old age; whether they are expressed as an adjusted life expectancy or as a sum of the years of disability for the entire population; and how they estimate the population’s health, prevalence of chronic disease, or prevalence of disability. Estimates of population health and disability are typically derived from either expert judgment in conjunction with published literature or survey data — both population and convenience samples have been used — on function, self-perceived health, and psychological or sensory distress. Along with continuing debate about methodologic issues, ethical concerns about the use of summary measures and the way in which they value life have been raised (15,17,18). Several excellent reviews on summary measures of population health and these issues are available (9,15,17,18).

Measures of the distribution of health in a population

Measures of the distribution of health in and among populations are as relevant as measures of the level of health in and among populations (15). Understanding the distribution of health can focus attention and action on

specific health determinants and population groups to reduce inequalities in health and improve the overall level of health. Although the distribution of health outcomes could be assessed on any measurable geographic, demographic, social, or economic characteristic, some researchers argue that health inequalities should be assessed by using specific social and economic characteristics that have historically determined social status (for example, wealth, ethnicity, sex, educational attainment) (19). Others suggest that this viewpoint excludes potentially relevant determinants of health (20). Metrics to assess the distribution of outcomes include measures of inequality (Gini index), measures of association (rate ratio), measures of impact (population-attributable proportion), and measures based on ranking (concentration index) (21,22).

Attributes of a Good Health Outcome Metric

Several groups have proposed criteria for assessing and selecting specific health indicators (Table 1). Their criteria include the need for the indicators to 1) further the goals of their organization, 2) be valid and reliable, 3) be easily understood by people who use them, 4) be measurable over time, 5) be measurable for specific geographically or demographically defined populations, 6) be measurable with available data sources, and 7) be sensitive to changes in factors that influence them, such as socioeconomic or environmental conditions or public policies (23-25).

Current Metrics for Population Health Outcomes

In 2008, Wold reviewed 35 sets of health indicators in use (26). Although not an exhaustive list, these 35 sets provide a representative view of health indicators and their intended uses, which include presenting a picture of the health of a place, stimulating action to improve health, and tracking progress toward meeting objectives (Table 2). No set of indicators is explicitly used as a guide to financially reward improvement in health outcomes.

Wold grouped the indicator sets into 4 overall categories: general health (14 sets), quality of life (5 sets), health systems performance (11 sets), and “other” (5 sets). She further divided the general health category into national (7 sets) and state and local (7 sets). These 35 indicator sets

contain various health measures, only a few of which are outcome measures. Frequently used outcome indicators are infant mortality rate, condition-specific mortality rate, age-adjusted mortality rate, years of potential life lost, life expectancy at birth, leading causes of death, and percentage of adults who report fair or poor health.

Data and Analytical Issues for Population Health Outcome Metrics

Available data sources

The principal sources of data available for US population health outcomes are mortality data derived from death certificates and data on subjective health status, functional status, and experiential state derived from population health surveys. The National Vital Statistics System (NVSS) collects and compiles data on births and deaths from all registration districts (most commonly states) in the United States. The most commonly used surveys are NHIS, BRFSS, NHANES, and the National Survey on Drug Use and Health (NSDUH). Several states conduct city- or county-level risk factor surveys by using BRFSS methods and questions, and an increasing number of cities and counties now conduct their own surveys based on or derived from BRFSS. A few states and local areas (Wisconsin and New York City, for example) conduct surveys based on NHIS or NHANES methods to provide state or local estimates of health outcomes and determinants.

Geographic units of analysis

Mortality data are available for states and counties. Some states geocode their vital statistics data and provide data — usually through a Web-based data query and mapping tool — for zip codes, census tracts, or locally defined areas. BRFSS provides state-level estimates and estimates for selected metropolitan statistical areas with 500 or more respondents. Several states, including Florida, North Dakota, Washington, and Wisconsin, conduct their own county-level BRFSS to produce estimates for at least some of their counties. NSDUH provides national and state estimates. NHIS and NHANES only provide national estimates.

Validity and precision of the measures

The validity and precision of mortality data — at least

the number of people who die in a given time period in a given place — are high, as death registration is virtually complete in the United States. Condition-specific mortality data may be less valid because of errors in determining and coding the cause of death.

The designs of NHIS and NHANES to ensure that their samples are representative of their target populations and their high response rates (75%-90%) are indicators of high validity. Precision of estimates is related to sample size and the amount of variation of the characteristic being estimated in the target population. The size of the NHIS sample is sufficient to provide national estimates for the total population with relative standard errors of 1% to 3%, although relative standard errors of estimates for small subgroups may be as high as 10% to 30%. To provide more precision, NHIS oversamples some population subgroups. Estimates may be obtained for most states by combining data collected in several years.

Response rates for BRFSS, a state-based telephone survey, are considerably lower than for NHIS and NHANES. For example, state response rates for the 2008 survey ranged from 20% (Connecticut) to 58% (Utah), and the median was 34% (35).

Measuring trends

NVSS, NHIS, BRFSS, and NSDUH provide data annually, and NHANES provides data every 2 years. National trends can be measured by using any of these data sources, state trends can be measured by using NVSS and BRFSS, and county trends can be measured by using NVSS.

Annual trends in crude and age-adjusted mortality rate and in life expectancy since the mid-1900s are available for the United States at the national, state, and county levels. See, for example, an analysis of trends in county-level mortality (36), life expectancy at birth by race and sex from 1900 through 2005 (37), and average annual age-adjusted mortality by race, Hispanic origin, and state for 1979 through 1981, 1989 through 1991, and 2003 through 2005 (37). Trend data on mortality are also available for selected causes of death (37).

Trends in HRQL, assessed by using CDC's HRQOL-4 measures derived from BRFSS, are available for the United States and for each state from 1993 through 2008, the most recent year for which BRFSS data are available (13). CDC

is generating county-level estimates for the following 3 CDC HRQOL-4 measures for 2001 through 2007 for the MATCH (Mobilizing Action Toward Community Health) county rankings by using BRFSS data: percentage who report fair or poor health, physically unhealthy days in the past 30 days, and mentally unhealthy days in the past 30 days. Neither national-, state-, nor county-level population data are available for the other HRQL indices. Their use has typically been in the clinical or research setting for assessing medical or surgical therapies. The Health Utilities Index has been used in Canada for 4 major population health surveys. Although many studies document the validity of various HRQL indices, fewer studies document their reliability or responsiveness to change over time.

Measuring inequalities in health

Several characteristics are available from NVSS and each of the surveys for measuring the dependence of population health on social and economic factors (Table 3). All systems provide these 5 characteristics for analysis: age, education level, ethnicity, race, and sex. Because of the limited availability of data for smaller geographic units, none of the systems can measure inequalities in health at the county level, except NVSS.

Recommendations

“No single measure can capture the health of the nation” (24). On the basis of this review of existing health outcome metrics and data available for counties, I recommend the following metrics for population health outcomes at the county level.

Life expectancy from birth or age-adjusted mortality rate

This metric mirrors a relevant outcome, data are readily available to assess temporal trends and geographic and demographic variation, and mortality is amenable to population health interventions, although changes in the mortality metric may take years to appear. Life expectancy has the advantage of being more easily communicated to, and understood by, the public than mortality rates.

Condition-specific changes in life expectancy or condition- or age-specific mortality rate

This metric has the advantages of the overall mortality

metric, as above, and allows public health programs to monitor the effect of specific interventions on more specific outcomes. An example might be monitoring increases in life expectancy or reductions in motor vehicle injury-related mortality resulting from efforts to modify driver behavior and to make roads and vehicles safer.

The conditions should be selected on the basis of local needs assessments (for example, conditions that dramatically affect mortality that could be addressed by local population health programs or other interventions). Alternatively, if states or counties needed to be compared directly, a fixed set of conditions could be selected, similar to conditions that the Institute of Medicine recommended for the State of the USA indicators (infant mortality and injury-related mortality).

Self-perceived level of health, functional status, or experiential state

This metric reflects the population's state of health and functional level and might provide a more immediate measure of the effect of interventions than the mortality metrics. Age-, sex-, and race-specific versions of the metric could provide at least some population specificity, which might be useful in monitoring the effect of interventions.

Although many of the HRQL instruments already in general use would work well for this metric, most of the instruments are proprietary, and state- and county-level data are not available from any of them. CDC's HRQOL-4 is probably the most viable option for this measure, as it is not proprietary and state-level data have been available since 1993. By using moving averages or other methods of aggregating data, county-level trend estimates could be developed even for small counties. Although data from CDC's HRQOL-4 are readily available, a more robust measure of HRQL, with specific questions about activity limitation, functional status, and experiential state, should be explored and adopted in the future (38). The CDC HRQOL-14, other HRQL indices described above, and work by Statistics Canada and REVES (Réseau Espérance de Vie en Santé, http://reves.site.ined.fr/en/home/about_reves) should be considered for this role.

Distribution of population health outcomes

Metrics that provide only the average level of health in a population may mask inequalities in the distribution

of health, with policy and programmatic implications. Metrics that provide information on the distribution of health are another component of a complete picture of population health (1,15). Such metrics would measure the inequalities in health among different geographic, economic, and demographic populations.

One geographically based metric is the rate difference between the highest and lowest county life expectancies or age-adjusted mortality rates in a state. America's Health Rankings introduced a measure in 2008 on the variation in mortality among counties in each state (27). A demographically based metric might be the difference between the highest and lowest sex- and race-specific life expectancies or age-adjusted mortality rates in a state. An economically based metric might be the difference in life expectancies or age-adjusted mortality rates between the highest and lowest income deciles in a state.

An optional summary measure of population health

Summary measures of population health, which combine information on death and nonfatal health outcomes, have the advantage of simplicity and parsimony and may be easier to communicate to the public and track over time than the series of basic measures previously recommended. If a summary measure is desirable, the health-adjusted life expectancy and healthy life years are good choices because they are based on life expectancy and use a population-based measure of HRQL, rather than an expert judgment-based measure.

Acknowledgment

I received financial support to develop this article from the University of Wisconsin. I acknowledge the careful review and helpful suggestions of Daniel J. Friedman, David Kindig, Patrick Remington, and Sharon McDonnell in the preparation of this article. This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Tables

Table 1. Criteria Used to Select Health-Related Indicators by 2 Institute Of Medicine Committees and Criteria Proposed to Select Global Health Indicators

Criteria ^a for Selecting an Indicator	Leading Health Indicators (23)	State of the USA Indicators (24)	Global Health Indicators (25)
Indicator is well-defined.			X
Indicator is worthwhile or important.	X	X	
Indicator is valid and reliable.	X	X	X
Indicator can be understood by people who need to act.	X		X
Indicator galvanizes action.	X		X
Action can improve the indicator.	X		
Measuring the indicator over time reflects effect of action.	X		
Measuring the indicator is feasible.			X
Data for the indicator are available for various geographic levels (local, national) and population subgroups.	X	X	X
Indicator is sensitive to changes in other societal domains (socioeconomic or environmental conditions or public policies).		X	

^a The criteria for selecting indicators were compiled from the 3 reports cited. An "X" indicates that a report proposed using this criterion for selecting indicators.

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Table 2. Stated Purposes of 9 Health Indicator Sets^a

Indicator Set	Purpose
America's Health Rankings (27)	To stimulate action by people, communities, public health professionals, health industry employees, and public administration and health officials to improve the health of the population of the United States
Boston Indicators Project (28)	To democratize access to information, foster informed public discourse, track progress on shared civic goals, and report on change in 10 sectors
Community Health Status Indictors (29)	To provide an overview of key health indicators for local communities and to encourage dialogue about actions that can be taken to improve a community's health
Georgia Health Equity Initiative (30)	To look holistically at the major factors that influence differences in health status and their relationship to racial and ethnic characteristics
<i>Healthy People 2010</i> Leading Health Indicators (31)	To define health objectives for the United States and track progress toward meeting them
Institute of Medicine, State of the USA Health Indicators (24)	To help Americans become more informed and, therefore, active participants in focusing public debate on important issues . . . To provide the most reliable and objective facts about the state of the United States and to serve as a tool for Americans to track the progress made on a broad range of issues, such as education, health, and the environment
Los Angeles County, Key Indicators of Health (32)	To monitor key health conditions and to engage a broad community of stakeholders in health improvement work
Robert Wood Johnson Foundation Commission to Build a Healthier America (33)	To raise visibility of the many factors that influence health, examine innovative interventions that are making a difference at the local level and in the private sector, and identify specific, feasible steps to improve Americans' health
Wisconsin County Health Rankings (34)	To summarize the current health of the counties as well as the distribution of key factors that determine future health . . . To encourage all community stakeholders to work with health departments and health care providers . . . to improve Wisconsin's health

^a Eight of these sets were selected from the 35 indicator sets identified and reviewed by Wold in 2008 (26) for the Institute of Medicine's State of the USA Committee. The ninth indicator set was developed by the Institute of Medicine's State of the USA Committee. The criteria used for selecting the indicator sets displayed in this table from the 36 candidate indicator sets were that the indicator set contained both health outcome indicators and a specific stated purpose.

Table 3. Characteristics for Which Inequalities in Health Can Be Measured by Using 1 State Survey (BRFSS), Data From 2 National Surveys (NHIS, NSDUH), and NVSS Mortality Data

Characteristic	BRFSS	NHIS	NSDUH	NVSS
Age	X	X	X	X
Citizenship		X		
Education level	X	X	X	X
Employment status	X	X	X	
Ethnicity	X	X	X	X
Geographic region			X	
Income	X	X		
Insurance status		X		
Marital status	X			X
National origin				X
Place of birth		X		
Place of residence	X		X	X
Race	X	X	X	X
Sex	X	X	X	X

Abbreviations: BRFSS, Behavioral Risk Factor Surveillance System; NHIS, National Health Interview Survey; NSDUH, National Survey on Drug Use and Health; NVSS, National Vital Statistics System.

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A Summary Measure of Health Inequalities for a Pay-for-Population Health Performance System

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Suggested citation for this article: Asada Y. A summary measure of health inequalities for a pay-for-population health performance system. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/09_0250.htm. Accessed [date].

PEER REVIEWED

Abstract

A system that rewards population health must be able to measure and track health inequalities. Health inequalities have most commonly been measured in a bivariate fashion, as a joint distribution of health and another attribute such as income, education, or race/ethnicity. I argue this practice gives insufficient information to reduce health inequalities and propose a summary measure of health inequalities, which gives information both on overall health inequality and bivariate health inequalities. I introduce 2 approaches to develop a summary measure of health inequalities. The bottom-up approach defines attributes of interest, measures bivariate health inequalities related to these attributes separately, and then combines these bivariate health inequalities into a summary index. The top-down approach measures overall health inequality and then breaks it down into health inequalities related to different attributes. After describing the 2 approaches in terms of building-block measurement properties, aggregation, value, data and sample size requirements, and communication, I recommend that, when data are available, a summary measure should use the top-down approach. In addition, a strong communication strategy is necessary to allow users of the summary measure to understand how it was calculated and what it means.

Introduction

Developers of any performance reward system must select the performance improvements that deserve rewards and ensure fairness by measuring them appropriately. Measurement is arguably more challenging in pay-for-performance systems that reward population health than those that reward medical care because determinants of population health go beyond medical care. The questions sketched by Kindig (1) summarize challenges of measurement in a pay-for-performance system that rewards population health: 1) How should we measure health outcomes?, 2) How should we measure health inequalities?, and 3) How should we balance the need for improvement in both?

This article focuses on the second question and calls for development of a summary measure of health inequalities, where health inequalities associated with multiple attributes (such as income, education, and race/ethnicity) are summarized into 1 number. I assume typical measures of population health, such as life years or health-adjusted life years, and population units that have a mandate for the health of their population, such as states. However, the core idea of a summary measure presented here can in principle be applied to other measures of population health and other population units.

Background

Because health inequality is an established field of research and policy making, we might expect that a well-tested template would be available for measuring health inequalities that could be used in a pay-for-population health performance system. However, such guidance has

not yet been established. Over the past century, many empirical studies have described health inequalities (2,3), and useful guides for measuring health inequalities are now available (4,5). In the past few decades, jurisdictions and organizations have endorsed reducing health inequalities (6) and have focused their efforts accordingly. The World Health Organization's (WHO's) Commission on Social Determinants of Health (7) is a notable example of such concerted efforts. Despite these efforts, progress has been inadequate in reducing health inequalities. One reason could be the lack of an effective strategy to measure and track health inequalities.

Health inequalities have most commonly been measured in a bivariate fashion, as a joint distribution of health and another attribute, such as income, education, sex, or race/ethnicity (8). A typical measure of bivariate health inequality assesses 1 attribute at a time, for example, different levels of health across income groups (Figure 1). The degree of health inequality across groups can be quantified by an index such as a range measure that compares the health of 2 groups (5). A more sophisticated approach assesses the level of income (or another attribute) for each individual rather than the average level of health of each group. An index that quantifies the degree of inequality can be complex, for example, the Concentration Index, which compares the health of every individual or income group (5). Regardless of the unit of analysis (group or individual) or the inequality index used, measures of bivariate health inequalities always assess health inequality in relation to another attribute.

Around 2000, there was a brief but heated debate about whether we should continue to measure bivariate health inequalities or start measuring univariate health inequality (9-13). Regardless of their association with other

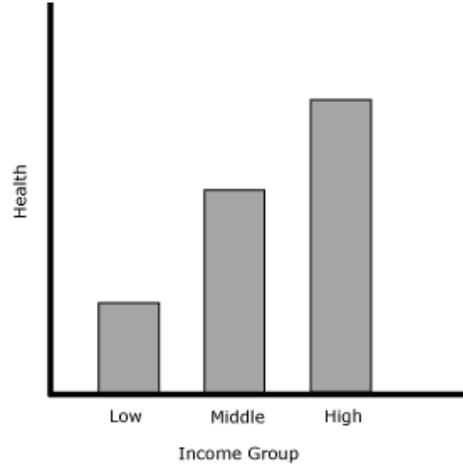


Figure 1. A hypothetical presentation of a bivariate health inequality. Measures of bivariate health inequality assess the association of health inequality with another attribute, in this example, income.

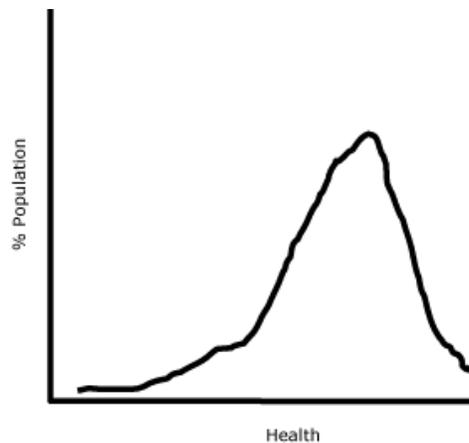


Figure 2. A hypothetical presentation of a univariate health inequality. Measures of univariate health inequality assess health inequality across individuals regardless of its association with other attributes.

attributes, measures of univariate health inequality assess health inequality across individuals in the same way that income inequality is typically assessed (Figure 2). A few researchers had measured health inequalities in a univariate fashion (14-16), but Murray and colleagues proposed univariate health inequality as the best focus in the assessment of population health (10,17,18).

This debate raised moral and policy questions (19). Health has an intrinsic importance, those who support measuring univariate health inequality argued, and we should not only be interested in health inequality by socioeconomic status, as most studies have focused on, but also in how health itself is distributed. The supporters of measuring bivariate health inequalities believed that health inequalities are significant when they are associated with other attributes, such as income. Simply put, with an example of income, this debate was about whether we should be worried about sick people regardless of their income level (univariate health inequality), or about impoverished sick people more than the wealthy sick people (bivariate health inequality).

Furthermore, those who support measuring univariate health inequality argued that the choice of which attributes to study is generally driven by the investigator's intuition or interest. Accordingly, we now have numerous empirical descriptions of health inequalities by various attributes, which are not necessarily comparable and do not immediately offer an overall picture of health inequalities. Univariate health inequality, they maintained, can offer an overall picture of health inequality in the population in a way that is comparable across populations. The advocates of measuring bivariate health inequalities, on the other hand, argued that univariate health inequality does not suggest how to tailor interventions or policies to reduce health inequalities.

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The result of this debate was an acknowledgment — primarily from supporters of univariate health inequality — that bivariate and univariate health inequalities are complementary (though exactly how they are complementary has not been specified) (20-22). Most empirical work has continued to measure bivariate health inequalities. Regarding univariate health inequality as a rarely used alternative, however, is a missed opportunity for health inequality research and policy. This debate points to a need for a better strategy to measure and track health inequalities.

This debate also suggests a strong resistance among health inequality researchers to abandoning bivariate health inequalities. They may be resistant because 1) they view health as not only intrinsically important but also as valuable in terms of its associations with other attributes, and 2) it is useful to know who is sick in order to develop policies. Arguments for measuring univariate health inequality also have merit. Lack of comparability of results and an overall view of health inequalities may be a barrier between numerous descriptions of health inequalities and effective policy making. A lesson from this debate may be that we need to develop a summary measure of health inequalities, which gives an overall picture of health inequalities in the population while maintaining pertinent information on bivariate health inequalities.

Two Approaches for a Summary Measure of Health Inequalities

Relevant literature suggests 2 approaches to developing a summary measure of health inequalities: the bottom-up and top-down approaches.

The bottom-up approach

The bottom-up approach first defines attributes of interest and measures bivariate health inequalities related to these attributes separately. It then combines these bivariate health inequalities into a summary index. An example is the inequality measure developed for the *Health of Wisconsin Report Card 2007* (hereafter, the “Wisconsin inequality measure”) (23,24). The Wisconsin inequality measure extends the Index of Disparity (25,26), a modified coefficient of variation defined as equation no. 1.

Equation 1

$$ID = \frac{\sum_{j=1}^{J-1} |r_j - r_{ref}|}{r_{ref}} (x) 100$$

Where r_j is health of the j th group, r_{ref} is health of the reference group, and J is the number of groups compared. The Index of Disparity is the average deviation of the health of groups compared with the reference group’s health, expressed as a percentage. When all groups have the same health, the index value is 0. Higher values suggest more inequality.

The Wisconsin inequality measure calculated the Index of Disparity by using all 14 groups (2 sex groups, 3 education groups, 4 rurality groups, and 5 race/ethnicity groups) and converted the index to a letter grade for ease of communication. All attributes (sex, education, rurality, and race/ethnicity) are considered to be of equal importance. The reference is set as the best health level among all groups (Figure 3).

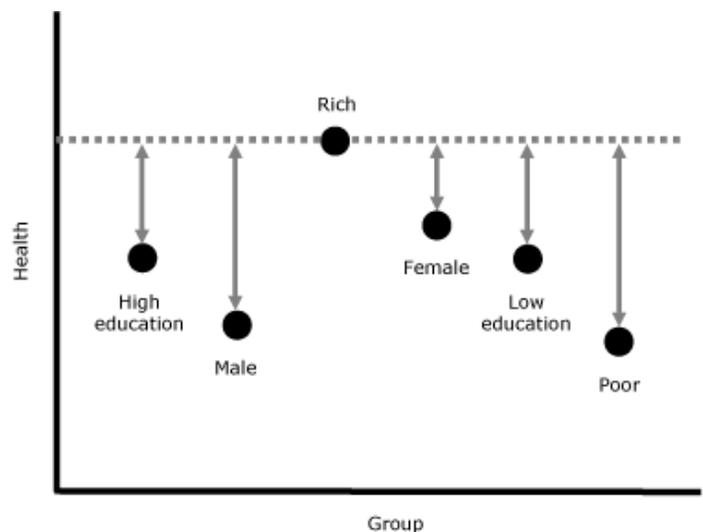


Figure 3. A simplified example of the Wisconsin health inequality measure. To obtain the overall health inequality, calculate the difference from the reference health level (rich) for each group (poor, low education, high education, male, and female), sum them, and divide by the number of groups minus 1 (6 - 1 = 5).

The top-down approach

The top-down approach first measures univariate health

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inequality, then breaks it down into health inequalities related to different attributes. Unlike the bottom-up approach, there is no known example of a summary measure of health inequalities using this approach. However, this approach comes close to the principal idea underlying WHO’s health inequality measurement in the *World Health Report 2000* (17,18), and similar methods have been proposed in other contexts. For example, this approach is similar to the framework of unfair inequalities in health and health care proposed by Fleurbaey and Schokkaert (27), although they do not propose it for a summary measure. It is also akin to inequality measure decomposition by attributes, though in health research this technique is most often used with the Concentration Index (28), a sophisticated measure of bivariate health inequality. Using decomposition, we can tell which attributes (eg, education and sex) explain a bivariate health inequality (eg, income-related health inequality) and to what degree. Although the Concentration Index decomposition is a useful tool to understand bivariate health inequality, it is different from decomposing univariate health inequality as a summary measure.

The top-down approach first attempts to explain the level of health of individual *i* by determinants of health. In the simplest form, Fleurbaey and Schokkaert define such a “structural model” as equation no. 2.

Equation 2

$$h_i = F(N_i, S_i, I_i, P_i, Z_i)$$

Where *N* is biologically determined health endowments, *S* is social background, *I* is available information, *P* is individual preferences, and *Z* is health care supply. At the risk of a gross simplification, empirically, *N* might be captured by age, *S* by income, *I* by education, *P* by health behavior such as smoking, and *Z* by health insurance. Variables can be extended to the community level, for example, adding neighborhood income for *S*, and rurality for *Z*. The top-down approach then asks which of these determinants or attributes are, following the increasingly used term in health economics, “illegitimate” or result in unfair inequality across individuals. For some attributes, there is a consensus on this question. For example, health inequality associated with social background typically is considered unfair. The top-down approach measures the distribution of *h_i* (univariate health inequality) and identifies the contribution of each of the illegitimate attributes,

however, defined, to univariate health inequality. Figure 4 is an example of information that the top-down approach can give.

Attribute	Degree of Health Inequality	% Contribution
Overall		
Income		
Education		
Race/ethnicity		
Other (residual)		

Figure 4. An example of information given by the top-down approach. The top-down approach provides information on univariate health inequality (as overall health inequality) and identifies contributions of the attributes we select (eg, income, education, and race/ethnicity). “Other (residual)” shows univariate health inequality that is not associated with the chosen attributes.

Issues for Developing a Summary Measure of Health Inequalities

Which approach is better suited to develop a summary measure of health inequalities? To answer this question, I address the following 5 issues: building blocks, aggregation, value, data and sample size requirements, and communication. Building blocks are common to both the bottom-up and top-down approaches. The subsequent 4 issues separate these 2 approaches.

Building blocks

Whichever approach we take, we should carefully choose a bivariate or univariate measure that becomes a building block of a summary measure. The building block for the Wisconsin inequality measure, an example of the bottom-up approach, is the Index of Disparity, and the Gini coefficient (5) can be used as a building block for the top-down approach. To decide whether they are appropriate building blocks on which to base a summary measure, we must examine the questions researchers ask when choosing health inequality measures (Table 1) (4,5).

All measurement properties of the Index of Disparity and the Gini coefficient coincide with the current discussion (4,5), except sensitivity to the mean (both measures) and subgroup considerations (Index of Disparity) (Table 1). The literature often recommends that researchers

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use both an absolute (ie, translation invariant) and a relative (ie, scale invariant) measure (5). This recommendation reflects the lack of consensus among researchers on the issue of sensitivity to the mean. However, researchers should choose one after trying both measures and understanding the nature and limitation of the chosen measure. Policy makers and the general public should not be given 2 measures (and possibly two different answers) without guidance. Insensitivity to the group size of the Index of Disparity contradicts the recommendation in the health inequality literature (4,5). Measuring bivariate health inequality with the Index of Disparity, we would consider the 2 populations in Figure 5, with 2 groups of different sizes, have the same degree of inequality. We may judge that the degrees of health inequality in these 2 populations are different because, for example, suffering is likely to be more prevalent in Population A than in Population B, given its larger proportion of poor people (4). In this case, bivariate inequality measures should be sensitive to group size because a measure of inequality should reflect our perception of inequality. Sensitivity to the group size, in practice, can be incorporated in the measure by giving a proportional weight to each group (5).

Aggregation

The bottom-up and top-down approaches aggregate bivariate inequalities to overall health inequality differently. The bottom-up approach aggregates bivariate inequalities arbitrarily, and the top-down approach decomposes univariate inequality into bivariate inequalities. This difference has 3 implications. First, the top-down approach can identify an independent association between each attribute and health and also interactive associations between attributes and health. Although possible, identifying independent and interactive effects is cumbersome in the bottom-up approach. The bottom-up approach starts by measuring unadjusted bivariate health inequalities, where each attribute of health inequality is measured without consideration for other attributes. We can categorize groups further, for example, from rich and poor (income) and male and female (sex) to rich male, rich female, poor male, and poor female. However, this

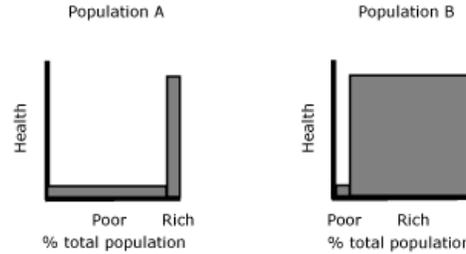


Figure 5. Inequality judgment and subgroup population size. The width of the bars suggests the proportion of poor and rich people in the 2 populations. If we consider that the degree of income-related health inequality differs in these populations, an inequality measure should be sensitive to this difference.

is a time-consuming way to describe independent and interactive effects of multiple determinants of health.

Second, the difference in aggregation between the 2 approaches leads to a difference in the meaning of an overall picture of health inequalities. An overall health inequality is a composite in the bottom-up approach, but it is univariate health inequality in the top-down approach. The top-down approach has a logical and mathematical hierarchy from bivariate health inequalities to univariate health inequality; the sum of bivariate health inequalities equals univariate health inequality. The bottom-up approach does not have such a hierarchy. Because each individual in the population belongs to multiple groups (eg, an individual is female, rich, educated, and minority), it is unclear exactly what an aggregation of non-mutually exclusive bivariate health inequalities means.

Finally, by decomposing univariate health inequality into bivariate health inequalities, the top-down approach can identify the contribution of each bivariate health inequality to univariate health inequality and thus the relative importance of bivariate health inequalities. For example, Wagstaff and van Doorslaer (29) reported that income-related health inequality accounted for approximately 25% of univariate inequality in malnutrition among Vietnamese children and general health status among Canadian adults, by using a subgroup decomposition technique that focuses on 1 attribute (as opposed to multiple attributes, as I am proposing here). Because of the use of a composite to indicate overall health inequality, the bottom-up approach cannot identify the relative contribution of each bivariate attribute.

Value

A measure can be descriptive (describing the object) or normative (incorporating our value of the object). Using either the bottom-up or top-down approach, a summary measure of health inequalities is normative in the most fundamental sense; it measures health inequalities that we value. But these approaches differ in terms of how normativity is introduced, and the top-down approach offers a richer framework than the bottom-up approach. The

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bottom-up approach starts by selecting attributes that we believe to be important in relation to health inequality. The top-down approach, on the other hand, starts by describing health inequalities and moves on to normative assessment of fair and unfair health inequalities (27). This assessment is done by selecting attributes that we believe to cause unfair health inequalities, and the top-down approach can embed the reasons these attributes are important, as Fleurbaey and Schokkaert suggest in the formation of *N* (health endowments), *S* (social background), *I* (available information), *P* (individual preferences), and *Z* (health care supply) (27). These selections and considerations can be incorporated in the bottom-up approach but are not built into it.

Furthermore, in either approach we must ask whether a summary measure of health inequalities should incorporate the relative importance of different attributes. According to Wagstaff and van Doorslaer (29), income-related health inequality explains approximately 25% of overall, univariate health inequality. If we believe that income-related health inequality is more important than other bivariate health inequalities (eg, education-, sex-, or geography-related health inequalities), then we might wish to reflect our value in the measurement by giving more weight to income-related health inequality than 25%. The Wisconsin inequality measure treats all bivariate health inequalities as equally important. The top-down approach describes the contribution of each attribute to univariate health inequality without considering which attribute is more important than others. If we wish to develop a summary measure of health inequalities to incorporate the importance of different attributes, whose values should be included and in what way? What about concentration of burden? We may not merely consider 1 attribute to be more important than another but multi-attribute correlations (for example, the sick who are poor, uneducated, and a minority) to be morally problematic. Not surprisingly, given the uncoordinated numerous descriptions of bivariate health inequalities, the current empirical health literature is silent about these value questions.

Data and sample size requirements

Generally, the top-down approach requires more data than the bottom-up approach. The top-down approach works best with individual-level data on health and determinants of health, while the bottom-up approach can be

pursued with group-level data. Population health surveys, possibly linked with census data, may offer enough information for the top-down approach, but the sample size of the survey determines how small the population can be for which a summary measure of health inequalities can be calculated. Despite the clear advantage of the top-down approach in terms of aggregation and value, data and sample size requirements may be a critical hindrance to its policy application.

These considerations for data and sample size requirements are typical in any quantitative analysis, but the use of a summary measure of health inequalities for a system of pay-for-population health performance requires at least 2 further considerations. First, how sensitive should a summary measure be to changes? If we agree to reward performance in the short term (eg, in 3-5 years), a summary measure should be sensitive to changes that occur in this time frame, and data should be updated regularly. Second, for which population (eg, state, county, community) does it make the most sense to establish a pay-for-performance system? The smallest population for which data are available may not necessarily be the most appropriate size.

Communication

Effective use of a summary measure of health inequalities demands clear communication. Ideally, a measure should be conceptually and methodologically sound and easy to communicate. The bottom-up approach is arguably methodologically simpler than the top-down approach. However, ease of communication does not necessarily equal simplicity in concepts and methods. A complex Concentration Index decomposition, similar to the top-down approach, has been increasingly used in policy-oriented work (28). Complex concepts and methods require an effective communication strategy.

I suggest a summary measure of health inequalities using the top-down approach and a strong communication strategy when data and sample size requirements are surmountable. Compared with the bottom-up approach, it offers a conceptually clearer meaning of overall health inequality and a richer framework for choosing relevant attributes associated with health inequality. In addition, development of a summary measure of health inequalities requires clarification of value questions.

Recommendations

First, a system of pay-for-population health performance should incorporate measurement of health inequalities. Second, measurement of bivariate health inequalities, the most common way to measure health inequalities, may not be the most effective mechanism to reduce health inequalities. A system that rewards population health should seek to develop a summary measure of health inequalities. Third, a summary measure of health inequalities can be developed by adopting the bottom-up or top-down approach. When data are available, a summary measure using the top-down approach should be used, along with a strong communication strategy to help users understand what the measure means and how it was calculated. Finally, clarification of value questions is a high priority for development of a summary measure of health inequalities.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation. The work was also funded by a Canadian Institutes of Health Research New Investigator Award and a Dalhousie Faculty of Medicine Clinical Research Scholar Award. I thank Yoko Yoshida for her assistance during the early stage of this project and anonymous reviewers for providing extensive and constructive comments.

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Table

Table. Questions That Arise in Selecting Health Inequality Measures and Measurement Properties of the Index of Disparity and the Gini Coefficient

Question	Index of Disparity	Gini Coefficient
Comparison		
<ul style="list-style-type: none"> Who is compared against whom or what? Should the comparison be made in terms of health only (univariate) or health and another attribute (bivariate)? 	The healthiest group against all other groups	Everyone against everyone
Aggregation		
<ul style="list-style-type: none"> How are differences aggregated at the population level? For bivariate health inequality measures, should the measures be sensitive to inherent ordering of another attribute (eg, income)? 	Unweighted addition of difference and sensitive to inherent ordering of attribute	Weighted addition of health share and unweighted addition of difference
Sensitivity to the mean		
<ul style="list-style-type: none"> Should the judgment of inequality be sensitive to the mean level of the population? <ol style="list-style-type: none"> Absolute measures are translation invariant, meaning that equal absolute difference implies equal degree of inequality, while the equal proportional increase makes inequality larger. Relative measures are scale invariant, meaning that equal proportional difference implies equal degree of inequality, while the equal absolute addition reduces inequality. Intermediate inequality measures consider equal proportional increase makes inequality bigger, while equal absolute addition decreases inequality. 	Translation invariant	Scale invariant
Sensitivity to the total population size		
<ul style="list-style-type: none"> Should the judgment of inequality be sensitive to the total population size? 	Insensitive	Insensitive
Subgroup considerations		
<ul style="list-style-type: none"> Should the judgment of inequality be sensitive to the subpopulation size? How should the overall inequality of a population correspond to inequalities of subgroups in that population? 	Insensitive to the group size	Decomposable

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Measuring Health Care Access and Quality to Improve Health in Populations

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Suggested citation for this article: Kottke TE, Isham GJ. Measuring health care access and quality to improve health in populations. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/09_0243.htm. Accessed [date].

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Abstract

Poor health status, rapidly escalating health care costs, and seemingly little association between investments in health care and health outcomes have prompted a call for a “pay-for-performance” system to improve population health. We suggest that both health plans and clinical service providers measure and report the rates of 5 behaviors: 1) smoking, 2) physical activity, 3) excessive drinking, 4) nutrition, and 5) condom use by sexually active youth. Because preventive services can improve population health, we suggest that health plans and clinical service providers report delivery rates of preventive services. We also suggest that an independent organization report 8 county-level indicators of health care performance: 1) health care expenditures, 2) insurance coverage, 3) rates of unmet medical, dental, and prescription drug needs, 4) preventive services delivery rates, 5) childhood vaccination rates, 6) rates of preventable hospitalizations, 7) an index of affordability, and 8) disparities in access to health care associated with race and income. To support healthy behaviors, access to work site wellness and health promotion programs should be measured. To promote coordinated care, an indicator should be developed for whether a clinical service provider is a member of an accountable care organization. To encourage clinical service providers and health plans to address the social determinants of health, organizational participation in community-benefit

initiatives that address the leading social determinants of health should be assessed.

Background

Poor health status, rapidly escalating health care costs, and seemingly little association between investments in health care and health outcomes have prompted a call for a “pay-for-performance” system to improve population health (1). The goal is to link structure and process to outcomes in the health system, which is the set of institutions and actors that affect people’s health, such as organizations that deliver care, health plans, educational systems, and city and county governments. Linking these organizations will contribute to the control of health care costs, improve the health of the US population relative to the health of other developed nations (2), and reduce disparities by region, race, ethnicity, and educational attainment (3).

The lack of tools to measure the effect of clinical services on US population health is rooted in the historical development of the American clinical health care system, which evolved to respond to the acute care needs of the individual: relief of pain and suffering through diagnosis, therapeutic intervention, and reassurance (4). Responsibility for population health needs was with the public health sector alone, and the effect on health of social policies related to education, work, transportation, and other factors was neglected. The Centers for Disease Control and Prevention might be considered the national population health agency, and many state health agencies monitor population health, but these agencies do not have regulatory authority over the health care delivery system. Many local public health agencies are mostly safety net providers. Notions of accountability for population health are underdeveloped at all levels.

Although clinical care accounts for only a small portion of the population health determinants (5), clinical service providers and health plans can contribute to population health initiatives by promoting healthy behaviors and providing clinical preventive services. At a population level, the behaviors that most powerfully affect health are physical inactivity, unhealthy diets, tobacco use, and excessive alcohol consumption (6,7). These behaviors can shorten life expectancy by 10 or more years (8,9). Behavioral support, when delivered with sufficient intensity in settings such as work sites, increases people's odds of adopting and maintaining a healthy lifestyle (10,11). Behavioral and social support is necessary to increase the prevalence of healthy lifestyles because, even when presented with the opportunity to adopt a healthy lifestyle, people still must choose a healthy lifestyle. They are unlikely to do so in a physical and social environment that encourages poor health habits.

Properly selected clinical preventive services also improve population health (12). People are more likely to receive appropriate preventive services when quality assessment systems ensure that they are informed about the benefits of the services and invited to accept the services.

Clinical indicators can identify gaps in access to care — an indicator of quality — and guide the application of incentives to close the gaps. Reporting clinical indicators of population health may also increase the salience of health incentive programs to stakeholders such as clinicians or purchasers of health services, who might be more focused on clinical performance than on long-term mortality trends. The level of clinical indicators can change more rapidly than death rates and longevity, and thus, may give more immediate feedback about the effectiveness of intervention programs. For example, feedback can be provided about positive changes in smoking rates and physical activity rates long before the effect on mortality can be observed.

Choosing Intervention Strategies to Measure

A list of access and quality indicators related to population health cannot be developed without asking what intervention strategies will improve population health. We believe that 4 clinical care system strategies are strong candidates. The first is to increase rates of healthy

behaviors and the delivery of preventive services in traditional settings of health services delivery. The second is to support healthy lifestyles and increase access to health care by extending the clinical setting beyond the doctor's office, for example, by providing wellness and health promotion services in work sites, the dominant social environment in the United States. The third is to develop a system by which clinical care organizations collaborate among themselves to coordinate care and reduce the illnesses and deaths that result from poor communication (13,14). The fourth is to offer clinical service providers and health plans incentives to participate with other sectors in the community (eg, education, transportation, housing, food) to develop policies and programs to improve population health. We describe indicators that are available to promote the first strategy and suggest a set of indicators that could be developed to promote the other strategies.

Available Indicators

Although nearly 3 dozen indicators are considered current and valid by the Institute of Medicine's Committee on the *State of the USA Health Indicators* (15), nearly all of them are limited in the health domains they assess or the populations they cover. For example, the Healthcare Effectiveness Data and Information Set (HEDIS) indicators, produced by the National Committee for Quality Assurance (NCQA), report the performance of participating health plans (16). In 2008, however, health plans covered only half of Americans, and only half of all health plans reported these indicators. Another organization, the Institute for Healthcare Improvement, has proposed mortality and whole system indicators for health care systems, but these are yet to be implemented. A third example is Minnesota HealthScores, a community-wide program that includes nearly all Minnesota payers. It uses HEDIS and composite indicators of quality of care that bundle many aspects of care performance by condition (17). However, Minnesota HealthScores reports quality of care indicators only for depression, diabetes, and vascular disease, and only for Minnesota. With few exceptions the valid indicators that apply to the entire US population are collected and reported only by the federal government. A notable exception is the Commonwealth Fund, which reports health care system performance and offers international comparisons for some indicators (18).

To inform discussion by policy makers and the public about population health, the State of the USA Project commissioned the Institute of Medicine in 2008 to convene an expert committee to recommend 20 county-level indicators of the health of the United States (15). The committee selected indicators with attention to the availability of data that could be used to report rates at the county level and to make comparisons with other countries. Six indicators of health behavior — smoking, physical activity, excessive drinking, nutrition, obesity, and condom use by sexually active youth in grades 9 through 12 — were selected. Another 6 indicators were selected to characterize the health care systems: health care expenditures; insurance coverage; unmet medical, dental, and prescription drug needs; preventive services; childhood vaccination; and preventable hospitalizations.

We recommend tracking 5 of the 6 health behaviors in a pay-for-population health initiative (Table 1). Although tracking body mass index as an intermediate outcome is useful, obesity is not a behavior per se; therefore, unlike the *State of the USA* report, we have not included it in our list. Regarding the indicators of health care system performance, we recommend tracking the 6 indicators recommended in the *State of the USA* report (15) (Table 2). To draw attention to the economic burden of health care and disparities in access to care, we also recommend 2 indicators that can be calculated from the indicators in the *State of the USA* report and federal data on per capita income, race, and ethnicity.

Indicators To Be Developed

We suggest that 3 indicators of access and quality be developed for paying health plans or others to improve population health: provision of wellness and health promotion programs, participation in accountable care organizations, and participation in initiatives to benefit communities. Data and, in some cases, methods are not yet available to characterize counties with these indicators.

Provision of wellness and health promotion programs

The work site is an effective venue to deliver interventions that support healthy behaviors (10), and NCQA now offers accreditation for wellness and health promotion programs (36). Work site wellness and health promotion programs can improve nutrition and physical activity

patterns (37). These programs can also reduce tobacco use and hazardous use of alcohol. Approximately 75% of adults aged 20 to 64 are employed (38), and many other adults are a spouse or domestic partner of someone who is employed. In principle, work site wellness and health promotion programs could also offer support in lifestyle skills, such as parenting and financial management, that lie beyond the traditional domain of health care but have a substantial effect on health. Because work site wellness and health promotion programs both reduce health care costs and increase productivity, employers can experience a positive return on investment from sponsoring the programs through increases in productivity alone. Examples of increased productivity include less absenteeism and more productivity.

The indicator that we suggest is the proportion of adults with access to an accredited work site wellness and health promotion program. To assess this rate, an appropriate question could be added to the Current Population Survey (30), the American Community Survey (31), or the US Census Bureau's Surveys of Business Owners (42).

Participation in accountable care organizations

Poor coordination of care, particularly during transitions between the hospital and the ambulatory care setting, causes avoidable illness and death. This problem can be mitigated through accountable care organizations (ACOs), which are actual or virtual partnerships designed to coordinate care across transitions (13,14). The core of an ACO is effective primary care. For primary care practices to become an ACO, they need at least 8 attributes (14):

- complete and timely information about patients and the services they are receiving.
- technology and skills for population management and coordination of care.
- adequate resources for patient education and self-management support.
- a culture of teamwork among the staff of the practice.
- coordinated relationships with specialists and other providers.
- the ability to measure and report on the quality of care.
- infrastructure and skills for management of financial risk.
- a commitment by the organization's leadership to improve value as a top priority, and a system of operational accountability to drive improved performance.

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Although ACOs should be able to improve quality of care, there is not yet evidence that they improve population health. The indicator that we suggest is whether a clinical service provider is a member of an ACO.

Participation in initiatives to benefit communities

Many of the most powerful determinants of health — for example, transportation, food, employment, social exclusion, and the social gradient — lie outside of the purview of health care (5). Population health could be improved if health care organizations would collaborate with other sectors (eg, housing, transportation, food, economic opportunity) to address these issues. Health plans and hospitals frequently employ substantial numbers of workers in a community. If they are not for profit, they also have obligations to benefit the community.

The Robert Wood Johnson Foundation program Leadership for Healthy Communities (43) is an example of a program that has engaged stakeholders both within and beyond the health care sector to address community characteristics and resources that affect health. The focus of the program is active living and healthy eating to prevent childhood obesity. Minnesota is developing the accountable health communities initiative. The intent of an accountable health community is to bring together health care, schools, work sites, local public health agencies, faith communities, chambers of commerce, nongovernmental agencies, governmental agencies, and others whose policies have an effect on health. The goal is to address social conditions that affect health but lie outside of the health services delivery sector.

The indicator we suggest is organizational participation in community-benefit initiatives that address the leading social determinants of health. NCQA would be an appropriate organization to develop the criteria, and America's Health Insurance Plans would be an appropriate organization to administer the survey.

Unresolved Issues

If a pay-for-population health initiative is to be implemented, criteria for most of our proposed indicators exist but they must be developed for 3 others. More difficult questions to answer are who would pay for the services and what organizations would be eligible to provide the

services. The answer to the latter question is fairly clear for clinical preventive services, but it is less clear for work site wellness and health promotion programs. Would only health plans be eligible, or would any company that offered NCQA-accredited wellness and health promotion services be eligible? Would group purchasing allow small employers to offer wellness and health promotion programs? How would community-benefit initiatives that address the leading social determinants of health be evaluated? How would the contributions of the participating organizations be parsed? Might the agency purchasing population health write a performance contract? These questions can be answered only through an iterative process of negotiation among employers, purveyors of health promotion programs, health plans, communities, and the other stakeholders.

A fundamental requirement for any pay-for-population health initiative is performance data. Ideally, these data would be available to make comparisons at the county level, but the data are not available for some indicators. As part of the pay-for-population health system development, the appropriate federal agencies should be encouraged to collect data that can be reported at the county level.

Summary

Data are available to measure health care access and quality as reflected by 5 health behavior indicators and 8 health care indicators. Most of the data are collected by federal agencies and are available yearly at the state or county level. Additional indicators that should be developed include whether employees have access to wellness and health promotion services through the work site, whether a health care organization is a member of an ACO, and whether a health plan collaborates in community-benefit initiatives that address the leading social determinants of health. Data for these indicators should be collected at the county level by appropriate federal agencies.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation in a grant to the University of Wisconsin Population Health Institute.

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Tables

Table 1. Health Behaviors That Are Measurable Indicators of Health Care Access and Quality

Behavior and Definition ^a	Data Source
Smoking: Percentage of adults who have smoked ≥100 cigarettes in their lifetime and who currently smoke some days or every day.	NHIS (19), BRFSS (20), and WHO (21)
Physical activity: Percentage of adults meeting the recommendation for moderate physical activity (at least 5 days per week for 30 minutes per day of moderate-intensity activity or at least 3 days per week for 20 minutes per day of vigorous-intensity activity).	NHIS (19) and BRFSS (20) ^b
Excessive drinking: Percentage of adults consuming 4 (women) or 5 (men) or more drinks on 1 occasion and/or consuming more than an average of 1 (women) or 2 (men) drinks per day during the past 30 days.	NHIS (19), BRFSS (20), and WHO (23)
Nutrition: Percentage of adults with a good diet (conformance to federal dietary guidance) as indicated by a score of ≥80 on the Healthy Eating Index (24).	NHANES (25) ^c
Condom use: Proportion of youth in grades 9-12 who are sexually active and do not use condoms, placing them at risk for sexually transmitted infections.	YRBSS (26) and WHO (27) ^d

Abbreviations: NHIS, National Health Interview Survey; BRFSS, Behavioral Risk Factor Surveillance System; WHO, World Health Organization; NHANES, National Health and Nutrition Examination Survey; YRBSS, Youth Risk Behavior Surveillance System.

^a Detailed information regarding each indicator is available in the Institute of Medicine's report *State of the USA Health Indicators: Letter Report* (15).

^b WHO has implemented a global strategy on diet, physical activity, and health (22), but data are not yet available for international comparisons.

^c The Healthy Eating Index is not well-suited for global comparisons, and uniform data for global comparisons are not available.

^d WHO collects data on condom use among people aged 15-24 years, so the data are not strictly comparable.

Table 2. Health Care Sector Attributes That Are Measurable Indicators of Health Care Access and Quality

Attribute and Definition ^a	Data Source
Health care expenditures: Per capita health care expenditures.	NHEA (28) and OECD (29)
Insurance coverage: Percentage of adults without health care coverage through insurance or entitlement.	CPS (30) and ACS (31)
Unmet medical, dental, and prescription drug needs: Percentage of noninstitutionalized people who did not receive or delayed receiving needed medical services, dental services, or prescription drugs during the previous year.	MEPS (32)
Preventive services: Percentage of adults who are up to date with age-appropriate screening services ^b and influenza vaccination.	MEPS (32)
Childhood vaccination: Percentage of children aged 19-35 months who are up to date with recommended vaccinations. ^c	NIS (33)
Preventable hospitalizations: Hospitalization rate for ambulatory-care-sensitive conditions. ^d	PQI (34)

Abbreviations: NHEA, National Health Expenditure Account; OECD, Organisation for Economic Co-operation and Development; CPS, Current Population Survey; ACS, American Community Survey; MEPS, Medical Expenditure Panel Survey; NIS, National Immunization Survey; PQI, Agency for Healthcare Research and Quality Prevention Quality Indicators; BEA, Bureau of Economic Analysis.

^a The Institute of Medicine's report *State of the USA Health Indicators: Letter Report* (15) has detailed information regarding health care expenditures; insurance coverage; unmet medical, dental, and prescription drug needs; preventive services; childhood vaccination; and preventable hospitalizations.

^b Blood pressure check within the previous 2 years; cholesterol check within the previous 5 years; fecal occult blood test within the previous 2 years; ever having had colonoscopy or sigmoidoscopy; influenza vaccination within the previous year; and Papanicolaou test within the previous 3 years and mammogram within the previous 2 years as appropriate for sex and age group.

^c The recommended series consists of 4 doses of diphtheria and tetanus toxoids and pertussis vaccine; 3 doses of polio vaccine; 1 or more doses of measles, mumps, and rubella vaccine; 3 doses of *Haemophilus influenzae* type b vaccine; 3 doses of hepatitis B vaccine; and 1 or more doses of varicella (chickenpox) vaccine.

^d Short-term and long-term complications of diabetes, uncontrolled diabetes, lower-extremity amputations among patients with diabetes, perforated appendicitis, chronic obstructive lung disease, congestive heart failure, angina without a procedure, hypertension, low birth weight, dehydration, bacterial pneumonia, urinary tract infections, and adult asthma.

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Table 2. (continued) Health Care Sector Attributes That Are Measurable Indicators of Health Care Access and Quality

Attribute and Definition ^a	Data Source
Index of affordability: Per capita health expenditures as a percentage of per capita income.	NHEA (28) and BEA (35)
Disparities in access to health care: Percentage of (noninstitutionalized) poor who did not receive or delayed receiving needed medical services, dental services, or prescription drugs during the previous year divided by the percentage of nonpoor reporting the same barrier. Data also presented for racial/ethnic minorities divided by data for non-Hispanic whites.	MEPS (32)

Abbreviations: NHEA, National Health Expenditure Account; OECD, Organisation for Economic Co-operation and Development; CPS, Current Population Survey; ACS, American Community Survey; MEPS, Medical Expenditure Panel Survey; NIS, National Immunization Survey; PQI, Agency for Healthcare Research and Quality Prevention Quality Indicators; BEA, Bureau of Economic Analysis.

^a The Institute of Medicine's report *State of the USA Health Indicators: Letter Report (15)* has detailed information regarding health care expenditures; insurance coverage; unmet medical, dental, and prescription drug needs; preventive services; childhood vaccination; and preventable hospitalizations.

^b Blood pressure check within the previous 2 years; cholesterol check within the previous 5 years; fecal occult blood test within the previous 2 years; ever having had colonoscopy or sigmoidoscopy; influenza vaccination within the previous year; and Papanicolaou test within the previous 3 years and mammogram within the previous 2 years as appropriate for sex and age group.

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^d Short-term and long-term complications of diabetes, uncontrolled diabetes, lower-extremity amputations among patients with diabetes, perforated appendicitis, chronic obstructive lung disease, congestive heart failure, angina without a procedure, hypertension, low birth weight, dehydration, bacterial pneumonia, urinary tract infections, and adult asthma.

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Socioeconomic Indicators That Matter for Population Health

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Suggested citation for this article: Lantz PM, Pritchard A. Socioeconomic indicators that matter for population health. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/09_0246.htm. Accessed [date].

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Abstract

Increasing research and policy attention is being given to how the socioeconomic environment influences health. This article discusses potential indicators or metrics regarding the socioeconomic environment that could play a role in an incentive-based system for population health. Given the state of the research regarding the influence of socioeconomic contextual variables on health outcomes, the state of data and metrics for these variables at the local level, and the potential for program and policy intervention, we recommend a set of metrics related to the socioeconomic composition of a community (including poverty, unemployment, and public assistance rates); educational attainment and achievement; racial segregation; and social-capital indicators such as density of voluntary organizations and voter turnout. These indicators reflect the evidence that population health gains depend on improvements in many of the fundamental social determinants of health, including meaningful employment, income security, educational opportunities, and engaged, active communities.

Introduction

Increasing research and policy attention is being given to how the socioeconomic environment influences health (1,2). We define socioeconomic environment as a place with

geographically defined boundaries that also has economic, educational, social, cultural, and political characteristics.

The socioeconomic environment shapes resources, opportunities, and exposures (positive and negative) (3). Theoretically, the neighborhood socioeconomic environment could influence health outcomes either directly or indirectly (1). Direct effects on health include injuries from crime or environmental hazards or illness from socially patterned toxic exposures. In addition, many aspects of the neighborhood socioeconomic environment — including poverty and discrimination — can be considered stressors. Chronic exposure to social stressors can elevate the body's stress response (via neural, endocrine, and immune systems) and produce "allostasis," a physiologic state that in the long run causes changes in the immune system and brain that can lead to disease through a variety of biological mechanisms (4,5). Other putative mechanisms linking socioeconomic environment and health are indirect, such as differential access to key resources like employment opportunities (which strongly influence income), food, housing, and health care services.

The degree to which these pathways play a role in producing contextual health outcomes is not well understood (6,7). Researchers encounter serious conceptual and methodological challenges to defining socioeconomic environments and in measuring contextual effects on health, especially over time (7-9). Nonetheless, research findings suggest that socioeconomic environment has a substantial effect on health risk behaviors (eg, tobacco use, poor diet, physical inactivity), health care use (eg, prenatal care, asthma care), and health outcomes (eg, functional health, cardiovascular disease, chronic disease mortality, and birth weight) (3,9-13).

Kindig has argued that financial incentives for the

nonmedical determinants of health need to be developed (14), including the socioeconomic environment that shapes many aspects of our social, economic, and political lives. The purpose of this article is to identify a potential set of metrics regarding the socioeconomic environment that could play a key role in such a system. We used the following criteria to generate a set of metrics for this objective: 1) the indicator can be measured with reasonable validity and reliability across socioeconomic environments, 2) evidence is sufficient that the indicator is related to health outcomes and is amenable to program or policy intervention, and 3) measurement of the indicator could be used to create incentives for and measure progress toward population health goals.

Indicators of the Socioeconomic Environment

Characteristics of a socioeconomic environment can be measured subjectively via individual self-reports, or objectively via direct observation or secondary data sources such as the census, administrative databases (eg, for crime, housing, education), or population-based surveys (2). Many of the indicators that researchers have considered in studies of socioeconomic environment and health have been included in individual community projects that attempt to define quality of life or community well-being in a particular area (2,15). In addition, many cities produce report cards or other documents that present metrics regarding the quality of life.

There is no consensus regarding which indicators of the socioeconomic environment are the most important determinants of population health. Nonetheless, there does appear to be a tacit acceptance that certain indicators have particular importance for mental and physical health. We focus on such indicators in 3 broad areas: community socioeconomic composition, social structure, and social cohesion/social capital.

Community socioeconomic composition

The socioeconomic composition of a community is a crucial aspect of how context can shape individual health behaviors, exposures, and outcomes (1,16). Levels of education, employment, income, and income security in a community create and shape risks and benefits for health, many of which accumulate over the life course.

Key indicators of the economic and educational composition of a community that can be considered individually and in combinations and that typically can be measured at multiple units of geography include 1) income, such as average household income and per capita income; 2) poverty rate, percentage of households receiving public assistance, and percentage of children receiving free or reduced lunch; 3) the unemployment rate and the percentage employed in professional or managerial occupations; 4) affordability of housing, homelessness rate, bankruptcy rate, foreclosure rate, and resident turnover rate; and 5) percentage of population aged 18 to 24 years with less than high school education, public high school dropout and graduation rates, percentage of third- and tenth-grade students at grade level in reading, and percentage of tenth-grade students at grade level in math.

The socioeconomic composition of a unit of geography (eg, census tract, zip code, county) could be measured using individual metrics or a set of metrics that together measure “community socioeconomic status.” Robert created a community socioeconomic disadvantage index at the census tract level by summing the following measures: percentage of households receiving public assistance, percentage of families earning less than \$30,000 annually, and percentage of adult unemployment (16). Another approach is to conduct factor analysis or principal components analysis on a wide range of indicators to identify which ones combine to measure a latent concept that cannot be captured with a single indicator. For example, using data from their research on Chicago neighborhoods, Sampson and Morenoff created scales for 1) concentrated disadvantage (consisting of the percentage of families below the poverty line), percentage of families receiving public assistance, percentage of unemployed people in the labor force, and percentage of families headed by women; and 2) concentrated affluence (defined by the percentage of families with annual income higher than \$75,000), percentage of adults with a college education, and percentage of adults employed in professional or managerial occupations (6,17). Another measure is the Index of Concentrations at the Extremes, which measures the proportional balance or imbalance of familial poverty and affluence in a neighborhood (18).

Social structure

Several researchers have investigated the influence of social structure — the ways in which social institutions

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and embedded norms shape the behavior and experiences of social actors — on health outcomes (1). In particular, 3 aspects of the social structure have received substantial attention in health-related research: income inequality, racial segregation, and discrimination. The quantitative evidence for the effect of these social structural phenomena on health is mixed and faces serious methodologic challenges (1).

A growing body of research suggests that in both developing and developed countries the degree of inequality in the income distribution of a geographic area is associated with mortality (19,20). In addition, several studies have shown an association between the degree of racial segregation in a geographic area and mortality as well as other health outcomes (17,21,22). However, association is not causation; the mechanisms by which income inequality and segregation might lead to poor health outcomes are unclear. The role of relative versus absolute deprivation in producing health inequalities and whether any part of the association between income inequality and health outcomes is causal is debated.

Discrimination is difficult to observe or measure. It is typically measured as “perceived discrimination” via self-reported survey data. Self-reports of perceived discrimination or unfair treatment because of race or ethnicity have also been associated with some negative health outcomes in several studies (23,24). The proposed health mechanisms are both direct (denial of needed services/resources related to health) and indirect (increased psychosocial stress, increased health risk behavior as a coping mechanism).

Social cohesion and social capital

Social integration, social networks, and social support — all of which have to do with the degree to which people are interconnected and embedded within social environments — are considered key to health (25). Many aspects of social relationships that combine and emerge at a collective level can also affect health. Social cohesion is the “extent of connectedness and solidarity among groups in society” (26) or the degree of trust, familiarity, values, and network ties shared among groups (including neighborhoods). Although debate continues, social capital generally refers to the social resources and benefits that emerge from strong social ties or social cohesion and facilitate collective action (26,27). Strong social ties and cohesion may

create social capital or private and public resources that matter for health.

Several studies have linked measures of social cohesion and social capital to health-related behaviors or health status outcomes (25-29). Nonetheless, given that approaches to defining and measuring social cohesion and social capital vary greatly, comparisons across studies are hampered. In addition, the exact mechanisms by which social cohesion, social capital, or both may produce better health outcomes are unknown.

Social cohesion has been measured as the magnitude of social and economic divisions in a community in terms of the degree of racial segregation and income equality. Social cohesion has also been measured with survey items intended to measure social networks or to capture interpersonal trust (ie, the extent to which people in a neighborhood trust each other, get along, share values, and are willing to help each other). Social capital also has been measured as the level of interpersonal trust in a community and feelings of trust, safety, and reciprocal relationship, which Harpham and colleagues refer to as “cognitive measures” (29). In addition, “structural” variables have been used to define and measure social capital, including the level of volunteerism, organizational membership or participation, civic engagement, and links to groups with resources both within and outside of a community (21,26,29). Potential indicators of social cohesion include the strength of social networks, connections, and interpersonal trust. Potential indicators of social capital that could be compared across socioeconomic environments include the number and density of community organizations, volunteerism or participation in voluntary organizations, voter registration, and voter turnout.

State of the Metrics

Community socioeconomic composition

A valuable source of data on socioeconomic indicators is the US decennial census. Using census data has many benefits; specifically, the data are publicly available and can be compiled for many units of geography, including the block level, tract level, zip code, county, and other defined areas. Nonetheless, census data also have limitations; the data are only collected every 10 years, census units or boundaries change over time, and many measures are

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sensitive to migration in and out of communities. In addition, a person's census tract or other geographic unit is not necessarily his or her socioeconomic environment (30). Identifiable "neighborhoods" do not always correspond to administratively determined units of geography, such as census tracts or zip codes.

Another useful resource is the American Community Survey (ACS), which is a key part of the Census Bureau's efforts to revamp and expand the decennial census program. The ACS is a random sample, population-based survey of counties designed to produce demographic, economic, social, and housing information more often than every 10 years. The ACS started in selected counties in 1996 and expanded in 2005 to include all US counties, the District of Columbia, and 78 municipalities in Puerto Rico. Beginning in 2005, the ACS produced 1-year estimates of key variables for geographic areas with 65,000 people or more. In 2008, the ACS released 3-year estimates of these indicators for areas with 20,000 people or more. For areas with populations of less than 20,000, 5-year estimates based on data from 2005 to 2009 will be released after 2010. As with the decennial census, response to the ACS questionnaire is required by law. Most socioeconomic indicators can be obtained from the ACS at the county level.

As part of the federal initiative No Child Left Behind, states are required to collect and report yearly program statistics for public school systems. District- and school-level statistics regarding graduation rates and student performance in reading and math can be accessed at [www.schooldatadirect.org](http://www schooldatadirect.org), which is maintained by the non-profit Council of Chief State School Officers. More detailed information can also be accessed through state agencies charged with collecting and maintaining the data.

The data collected by the census, the ACS, and No Child Left Behind offer economic and educational indicators that are publicly available for measurement at the county level (and for smaller units) over time. Although it is possible to stratify these indicators by race and ethnicity to assess disparities, the necessary data are not publicly available and such analyses would be labor-intensive.

Social structure

Income inequality can be measured with data on per capita or household income in a geographic area, which are readily available from the census. Approaches used to

operationalize the measurement of income inequality include 1) the Gini coefficient, which is a measure of the statistical dispersion of income or wealth in a population, ranging on a standardized scale from 0 (perfect equality or everyone has the same amount of money) to 1 (perfect inequality; 1 person has all the income and everyone else has none); and 2) the Robin Hood index (also called the Pietra ratio), the proportion of income that has to be transferred from those above the mean to those below to create an equal distribution (19-21). Kawachi and Kennedy found that the association between income inequality in US states and mortality rates did not vary across 6 measures of income distribution (31).

Residential racial segregation can be measured reliably with census data (22). Segregation is typically measured by using the "index of dissimilarity," which indicates the evenness with which 2 groups are distributed across component geographic units (eg, census tracts) of a larger area (eg, county or metropolitan statistical area), or using the Gini coefficient (21).

Discrimination reflects social structure, which refers to the enduring social relationships, norms, and patterns of behavior within a society. Discrimination is difficult to measure both in the cross-section and over time, and it is virtually impossible to measure at a contextual level (23,24). Researchers typically rely on self-reports of perceived harassment and discrimination both within and outside of respondents' community context. The methods used to measure perceived discrimination have varied extensively; this type of data is not readily available across communities.

Social cohesion or social capital

Many population-based surveys and individual research projects have attempted to measure neighborhood social cohesion and the benefits (or social capital) that can result. For example, both the Project on Human Development in Chicago Neighborhoods and the Los Angeles Family and Neighborhood Study use multi-item scales of social cohesion (15). Unfortunately, metrics for this area are not well developed (26). There is no agreed-upon approach for measuring social or community cohesion, and no data are available across time and communities (29).

A reasonable measurement strategy for social capital that can be applied consistently across many contexts

is the structural approach, which focuses on community engagement and civic participation. Community engagement can be measured by the number and density of community and voluntary organizations in a defined geographic area and by the participation level of community members in these organizations. In addition, voter registration and participation can serve as markers for civic engagement. Basic voter registration information is published by the Census Bureau every election year but not at the local level. The Help America Vote Act of 2002 mandates that states establish a database of registered voters, but these systems are not yet available for use. The best information currently available comes from private firms.

Data on voter turnout are available from the US Election Assistance Commission (EAC), updated every 2 years after congressional and presidential elections. State-level data are available to the public through the EAC Web site, and more detailed data are available to approved researchers. In addition, access to the EAC's records can be requested under the Freedom of Information Act.

Recommendations

Identifying a set of indicators for the socioeconomic environment on which incentives for population health can be based is a worthwhile yet daunting task, especially given the methodological and measurement challenges to research attempting to establish causal links between multiple nonrandom social and economic exposures and health outcomes. Considering the state of the research, the current state of data and metrics for health outcome variables at the local level, and the potential for program and policy intervention, we rank the following set of indicators as potentially powerful in assessing and motivating communities' progress toward population health goals, both in the medium term (3-5 years) and beyond:

1. Poverty rate
2. Unemployment rate
3. Average household income
4. Affordability of single-family home
5. Bankruptcy and foreclosure rates
6. Percentage of households on public assistance
7. Percentage of single-parent households
8. Percentage of children receiving free or reduced-price lunch

9. Concentrated disadvantage and concentrated affluence scales
10. Percentage of adults older than 24 years with less than a high school education
11. Percentage of adults older than 18 years with less than an eighth-grade education
12. Public high school graduation and dropout rates
13. Percentage of third- and tenth-grade students at grade level in reading
14. Percentage of tenth-grade students at grade level in math
15. Racial segregation
16. Density of voluntary organizations
17. Voter registration and turnout

The broad list of indicators in this article is consistent with the recommendations of numerous researchers and opinion leaders regarding investments related to the social determinants of health (14,32). Population health improvements depend on improvements in many of the fundamental social determinants of health including educational opportunities, safe and meaningful employment, income security, and engaged, active communities free from poverty and discrimination. Despite serious limitations and challenges in the science and the state of many of the metrics proposed here, further investments in such development are critical to efforts to measure, promote, and achieve population health.

Acknowledgment

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Measuring Health Behaviors in Populations

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Suggested citation for this article: Mokdad AH, Remington PL. Measuring health behaviors in populations. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/10_0010.htm. Accessed [date].

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Abstract

Health behaviors are a leading cause of illness and death in the United States. Efforts to improve public health require information on the prevalence of health behaviors in populations — not only to target programs to areas of most need but also to evaluate the effectiveness of intervention efforts. Telephone surveys, such as the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System, are a good way to assess health behaviors in populations. These data provide estimates at the national and state levels but often require multiple years of data to provide reliable estimates at the local level. With changes in telephone use (eg, rapid decline in the ownership of landlines), innovative methods to collect data on health behaviors, such as in health care settings or through Internet-based surveys, need to be developed.

Introduction

Efforts to improve community health at national, state, and local levels require detailed and accurate information about the prevalence of health behaviors (1-3). If existing data collection systems are to remain viable, current approaches to measuring population health behaviors must be adapted. Potential solutions address the challenges of nonresponse, coverage, data quality, sample size, and costs.

McGinnis and Foege summarized the role of health behaviors as a leading cause of death and labeled them the “actual causes of death” (4). Later updated by Mokdad et al (5), these studies concluded that approximately half of all deaths in the United States could be attributed to factors such as smoking, physical inactivity, poor diet, and alcohol use (Table 1). Public health campaigns were established that educated the public about the need for healthy lifestyles and supported health-promoting programs and policies. These changes contributed to major declines in heart disease, stroke, and injury deaths (6).

Telephone surveys emerged as a feasible method to assess the prevalence of many health risk behaviors among populations (7). In 1984, the Centers for Disease Control and Prevention (CDC) implemented the first state-based surveillance system for health behaviors, the Behavioral Risk Factor Surveillance System (BRFSS) (8). BRFSS collects information on health risk behaviors associated with the leading causes of illness and death (9).

Reasons for Measuring Health Behaviors

The measurement of health behaviors in populations is useful for both program planning and program evaluation. For program planning, estimates of the prevalence of behavioral risk factors can be used to set priorities or to compare rates across communities. For example, to provide more reliable estimates, the Wisconsin County Health Rankings combines 7 years of data from BRFSS to compare the rates of behaviors across all the counties in the state (10). In contrast, more precise measures are needed when evaluating changes in health behaviors over time. For example, a 95% confidence limit of plus or minus 3% may be sufficient to estimate the prevalence of smoking in a population but is insufficient to demonstrate

changes in smoking rates over time. Efforts to reward communities for improved health outcomes (11) require precise estimates of health behaviors so that incentives can be closely linked with the implementation of programs or policies.

Methods to Measure Health Behaviors in Populations

Several methods exist to assess behaviors in a target population. The choice of methods is usually a function of cost due to time and personnel. Ideally, a census would be the optimal means of collecting data. However, censuses are not conducted frequently enough to enable timely data for planning. Hence, surveys are often the best mode of data collection. Advances in sampling techniques and software availability have rendered surveys the workhorse for behavioral assessment. Several modes are useful for collecting survey data: 1) face-to-face, 2) by telephone, 3) by mail, or 4) on the Internet. The mode dictates whether the data are self-reported, observed, or measured.

Five components determine the quality of a survey: 1) coverage, 2) sampling, 3) nonresponse, 4) measurement, and 5) data processing. Adequate coverage is achieved when the sampling frame includes all units of the population of interest. If the list of population units is incomplete, frame coverage errors result. Challenges to coverage vary by survey mode. Usually, sampling frames for face-to-face surveys are expensive to develop, whereas telephone sampling frames are challenging because of the use of cellular telephones and number portability (area codes are no longer associated with a specific geographic location). The US Postal Service's sampling frames (mail surveys) are not complete, but they are improving. On the other hand, Web sampling frames are not yet comprehensive.

Adequate sampling is achieved when each element on the sampling frame has a known and nonzero probability of selection. This protects against sampling bias and enables the researchers to quantify sampling error. Again, this error varies by survey modes. Face-to-face and telephone surveys have well-developed techniques for sampling. On the other hand, mail surveys do not have a clear method for within-household selection, although some promising findings have been reported. Researchers cannot control who will answer the questionnaire once the letter is received.

Nonresponse errors occur when researchers are unable to obtain data from selected respondents. This error has 2 aspects. Unit nonresponse means that the selected person refuses to do the survey; item nonresponse means that the respondent completes the survey but refuses to answer certain questions. Again, this error varies by survey mode and questions. For example, in face-to-face interviews, a respondent may be less likely to provide personal information on sexual behaviors to an interviewer. However, the same person may provide such answers via the Internet or through a computer-assisted interview (ie, researchers provide respondents a laptop during the household interview, allowing them to self-administer sensitive questions).

Measurement errors occur when a respondent's answer to a question is inaccurate (departs from the "true" value). Several factors contribute to this error, primarily, the wording of questions and their order in the questionnaire. Therefore, it is crucial to cognitively test questionnaires and pilot surveys before full implementation. Survey mode has implications for measurement errors (interviewer vs self-administered). Indeed, the interviewer stimuli and the manner in which the survey questions are conveyed to respondents and in which the responses are recorded will affect this error. For example, asking "Are you trying to lose weight?" or "Weight loss is important for your health; are you trying to lose weight?" will yield different estimates for weight-loss attempts.

Data processing errors occur during data management, editing, and recoding. Sometimes errors are made during imputations of certain missing items or responses. Finally, errors could be made in the calculation of final weights or poststratification adjustments. Hence, systems must be in place during survey operation for quality assurance and control.

Existing Surveys of Health Behaviors

Several US surveillance systems and surveys provide valuable information on behavioral risk factors (Table 2). Most of the surveys and surveillance systems are national; a few exceptions provide data at the local and state levels. In addition, most of the surveys use self-reported information on health behaviors because of the high cost of face-to-face surveys and collecting physical measurements. Among self-reported surveys, telephone surveys are the most com-

mon because they are the least expensive. In addition, the development of computer-assisted telephone interviewing software has allowed for rapid release of data.

The largest telephone survey in the United States is BRFSS, whereas the National Health and Nutrition Examination Survey (NHANES) is the main survey to provide physical measurement. A brief description of some of the key surveys follows.

The Behavioral Risk Factor Surveillance System

BRFSS is a state-based system of health surveys (9,12). The objective of BRFSS is to collect uniform, state-specific data on health risk behaviors, clinical preventive health practices, and health care access that are associated with the leading causes of death and illness in the United States. Currently, data are collected monthly in all 50 states, the District of Columbia, Puerto Rico, the Virgin Islands, and Guam. Health departments use the data to identify demographic variations in health-related behaviors, target services, address emergent and critical health issues, propose legislation for health initiatives, measure progress toward state and national health objectives, and design evaluations of their programs and policies. For most states and counties, BRFSS is the only source of population-based health behavior data related to chronic disease.

National Health and Nutrition Examination Survey

NHANES is a series of national surveys of American health and nutrition that have been conducted since the early 1960s (13). The surveys obtain both interview and physical examination data from national samples of the US population. Data collection for the current NHANES began in 1999 and is ongoing. Each year, nearly 7,000 people of all ages in households across the United States are randomly selected to participate. The study design includes representative samples of people by age, sex, and income, and oversamples African Americans, Mexican Americans, adolescents, older people, and pregnant women. Participants are interviewed in their homes. After the interview is complete, they are asked to participate in a series of physical examinations. Physical exams are conducted in specially equipped and designed mobile examination centers consisting of 4 trailers. NHANES data have been widely used by policy makers at the national level.

Pregnancy Risk Assessment Monitoring System

The Pregnancy Risk Assessment Monitoring System (PRAMS) is a surveillance project of CDC and state health departments (14). PRAMS collects state-specific, population-based data on maternal attitudes and experiences before, during, and shortly after pregnancy. Research has indicated that maternal behaviors during pregnancy may influence infant birth weight and mortality. The goal of the PRAMS project is to improve the health of mothers and infants by reducing adverse outcomes such as low birth weight, infant illness and death, and maternal illness. PRAMS provides state-specific data for planning and assessing health programs and for describing maternal experiences that may contribute to maternal and infant health.

The Youth Risk Behavior Surveillance System

The Youth Risk Behavior Surveillance System (YRBSS) monitors priority health-risk behaviors and the prevalence of obesity and asthma among youth and young adults (15). YRBSS includes a national school-based survey conducted by CDC and state, territorial, tribal, and local surveys conducted by state, territorial, and local education and health agencies and tribal governments. YRBSS monitors 6 categories of priority health-risk behaviors among youths and young adults, including behaviors that contribute to unintentional injuries and violence; tobacco use, alcohol and other drug use; sexual behaviors; and diet and physical inactivity.

The National Survey on Drug Use and Health

The National Survey on Drug Use and Health (NSDUH) provides yearly national and state-level data on the use of alcohol, tobacco, and illicit and nonmedical prescription drugs in the United States (16). Other health-related questions also appear from year to year, including questions about mental health. Many state health agencies use NSDUH data to estimate the need for drug treatment facilities.

Other surveys and surveillance systems

Among other surveys and surveillance systems that states can use for their public health activities are the Pediatric Nutrition Surveillance System, Pregnancy Surveillance System, and the National Health Care Surveys (Table 2).

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Examples of Data Use at the State and Local Level

Trends in obesity by state

BRFSS provides valuable information about health behaviors at the state and local level that is of interest not only to public health professionals but also to the media. The use of a standard questionnaire in all states and over time enables researchers to compare the health of communities. The best known example of using data to communicate information about the obesity epidemic is in a landmark article in 1999, followed by the posting of PowerPoint slides on the CDC Web site (www.cdc.gov/obesity/data/trends.html). These slides graphically show the spread of high rates of obesity across the entire United States, from coast to coast (17-19).

The SMART Project

The need for prevalence estimates at the local level has led to the creation of the Selected Metropolitan/Micropolitan Area Risk Trends (SMART) Project to analyze the data of selected metropolitan and micropolitan statistical areas (MMSAs) that have 500 or more respondents in BRFSS. Although BRFSS was designed to produce state-level estimates, growth in the sample size has facilitated production of smaller-area estimates. SMART showed that the prevalence of certain behaviors varied across cities, not unlike the differences found across states. Researchers were able to observe variation in prevalence by comparing cities with their surrounding metropolitan areas and with the rest of their state. This new use of BRFSS data fills a public health need for local area surveillance data to support targeted program implementation and evaluation; these data should help cities to better plan and direct their prevention efforts.

Mandating colorectal cancer screening insurance coverage

Data show that screening for colorectal cancer lags far behind screening for other cancers. In 2006, BRFSS data showed that New Mexico's colorectal cancer screening rates were below the national median. Citing BRFSS data, which indicated that states with mandatory coverage had better colorectal cancer screening rates, New Mexico's legislature passed a law requiring health insurance providers to cover colorectal cancer screening for New Mexico

residents aged 50 years or older, joining 22 other states with mandatory coverage.

Discussion

Data from surveys of health behaviors in populations will continue to play a role in public health efforts at the national, state, and local levels. During the past 30 years, telephone surveys have become a standard approach to collect information from adults and children. However, as response rates continue to decline and costs to increase, other methods for collecting these data need to be considered.

Challenges of health behavior surveys and data

The challenge for surveys and surveillance systems is to effectively manage increasingly complex systems that can serve the needs of multiple programs while adapting to changes in communications technology, such as the increased use of cellular telephones and call screening devices, societal behaviors (concerns about privacy and declining participation in surveys), and population diversity (the growing number of languages spoken in the United States, more cultural and ethnic diversity). As a result, all surveys are facing declining response rates, especially those based on telephones. Hence, all surveys are focusing on efforts to improve their data quality, reach populations previously not included in their survey, and expand the usefulness of the surveillance data.

Many surveys have established expert panels to guide their system improvements, to ensure the quality and validity of the data, and to reduce the potential for bias in estimates. In addition, surveillance is becoming more expensive and funding is becoming a major challenge. Indeed, many behavioral surveillance surveys are receiving less funding at a time of more demand to increase their sample sizes and add more questions.

Many surveys and surveillance systems face these challenges and are exploring potential solutions (Appendix). Some provide incentives to increase response rates. In addition, most large surveys are using prenotification to increase participation in their systems. Multimode data collection can also increase coverage and reduce cost. The systems maximize the collection of data using a less expensive mode (eg, Web or landline telephones) and con-

tacting fewer respondents from more expensive modes, such as household interviews. The combination would allow a more representative sample of the community at a lower cost.

Moreover, different participants may prefer certain modes and will respond better to such options. For example, young participants may prefer to respond to a survey over the Internet and may be more accessible through their cellular telephones. To address self-reported bias, surveys could consider conducting physical measurements on a subsample of their respondents to examine and adjust for this limitation. All surveys and surveillance systems should institute a transparent data-quality report for their users to better describe the limitations of the data and its generalizability. Finally, all surveys should consider rotating questions every year or every several years; fewer questions make better use of the questionnaire's limited space and reduces the burden on respondents.

Future directions for health behavior surveys and surveillance systems

Several issues should be considered in moving forward with data collection and local needs. The survey and surveillance community should develop and implement more innovative methods for data collection that will reduce operational cost, hence allowing for an increase in sample size. The key factor is how much detailed information is needed for monitoring trends and for action. Unless the risk factor is very rare or prevalent only in a subgroup of the population (eg, the percentage of people diagnosed with diabetes receiving a yearly eye exam), a survey based on a sample size of 300 or more should be adequate for action. On the other hand, monitoring a trend is more challenging, especially if the purpose is to detect a small change in the prevalence of a risk factor. In reality, the changes that we would expect in behaviors after a program or policy change are very small. In such a case, researchers would need a larger sample size to detect a significant difference from a baseline.

Several approaches are available for acquiring data for local communities. The preference would be to increase the sample size of an ongoing survey in a community. However, such an option can be very expensive. Perhaps using the existing infrastructure of health care settings to collect data is worth pursuing. This approach would involve developing new statistical methods to combine

data from different sources to inform decision makers. The use of small-area estimates is the most promising alternative. Indeed, using existing methods and a small sample size, it is possible to provide valid estimates at the local level.

Showing the values of surveillance systems at the local level is the best way to secure resources. Moreover, it is time to critically review our surveillance systems to explore the possibility of combining efforts and systems to better meet the needs of local data. For example, the National Immunization Survey could be combined with BRFSS, and NHANES could be combined with the National Health Interview Survey (ie, measurements on a subsample of NHIS). Indeed, CDC is now better positioned to implement such changes to improve surveillance, having recently created the Office of Surveillance, Epidemiology, and Laboratory Services. The future of health behavior surveys and surveillance systems depends on such improvements to ensure adequate funding for data collection, more research on alternative methods for data collection, and ongoing support for the use of these data.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Tables

Table 1. Actual Causes of Death, United States, 1990 and 2000

Actual Cause	No. (%) ^a in 1990	No. (%) ^a in 2000
Tobacco	400,000 (19)	435,000 (18)
Poor diet and physical inactivity	300,000 (14)	365,000 (15)
Alcohol consumption	100,000 (5)	85,000 (4)
Microbial agents	90,000 (4)	75,000 (3)
Toxic agents	60,000 (3)	55,000 (2)
Motor vehicle	25,000 (1)	43,000 (2)
Firearms	35,000 (2)	29,000 (1)
Sexual behavior	30,000 (1)	20,000 (<1)
Illicit drug use	20,000 (<1)	17,000 (<1)
Total	1,060,000 (50)	1,124,000 (47)

^a The percentages are for all deaths. Source: reference 5.

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Table 2. Major US Surveys That Measure Health Behaviors

Acronym	Name	Sponsoring Agency
ACS	American Community Survey	US Census Bureau
BRFSS	Behavioral Risk Factor Surveillance System	CDC
CPS	Current Population Survey	US Census Bureau
CSFII	Continuing Survey of Food Intakes by Individuals	US Department of Agriculture
CSHCN	National Survey of Children with Special Health Care Needs	CDC
IFPS	Infant Feeding Practice Study II	CDC
IHIS	Integrated Health Interview Series	NCHS-NHIS
HRS	Institute for Social Research Health and Retirement Study	University of Michigan, Institute for Social Research
LSOAs	Longitudinal Studies of Aging	CDC-NCHS
MEPS	Medical Expenditure Panel Survey	AHRQ
NAMCS	National Ambulatory Medical Care Survey	CDC
NAS	National Asthma Survey	CDC
NCS	National Children's Study	NIH
NCS-1	National Comorbidity Survey Replication	ICPSR
NEHIS	National Employer Health Insurance Survey	CDC
NHAMCS	National Hospital Ambulatory Medical Care Survey	CDC
NHANES	National Health and Nutrition Examination Survey	CDC
NHCS	National Health Care Surveys	CDC
NHDS	National Hospital Discharge Survey	CDC
NHHCS	National Home and Hospice Care Survey	CDC

Acronym	Name	Sponsoring Agency
NHIS	National Health Interview Survey	CDC
NIS	National Immunization Survey	CDC
NLAAS	National Latino and Asian American Study	ICPSR
NLTCS	National Long Term Care Survey	Duke University
NMFS	National Mortality Followback Survey	CDC
NMIHS	National Maternal and Infant Health Survey	CDC
NNHS	National Nursing Home Survey	CDC
NOES	National Occupational Exposure Survey	CDC
NSAS	National Survey of Ambulatory Surgery	CDC
NSCH	National Survey of Children's Health	CDC
NSDUH	National Survey on Drug Use and Health	SAMHSA, US Census Bureau
NSECH	National Survey of Early Childhood Health	CDC
NSFG	National Survey of Family Growth	CDC
PedNSS	Pediatric Nutrition Surveillance System	CDC
PNSS	Pregnancy Surveillance System	CDC
YRBSS	Youth Risk Behavior Surveillance System	CDC

Abbreviations: CDC, Centers for Disease Control and Prevention; NCHS, National Center for Health Statistics; NHIS, National Health Interview Survey; AHRQ, Agency for Healthcare Research and Quality; NIH, National Institutes of Health; ICPSR, Inter-University Consortium for Political and Social Research; SAMHSA, Substance Abuse and Mental Health Services Administration.

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Appendix. Selected Challenges and Potential Solutions for Surveys of Health Behaviors

Challenge	Potential Solution
Nonresponse	Consider incentives and prenotification.
Coverage due to mode of data collection	Consider multimode collection.
Self-reported data	Consider measurements on an in-person subsample.
Coverage (due to young age groups and language barriers)	Consider use of cellular telephones and employ bilingual interviewers.
Data quality	Institute data quality protocols and checks.
Small sample size	Oversample in certain areas, use small-area techniques.
Cost	Charge for certain questions, use survey for evaluation and get funding as part of the intervention, use multimode data collection.
Limited space for questions	Consider rotating surveys.

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Environmental Metrics for Community Health Improvement

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Suggested citation for this article: Jakubowski B, Frumkin H. Environmental metrics for community health improvement. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/09_0242.htm. Accessed [date].

PEER REVIEWED

Abstract

Environmental factors greatly affect human health. Accordingly, environmental metrics are a key part of the community health information base. We review environmental metrics relevant to community health, including measurements of contaminants in environmental media, such as air, water, and food; measurements of contaminants in people (biomonitoring); measurements of features of the built environment that affect health; and measurements of “upstream” environmental conditions relevant to health. We offer a set of metrics (including unhealthy exposures, such as pollutants, and health-promoting assets, such as parks and green space) selected on the basis of relevance to health outcomes, magnitude of associated health outcomes, corroboration in the peer-reviewed literature, and data availability, especially at the community level, and we recommend ways to use these metrics most effectively.

Introduction

Metrics (or *indicators*) are powerful tools for tracking community health determinants and outcomes. Optimal metrics are measurable, simple, sensitive, robust, credible, impartial, actionable, and reflective of community values (1-3). Metrics can help identify problems, define community priorities, drive policy development, compare differ-

ent communities, assess health disparities, and monitor progress over time in reaching goals.

Environmental metrics are a key part of the community health information base. Environmental factors greatly affect human health, both directly and proximately (eg, the quality of air people breathe) and indirectly and “upstream” (eg, the sources of energy a community uses). Environmental metrics may measure both unhealthy exposures, such as pollutants, and “salutogenic” exposures, such as parks and greenspace.

Three efforts help inform thinking about environmental metrics for community health. First, many communities identified *quality of life indicators* (also known as livability indicators) beginning in the 1980s (4). These frequently reflect environmental factors relevant to health. Second, *sustainability indicators* have recently found wide use (4). Many sustainability indicators pertain to environmental factors with clear relevance to human health (5). Third, the Council of State and Territorial Epidemiologists (6), collaborating with the Centers for Disease Control and Prevention (CDC), has addressed *environmental public health indicators*, emphasizing drinking water, air quality, asthma, and climate change.

We draw on each of these efforts to discuss environmental health metrics at the community level. Our logic model is based on the standard toxicologic sequence: exposure (in the environment) leads to dose (in the body), which leads to health effect. Since “exposure” can be either dangerous or salutary and either proximate or upstream, we consider several “exposure” metrics. These metrics fall into 4 major categories: measurements of contaminants in environmental media, such as air, water, and food; measurements of contaminants in people (biomonitoring); measurements of features of the built environment that affect health; and

measurements of “upstream” environmental conditions relevant to health (Table). We selected metrics on the basis of relevance to health outcomes, magnitude of associated health outcomes, data availability (especially at the local level), and corroboration in the peer-reviewed literature. Finally, we discuss ways to integrate environmental data with other data and to apply them to public health action.

Measurements of Contaminants in Environmental Media

Contaminants can be measured and tracked in air, water, and food, and waste production and exposure can be tracked via both emissions and residential proximity to waste sites.

Air pollution is associated with considerable illness and death. The Clean Air Act defines 6 “criteria pollutants” — carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and particulate matter (PM_{2.5} and PM₁₀) — each with well-characterized health effects. Analysis of these pollutants is an established metric (6). The US Environmental Protection Agency (EPA) designates an additional 187 substances as hazardous air pollutants (HAP), which also threaten health (7). Although criteria pollutant levels are measured for regulatory purposes at approximately 5,000 sites nationwide, HAP monitoring is more sparse. These monitoring data are available through EPA’s Air Quality System Data Mart (www.epa.gov/ttn/airs/aqsdatamart/), but poor temporal and spatial coverage and unrepresentative site placement limit their use. Communities can partially overcome these limits by using air quality modeling.

Water quality may be monitored both at the source (including groundwater and surface water) and at the tap. Metrics are available for both. The Clean Water Act requires states to monitor surface waters and to list those failing to meet water quality standards as “impaired” (8). A useful surface water quality metric is therefore the percentage of waters classified as impaired. Under the Safe Drinking Water Act, EPA has set national health-based standards for 90 microbiological, chemical, and radiologic drinking water contaminants in public water systems (9). Given this large number, metrics may include summary measures, such as annual number of drinking water contaminant exceedances and concentrations of selected indicator contaminants. Data are available through the EPA

Safe Drinking Water Information System, including violation information for each public water system (www.epa.gov/safewater/databases/sdwis/index.html). Alternatively, data may be obtained directly from municipal water departments, which publish annual reports of water quality. Private wells and small water systems, which supply roughly 1 in 7 Americans with water, are exempt from routine monitoring (10).

Food contamination is measured on a national scale by the Food and Drug Administration (FDA) and the US Department of Agriculture (USDA). The FDA’s Total Diet Study tests a market basket of 300 foods 4 times per year for pesticide residues, nutrient elements, industrial chemicals, and other chemical contaminants (11). The USDA tests agricultural commodities for pesticide residues through the Pesticide Data Program (www.ams.usda.gov/AMSV1.0/pdp) and verifies that pesticide tolerance levels established by the EPA are not violated in animal products through the National Residue Program (www.fsis.usda.gov/PDF/2009_Blue_Book.pdf). Regional or local monitoring of food contamination is rare (6); a unique exception is the measurement of contaminants in fish and shellfish in the Great Lakes (12). Food contaminants are not routinely measured at the community level, and feasible metrics have not been identified. However, an estimated 76 million illnesses are associated with microbiological food contamination each year (13), 44% of Americans eat at a restaurant on an average day (14), and local health departments routinely inspect restaurants. Therefore, the annual number of critical violations documented during restaurant inspections is a useful community metric.

Toxic chemical releases are tabulated by EPA’s Toxic Release Inventory (TRI). This reporting system collects data on environmental releases of 581 chemicals and 30 chemical categories by facilities in selected industries, and the data are available online in EPA’s TRI.NET system (www.epa.gov/tri/tridotnet/). The sum of annual toxic releases is a simple metric, but it fails to account for the variable toxicity of released chemicals. Communities can address this issue by using toxicity weighting tools (15). TRI data limitations include the 2-year time lag between toxic release and data release; the omission of thousands of chemicals in commercial production; reporting exemptions based on size, primary business activity, and chemical manufacturing, processing, and use thresholds; inaccuracies in self-reported data; and the fact that emissions do not equate to human exposures.

Hazardous waste exposure has been associated with self-reported poor health (16), decreased psychological well-being (17), and other health effects. Potential metrics include the number of hazardous waste sites in a community and the percentage of households living within 1 mile of a hazardous waste site, a distance at which health effects have been reported (18). Although data for such metrics are readily available through state environment departments, a limitation is that proximity to a waste site does not equate to human exposures.

Measurements of Contaminants in People (Biomonitoring)

Biomonitoring, or measuring levels of contaminants in human samples (eg, blood, urine), is a powerful tool to quantify human exposure to chemicals and to link national risk assessments to specific community threats (19). CDC conducts ongoing biomonitoring on national population samples. Its *Third National Report on Human Exposure to Environmental Chemicals* reported blood and urine levels of 148 environmental chemicals (20), and the *Fourth National Report* added 75 new chemicals (21). Although the *National Report* does not provide data at the community level, it does provide national exposure levels that can serve as benchmarks for local comparison.

Lead screening in children is the only routine subnational application of biomonitoring. In 2006, more than 3 million children younger than 72 months had their blood lead levels checked (22). Communities may conduct other biomonitoring, especially if certain contaminants are of local concern; for example, 3 Minnesota communities with suspected exposures are measuring levels of arsenic, mercury, and perfluorochemicals (PFCs) under a biomonitoring pilot program (23). Such efforts can be complex and costly, up to \$2,000 per person, depending on the analytes selected. Additionally, epidemiologic and toxicologic knowledge gaps frustrate efforts to translate exposure levels into health recommendations. Finally, although biomonitoring can unequivocally establish the occurrence of exposure, it is rarely useful in identifying its source.

Measurements of the Built Environment

The built environment — places designed, shaped, and maintained by human activity — encompasses nearly all

of the places we live, work, play, and study. It ranges from the small scale of rooms and buildings, to the intermediate scale of neighborhoods, to the large scale of metropolitan areas, and includes homes, sidewalks, parks, transit systems, roads, and more. The role of the built environment in health has been increasingly recognized in recent years (24). However, community health metrics of the built environment remain underused.

Automobile use is associated with air pollution, injuries and fatalities, physical inactivity, noise pollution, and other direct health effects (25), and contributes substantially to greenhouse gas (GHG) emissions (26). Reducing automobile use by reducing travel demand and shifting to alternative modes of transportation (eg, walking, bicycling, transit) can promote public health. Metrics of automobile dependence include average commute time to work and per capita daily vehicle miles traveled (DVMT). Annual county-level commute time data are available through the US Census Bureau American Community Survey (ACS) (www.census.gov/acs/www/index.html). The Texas Transportation Institute reports DVMT data for 90 US cities in its annual *Urban Mobility Report* (27); communities not included in the report can measure DVMT by using a survey instrument developed by the Energy Information Administration (28).

Measures of alternative transportation complement automobile dependence metrics. Public transportation use reduces automobile crashes, improves air quality, and entails routine physical activity (associated with walking to and from transit). Transit use can be measured as the proportion of employed people using transit to get to work; these data are collected in the ACS. Transit access can be measured as the proportion of households within 0.25 miles of a local bus or rail link, corresponding to the observation that people are willing to walk up to this distance to transit stops (29).

Other land-use and transportation features — population density, land-use mix, and connectivity (the ease of getting from one place to another, a function of the distance and directness of a trip route) — are associated with walkability, which in turn yields many health benefits. Population density can be calculated across spatial scales by using census data. Although measures of connectivity abound, average block length is often chosen because of its simplicity. Similarly, although many metrics of land-use mix are available (30), quantitative

measures such as the index developed by Frank and Pivo (31) are frequently used. Distance between common trip origins and destinations also gives rise to some metrics. One example is the proportion of households with half-mile access to a public elementary school. This metric is relevant in relation to children's travel to school; during the past 30 years, the rate of active commuting has dramatically declined (32).

Because pedestrian infrastructure, such as sidewalks and trails, is associated with walking (33), metrics of this infrastructure, such as the ratio of sidewalk length to road length, are also salient. Unfortunately, data on sidewalk coverage are scarce, and data extracted from aerial photos are frequently of poor quality.

Bicycling complements walking by allowing active travel over greater distances. Bicycling infrastructure promotes bicycling (34); benefits include reduced body weight and reduced air pollutant and GHG emissions. Bicycle infrastructure can be measured as the length of the bikeway network, including bicycle paths and lanes, relative to total street miles.

Travel behavior, although it is not itself an environmental feature, offers metrics relevant to people's use of the built environment. The ACS measures the proportion of employed people who walk and bicycle to work. For children, active commuting to school can be measured by using parental surveys.

Green space, parks, and community gardens are examples of land use that promote health. Green space supports community health by reducing stress, promoting physical activity, and improving perceived general health (35). Percentage of tree canopy cover in an area is a widely used measure of community green space that can be determined through analysis of satellite or aerial images (36). Park access, a correlate of physical activity, can be measured as the proportion of households within 0.25 miles of a public park (sometimes limited to parks of a certain area, such as one-half acre or larger). Some communities measure the park and protected open space acreage per 1,000 residents. Finally, community gardens merit measurement because they benefit both gardeners and the public; increased physical activity, fruit and vegetable consumption, and community empowerment are all reported benefits of community garden programs (37). The proportion of households within 0.25 miles of a community

garden and acreage used for community garden plots are metrics of community garden accessibility and density.

The food environment refers to the availability of both healthful and unhealthful foods in neighborhoods. Features of the food environment have increasingly been associated with eating patterns and nutritional status (38). However, practicable metrics of the food environment are only recently being developed and validated (39,40). Access to healthful food is a community asset. Full-service supermarkets provide more healthful food choices than do neighborhood groceries and convenience stores (39), and their presence has been associated with reduced overweight and obesity (41). Similarly, farmers' markets improve fruit and vegetable availability and provide a venue for education about healthful eating. In a longitudinal study of an African American community in North Carolina, establishing a community farmers' market significantly increased the proportion of residents who met daily fruit and vegetable consumption recommendations (42). The density of supermarkets in a census tract and the proportion of households within 1 mile of a farmers' market are metrics of a healthful food environment (43). Data supporting these metrics are available from local health departments and state agriculture departments, but geographic analysis is required.

Alcohol outlets, convenience stores, and fast-food restaurants are a counterpoint to supermarkets and farmers' markets. Studies have reported associations between alcohol outlet density and the prevalence of gonorrhea (44) and violence (45). Although distribution of alcohol licenses by zip code is a simple metric that uses publicly available data, finer geographic resolution is achieved by measuring the ratio of liquor outlets to roadway miles at the census tract level. Convenience store density and accessibility have been associated with increased prevalence of overweight and obesity (46-48); the corresponding metric is census tract convenience store density. Although an association between fast-food accessibility and obesity has not been observed in the general population, children and adolescents may be at risk. Elevated densities of fast-food restaurants have been reported around schools in Chicago (49) and Los Angeles (50), and some Californian middle- and high-school students attending schools located within 0.5 miles of the nearest fast-food restaurant are more likely to be obese or overweight than their counterparts attending schools in environments with more healthful foods (51). On the basis of these findings, the number of

schools located within 0.5 miles of a fast-food restaurant may be a useful metric.

Moving Further Upstream

Some environmental practices and features affect health indirectly, over large spatial scales, and over long periods. Such factors are not typically considered as community health metrics but may be informative and may help define community health aspirations and plans.

Development and use of renewable energy resources can mitigate climate change, reduce air pollution, and eliminate diseases and injuries associated with fossil fuel extraction (52). The corresponding metric is the proportion of electricity derived from renewable sources, drawing on data available from local utilities. Annual per capita GHG emissions (53) is a related metric. One approach to this metric is calculation of the “carbon footprint,” and many “carbon footprint calculators” are available (<http://co2list.org/files/calculators.htm>). Such calculations are complex; transportation, dietary habits, electricity production, natural gas consumption, and landfill waste decomposition must all be considered. Regardless, the potential health effect of climate change supports use of this metric.

Metrics of waste management are relevant both because waste can have an effect on public health, and waste generation indirectly reflects resource depletion. Two metrics suitable for use at the community level are the proportion of the waste stream diverted from landfill and annual per capita quantity of landfilled solid waste. Resource depletion goes well beyond waste generation, to include biodiversity loss, soil erosion, groundwater depletion, and other aspects of environmental degradation (54), but no feasible community-level measures of these long-term health determinants have been identified.

Health Effects Associated With Environmental Exposures and Environmental Policies for Health

Although measures of general health outcomes are discussed elsewhere in this issue of *Preventing Chronic Disease (PCD)*, some diseases deserve mention here because of their close associations with environmental exposures (6). One category is diseases uniquely related

to environmental exposures; examples include pesticide toxicity (from pesticides) and asbestosis and mesothelioma (from asbestos). The incidence of these diseases may be a useful metric in populations with known exposure risks. A second category is diseases with complex causes, including a substantial environmental component, such as asthma and hearing loss. The incidences of such conditions may be useful environmental health metrics, but they must be interpreted cautiously because other etiologic factors play important roles.

Similarly, although health policies and programs are addressed elsewhere in this issue of *PCD*, policies that reduce community exposures to environmental hazards deserve mention here (6). The prototypical environmental health policy is enforceable limits on smoking in public places, but policies ranging from zoning ordinances to open burning bans can promote health and may provide useful metrics.

Integrating and Applying Environmental Data for Public Health

Environmental metrics provide valuable information, and when combined with other community health metrics can help identify problems, define priorities, inform policy development, compare different communities, assess health disparities, and monitor progress over time in reaching goals. Environmental metrics must be applied strategically to maximize their effect on public health. This approach requires appreciating differences among communities, using techniques (eg, geographic information systems [GIS]) to connect environmental data with communities, and applying metrics toward policy making.

Not every environmental metric of community health is applicable to every community. Demographic and geographic differences matter (55). For example, coastal water quality indicators are regionally specific; a northwest community may measure Chinook spawning in local waterways, whereas an Atlantic coastal community may measure harvestable shellfish beds. Involving communities in defining and using metrics can help ensure metric relevance and promote long-term program sustainability (56,57).

Metrics are data, and data must be integrated to yield information. An invaluable tool is GIS, which helps link health determinants and outcomes over appropriate spa-

tial scales. GIS not only allow for data integration but also facilitates communication between the public and professionals by providing a common language, namely the language of place (58). GIS is also ideally suited to identify health disparities and environmental injustices in communities (59). By integrating environmental measurements with demographic information, including race, ethnicity, and socioeconomic status, inequities can be identified, and interventions can be directed to improve the health of disenfranchised populations. GIS also facilitates public education, a commonly cited goal of community indicator projects. However, realizing the educational value of community measurements requires supplementing visual information with plain language translations of technical metrics and synthesis of broader narratives that reconnect with community values. Because of GIS's emerging emphasis, GIS capacity is increasingly an essential part of community metrics.

Finally, metrics must be used to drive policy and achieve and reward sustained community health improvements. This approach requires engaging decision makers in indicator development (60) and tying policy initiatives to metrics. For example, the San Francisco Bay Area's transportation plan, *Transportation 2035: Change in Motion*, establishes targets for reduced emissions of carbon dioxide, PM_{2.5} and PM₁₀, per capita vehicle miles traveled, and travel delay (61). Environmental metrics of community health can and should be tied to health and health equity targets to maximize their ability to improve community health and well-being.

Acknowledgments

This article was prepared by invitation from the University of Wisconsin Population Health Institute project, County Health Rankings-Mobilizing Action Toward Community Health (MATCH). Mr Jakubowski coauthored this paper while participating in the National Center for Environmental Health/Agency for Toxic Substances and Disease Registry Collegiate Leaders in Environmental Health program in the summer of 2009 (www.cdc.gov/nceh/cleh/).

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Table

Table. Environmental Metrics for Community Health Improvement

Measurements of contaminants in environmental media				
Air quality	Criteria pollutant levels ^b	1	1	2
	Hazardous air pollutant levels	1	3	3
Water quality	Percentage of surface waters listed as “impaired” ^b	2	1	2
	Number of drinking water contaminant exceedances ^b	1	1	2
	Concentrations of drinking water contamination indicator contaminants ^b	1	1	2
Food contamination	Annual number of critical violations during routine restaurant inspections	2	1	2
Toxic releases	Environmental releases of Toxic Release Inventory chemicals by reporting facilities ^b	2	1	1
Hazardous waste	Percentage of households living within 1 mile of a hazardous waste site	3	1	1
Measurements of contaminants in people				
Biomonitoring	Prevalence of elevated blood lead levels in children ^b	1	1	1
Measurements of the built environment				
Transportation and land use	Percentage of employed persons riding public transit, walking, and bicycling to work	2, 1, 1	2, 2, 2	2
	Average commute time to work	2	1	2
	Per capita daily vehicle miles traveled ^b	2	3	2
	Population density	2	1	1
	Connectivity (ease of traveling between 2 points): average block length	2	2	1
	Land-use mix (diversity of land uses [eg, residential, commercial, recreational, educational] within a defined area)	2	3	1
	Percentage of households within 0.25 miles of a local bus or rail link ^b	2	2	1
	Ratio of sidewalk length to road length	2	2	1
	Length of bikeway network relative to total street miles	2	2	2
	Percentage of households within 0.5 miles of a public elementary school	2	2	1
	Active commuting rates in school children	1	2	2

^a Scores from 1 to 3 are semi-quantitative assessments based on the authors’ assessments, reached by agreement of the 2 authors, with 1 being greatest.

^b From the Council of State and Territorial Epidemiologists (6).

(Continued on next page)

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Table. (continued) Environmental Metrics for Community Health Improvement

Environmental Factor	Metric	Magnitude of Health Effect ^a	Ease of Use/Data Collection ^a	Ability to Detect Disparities ^a
Green space, parks, and community gardens	Percentage households within 0.25 miles of a public park one-half acre or larger	1	2	1
	Park and green space acreage per 1,000 residents	2	1	1
	Percentage of tree canopy cover in an area	2	2	1
	Percentage of households within 0.25 miles of a community garden	2	2	1
	Acreage used for community garden plots	3	2	2
Food environment	Percentage of households within 1 mile of a farmers' market	2	2	1
	Supermarket density	1	2	1
	Alcohol license density	2	2	3
	Ratio of liquor outlets to roadway miles	1	3	1
	Convenience store density	1	2	1
	Number of schools within 0.5 miles of a fast-food restaurant	2	2	1
Measurements of upstream factors relevant to health				
Environmental conditions	Percentage of electricity from renewable sources (eg, wind, solar, geothermal)	2	2	3
	Annual per capita greenhouse gas emissions	1	3	3
	Percentage of waste stream diverted from landfill	2	2	3
	Annual per capita landfilled solid waste	2	2	3

^a Scores from 1 to 3 are semi-quantitative assessments based on the authors' assessments, reached by agreement of the 2 authors, with 1 being greatest.

^b From the Council of State and Territorial Epidemiologists (6).

SPECIAL TOPIC

Measuring the Impact of Public Health Policy

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Suggested citation for this article: Brownson RC, Seiler R, Eyster AA. Measuring the impact of public health policy. *Prev Chronic Dis* 2010;7(4). http://www.cdc.gov/pcd/issues/2010/jul/09_0249.htm. Accessed [date].

PEER REVIEWED

Abstract

Effective health policies and allocation of public health resources can substantially improve public health. An objective of public health practitioners and researchers is to identify key metrics that would help improve effective policies and terminate poor ones. We review articles published in 2008 surrounding measurement issues for public health policy and present a set of recommendations for future emphasis. We found that a set of consensus metrics for population health performance should be developed. However, considerable work is needed to develop appropriate metrics covering policy approaches that can affect large populations, intervention approaches within organizations, and individual-level behavioral approaches for prevention or disease management.

Introduction

Effective health policies and allocation of public health resources can substantially improve public health (1). For example, each of the 10 great public health achievements of the 20th century (2) was influenced by policy change, such as seat belt laws or regulations governing permissible workplace exposures. To improve public health outcomes, evidence-based policy is developed through a continuous process that uses the best available quantitative and qualitative evidence (3). To broaden the evidence base, a “pay-

for-performance” concept that has been widely applied to medical care (4) should be considered for population- and policy-related outcomes (5). In the pay-for-performance approach, providers are rewarded for meeting targets for health care services. For public health, the analogous example might be if public health laws were based in part on policies that are the most cost-effective.

A difference between individual-level health care and population-level approaches for improving health is that public health interventions often occur at multiple levels (6). Upstream interventions involve policy approaches that can affect large populations through regulation, increased access, or economic incentives. For example, increasing tobacco taxes is an effective method for controlling tobacco-related diseases (7). Midstream interventions occur within organizations. For example, worksite-based programs that increase employee access to facilities for physical activity show promise in improving health. Most research has been conducted on downstream interventions, which often involve individual-level behavioral approaches for prevention or disease management. A set of metrics (ie, a group of related measures to quantify some characteristic) can be developed corresponding to these 3 levels. For example, for tobacco control, 3 metrics might be the number of state laws that ban smoking (upstream), the number of private worksites that ban smoking in states with weak laws (midstream), and the rate of self-reported exposure to secondhand smoke (downstream).

In addition to these levels of change, the policy process also must be considered. The framework of Kingdon (8) is useful in illustrating the policy-making process. Kingdon suggests that policies move forward when elements of 3 “streams” come together. (These “streams” are different than the upstream, midstream, and downstream metrics noted above.) The first of these streams is the definition

of the problem (eg, a high cancer rate). The second is the development of potential policies to solve that problem (eg, identification of policy measures to achieve an effective cancer control strategy). The third is the role of politics and public opinion (eg, interest groups supporting or opposing the policy). Policy change occurs when a “window of opportunity” opens and the 3 streams push through policy change. A tenet of Kingdon’s model is that policy makers are on the receiving end of sometimes disconnected, random, and chaotic data (8,9). Therefore, a key objective of public health practitioners and researchers is to identify metrics for assessing burden, setting priorities, and measuring progress. Such a set of metrics would help public health decision makers as they seek to improve, expand, or terminate policies.

To illustrate the measurement-related issues for public health policy, we review the literature that sets up recommendations. To reach public health goals, we need metrics for the policy environment, just as we do for other environments relevant to public health progress (eg, air, water, the built environment, health care settings).

Analysis of Metrics in the Literature

Methods

To better understand the use of policy metrics, we reviewed articles published in 14 public health and preventive medicine journals. The journals chosen were broad, general public health journals and not specific to a single topic such as nutrition or disease. Journals that focused solely on policy and journal supplements were not included. We examined the following journals:

1. *American Journal of Health Behavior*
2. *American Journal of Health Promotion*
3. *American Journal of Preventive Medicine*
4. *American Journal of Public Health*
5. *Australian and New Zealand Journal of Public Health*
6. *Health Education and Behavior*
7. *Health Education Research*
8. *Health Promotion International*
9. *Health Psychology*
10. *Journal of Behavioral Medicine*
11. *Journal of Public Health Management and Practice*
12. *Journal of School Health*

13. *Public Health Reports*

14. *Social Science and Medicine*

We defined a policy article as one that explicitly describes a policy, law, or regulation (including development, implementation, and evaluation). Using online archives, we conducted a systematic audit of articles published in 2008. Tables of contents were collected from each journal issue for that year. Two researchers reviewed the table of contents in each issue and compiled a list of policy-related articles. If the policy content was unclear from the title of the article, the abstract or full text was used. Any articles in question were reconciled by the research team until consensus was reached.

Once the list of policy articles was compiled, the titles were sorted by policy category. To examine policy metrics in detail, 78 articles from 2008 were analyzed. Editorials, commentaries, and reviews were excluded, resulting in 47 articles from which metrics were summarized. For articles that presented data analysis, we assessed policy metrics across several categories:

- the evaluation design
- whether the evaluation was quantitative, qualitative, or both
- the outcome (dependent) variables
- whether metrics were at an upstream, midstream, or downstream level
- whether measurement properties of the metrics were reported
- whether there was specific attention to health disparities
- presence or absence of economic data

Results

The articles examined were a mixture of both “big P” policy studies (eg, formal laws, rules, regulations enacted by elected officials) and “small p” policy research (eg, organizational guidelines, internal agency decisions or memoranda, social norms guiding behavior) (3). Articles were categorized as child health; maternal health; HIV/AIDS; drug use prevention; tobacco control; violence control; environmental and disaster preparedness and biosecurity; school health; special populations; worksite health; international health; advocacy; general policy; or health care.

The topics that were most represented were tobacco control, international health, and school health. Among

international articles, health care was the most common topic. The *Journal of School Health* and the *American Journal of Public Health* published the most policy-related articles.

Most articles (74.5%) relied on a cross-sectional design (Table 1). Only 3 studies reported any economic or cost data. Fourteen studies reported on psychometric properties of the metrics. Most presented new data on psychometric testing (n = 10), while some referred to previous articles (n = 4). The testing most often reported was for reliability (eg, interrater reliability), internal consistency, or key informant validation of methods. When categorizing according to 3 levels of outcomes, most were downstream (n = 31), followed by midstream (n = 13) and upstream (n = 3). Detailed data on health disparities (eg, subgroup analysis for vulnerable populations) were available for only 2 studies. Both of these studies (10,11) explicitly investigated differences among disparate groups; 1 studied how national laws that increased tobacco prices affected smoking prevalence among different socioeconomic groups (by sex, occupation, and birth cohort), and the other investigated differences in the use of skilled birth attendants by women of varying wealth in several countries.

Most of these studies dealt with the effectiveness or evaluation of a given policy that is in effect. Three studies focused on characteristics of or influences on policies that are successfully “passed.”

Recommendations for Policy-Related Metrics

Expand sources of evidence

Policy outcomes can be monitored by accumulating evidence from many sources to gain insight into a particular topic, often combining quantitative and qualitative data to understand content and track progress. Consensus on valid and useful measures is needed (12). Successfully monitoring outcomes will also require sources beyond the usual public health data sets (eg, tax revenue, polling, and marketing data). We used the 3 domains of evidence-based policy (process, content, outcome) to present sample metrics across the 3 domains (Table 2). Metrics are quantitative (eg, the percentage of the population with a particular health behavior) and qualitative (eg, the content of a

certain policy). Most studies in this review were cross-sectional; stronger study designs are needed to improve the evidence base.

Consider the paradox of local policy evidence

Although much of the effect of public health policy occurs locally, in many jurisdictions high-quality data are lacking at the city, county, or metropolitan levels. Some attempts have been made to identify local-level indicators (13), but a set of consensus policy metrics needs to be developed for local areas, as has been done at the national and state levels.

Develop systems for policy surveillance

A public health adage is “what gets measured gets done” (14). This has typically been applied to downstream endpoints; however, for policy approaches, midstream and upstream metrics are needed. A few efforts are under way to develop public health policy surveillance systems. For example, a group of federal and voluntary agencies has developed policy surveillance systems for tobacco, alcohol, and more recently, school-based nutrition and physical education (3).

Increase understanding of practice-based evidence

Policy-relevant evidence should come from settings and organizations that reflect public health practice and policy. For example, efforts such as the Steps to a HealthierUS initiative, YMCA’s Activate America, and faith-based interventions demonstrate that existing approaches for leadership development can enhance the use of evidence for promoting physical activity (15). As these efforts are documented, specific attention should be given to the key metrics for measuring progress.

Make research more accessible for policy audiences

Researchers and policy makers sometimes exist in parallel universes because of decision-making differences, poor timing, ambiguous findings, and lack of relevant data (16). Metrics may become relevant to policy makers when the effects of a health outcome are framed in terms of the direct impact on one’s community, family, or constituents (17). An excellent example comes from the Rudd Center Revenue Calculator (www.yaleruddcenter.org/sodatax.aspx), which shows the revenue that could be generated

from a 1-cent excise tax per ounce of sugar-sweetened beverages by state or municipality.

Improve and clarify metrics relevant to health disparities

Eliminating health disparities is a policy imperative. To achieve this goal, we need to better articulate the key domains of inequality. For example, variables have included race/ethnicity, socioeconomic status or social class, geography, age, and sex (18). Our review of the existing literature showed sparse attention to metrics for health disparities and policy.

Improve incorporation of economic metrics

In deciding whether to take action and how to prioritize resources, policy makers often ask 3 questions: 1) Is there a problem? 2) Do we know how to fix the problem? and 3) How much will it cost? We probably have the most data for answering the first question (19), an intermediate amount for the second (20), and the least data for the economic issues (21). Studies of disease burden that use comparative units of analysis (eg, quality-adjusted life years) provide a basis for economic evaluations (22). Since much of the literature on pay-for-performance has focused on financial incentives, more work is needed to understand how the concepts apply to population-level public health policy.

Learn by analogy

Although public health research and practice are often segregated into “silos” because of categorical funding streams and interest groups (23), much can be learned across content areas. For example, several authors have examined the lessons from tobacco control that can be applied to the obesity epidemic (24,25). Similar areas in public health where policy measurement is advanced may provide beneficial insights to developing topics.

Conclusion

Much of what has been learned from surveillance of diseases and risk factors can probably be applied in the policy arena. A full spectrum of outcomes is needed spanning upstream, midstream, and downstream domains. Arriving at these metrics will require creative thinking and application of alternative study designs. For example, adherence

to a strict hierarchy of study designs may reinforce an “inverse evidence law” by which interventions most likely to influence whole populations (eg, policy change) are least valued in an evidence matrix emphasizing randomized designs (26). To establish a system that rewards policies for improved population health (5), considerable work is needed on the appropriate metrics.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

This work was partially funded through Centers for Disease Control and Prevention award U48 DP00060 (Prevention Research Centers Program) and support from the National Institutes of Health (grant NCI 1R01CA124404-02).

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Tables

Table 1. Summary of Policy Study Designs and Metrics From Articles in Selected Journals,^a 2008^b

Content Area	No. of Papers	No. With Original Data	No. With Cross-Sectional Design	No. With Outcome Level ^c		
				Upstream	Midstream	Downstream
Child health	2	2	2 ^d	1	0	1
Maternal health	0	NA	NA	NA	NA	NA
HIV/AIDS	2	2	2	0	1	1
Drug use prevention	1	1	1	0	1	0
Tobacco control	21	19	14 ^d	2	4	15
Violence control	1	1	1	0	0	1
Environmental and disaster preparedness and biosecurity	2	2	2	0	0	2
School health ^e	4	4	3	0	3	1
Special populations	1	1	0	0	1	0
Worksite health	2	1	2	0	2	0
International health	9	7	7 ^d	0	1	8
Advocacy	0	NA	NA	NA	NA	NA
General policy	1	1	1	0	0	1
Health care	1	1	0	0	0	1
Total	47	42	35	3	13	31

Abbreviation: NA, not applicable.

^a *American Journal of Health Behavior, American Journal of Health Promotion, American Journal of Preventive Medicine, American Journal of Public Health, Australian and New Zealand Journal of Public Health, Health Education and Behavior, Health Education Research, Health Promotion International, Health Psychology, Journal of Behavioral Medicine, Journal of Public Health Management and Practice, Journal of School Health, Public Health Reports, Social Science and Medicine.*

^b Excludes editorials, commentaries, and reviews.

^c Upstream interventions involve policy approaches that have the potential to affect large populations through regulation, increasing access, or economic incentives. Midstream interventions occur within organizations, such as worksites. Downstream interventions involve individual-level behavioral approaches for prevention or disease management.

^d Includes 1 multilevel study.

^e Includes studies on obesity prevention in school settings (eg, wellness policies).

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Table 2. Metrics for Evidence-Based Public Health Policy Across Various Domains

Domain	Objective	Data Sources	Example Metrics for Tobacco Control
Process	To understand approaches to enhance the likelihood of policy adoption	<ul style="list-style-type: none"> • Key informant interviews • Case studies • Surveys of setting-specific political contexts 	<ul style="list-style-type: none"> • Understanding the lessons learned from successful state and local efforts in tobacco control • The level of support from policy makers for various tobacco control interventions
Content	To identify specific policy elements that are likely to be effective	<ul style="list-style-type: none"> • Systematic reviews • Content analyses 	<ul style="list-style-type: none"> • The specific content of model laws on tobacco that make use of decades of research on the impacts of policy on tobacco use • The specific content of policies regarding the funding needed for various tobacco control activities (eg, surveillance, health communication, cessation)
Outcome	To document the potential effect of policy	<ul style="list-style-type: none"> • Surveillance systems • Natural experiments tracking policy-related endpoints 	<ul style="list-style-type: none"> • The changes in rates of self-reported tobacco use • The cost-effectiveness of tobacco policy interventions

Source: Adapted from Brownson et al (3).

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Observations on Incentives to Improve Population Health

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Suggested citation for this article: McGinnis JM. Observations on incentives to improve population health. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0078.htm. Accessed [date].

Initial Reflections

The pace of progress in population health can be influenced by the incentives in play and the metrics that trigger them. The MATCH (Mobilizing Action Toward Community Health) articles in this issue of *Preventing Chronic Disease* explore the use of incentives to improve population health and hold implications for the development and application of the measures to which they are linked. Metrics in population health can serve to draw and focus attention, encourage action, and direct rewards and penalties. When those rewards and penalties take on an economic dimension, the results can be powerful.

This potential application of population health measures is especially important if the aim is to transform the allocation of social energy and resources, as it clearly must be. Currently, our national health investment profile is deeply flawed — more than 95% of every health dollar goes to treatment rather than prevention. In a system in which all our salient incentives are structured to reward volume over value, we miss virtually no opportunity to treat disease, often unsuccessfully or erroneously.

On the other hand, each day we miss countless opportunities to prevent disease and promote health. If we seek to reform health care payment systems to yield better health returns, investment in prevention has to move to the highest — not lowest — priority. If our aim is to fashion the health equivalent of indicators that shape our economic policies, the most rational social investment strategy

would center around prevention and our health care payment system would follow suit.

A reformed health care payment system can advance health as the fundamental priority in 3 ways. First, every American should receive coverage for the clinical preventive services that are appropriate to him or her without copayment. Second, grant support should be set aside for community-based initiatives that are necessary to improve the health and health care of the community's residents. Finally, resources to address the overall health care needs of a population should be shaped by a blend of the community's health needs and efforts, as reflected by metrics that indicate trends for determinants of the population's health status.

The Articles

The articles in this issue present a number of perspectives relevant to considering how incentives might work for population health improvement. Described below are common elements and how we might think about using incentives.

Haveman introduces the economist's perspective of the concept, structure, and function of incentives — financial and nonfinancial — including examples from education, jobs, and health (1). Mullahy reviews the conceptual challenges in transferring insights from targeting incentives for personal health services to possible effects on population health, including issues related to accounting for the production function for population health and the roles of multiple sectors (2). Rothschild shows the relevance of social marketing as a factor in improving population health (3).

Witte looks at performance metrics and rewards in education as a reference point for population health (4).

Baxter identifies incentive options if no new resources are available, for example, using existing but unenforced requirements (such as those related to the nutritional content of school meals), using the purchasing power of government or emphasizing “cobenefits” (such as taxes on tobacco that offer disincentives and raise revenues) (5). Asch assesses the applicability of paying for performance in health care to population health (6).

Fox looks at the nature and evolving results of “triple aim” efforts, with emphasis on health care, population health, and cost reduction, including how a “value dividend” might most effectively be characterized (7). Oliver describes the potential incentives inherent in population health rankings such as MATCH, including how to link them to key uses such as identifying problems, setting agendas, and changing community policies (8). Smith reviews the European experience with setting health targets, noting, for example, the challenges in setting the targets (which ones, outcomes vs process, how to quantify, cross-sector responsibilities) and in translating some of the key population health aims to the local level (9).

Each of the articles is rich with examples of economic incentives, such as the use of graduate medical education payments by Medicare to teaching hospitals (1). Many of the examples, however, can have unintended consequences:

- The intent of developing the diagnosis-related groups (DRGs) — paying a flat fee for a group of services for a given condition — is to blunt the tendency of fee-for-service to increase service volume. Some “gaming” occurs, however, such as listing healthy patients under a more expensive DRG category or dividing the treatment into multiple admissions or episodes (6).
- Merit pay in education in Wisconsin did not appear to yield the educational value anticipated for teacher performance, judged by the year-to-year identification of high-performing teachers (4).
- The Child Nutrition Act has provisions for nutrition and wellness programs, but these are often unenforced because states view them as unfunded mandates. The situation is similar in the persistent number of eligible-but-unenrolled children in the Early Periodic Screening, Diagnosis, and Treatment Program and the State Children’s Health Insurance Program (5).
- Pay-for-performance as a motivating strategy to improve clinical care may have perverse consequences. For exam-

ple, providing extra payment based on the percentage of diabetes patients whose glycosylated hemoglobin levels are below 7% has led to clinician avoidance of difficult-to-manage patients and to overdiagnosing and overtreating patients with borderline levels (6).

- Prominent public reporting of coronary bypass graft death rates in New York State led to an increased number of operations in New York on patients with less severe illness and, alternatively, to referral of patients with more severe illness to border states for treatment (6).
- In assessing health system performance in the United Kingdom, where resources were allocated to perceived need, some managers disregarded the threat of damage to their reputations and were happy to use poor performance scores on what they viewed as unimportant processes as a strategy to get more resources, while other managers worked efficiently and received no reward for their superior performance (9).

Common Elements in Considering Incentives

While the authors of these MATCH articles approached their assignments differently, they touch on common elements that should be considered in assessing the intended impact of incentives:

1. **Nature of the targeted actor.** Is the focus on a person making a personal decision, or is it an institutional decision maker or geographic collective? What is the relevant sector of action — health, education, environment, transportation?
2. **Nature of the targeted change.** Is change anticipated at a single locus (such as institutional, geographic, or cultural) or, as is more frequently the case, is it multilevel in nature?
3. **Choice of measures.** What measures will be used? Are they individual or are they summary in nature? What are the implications for their interpretation?
4. **Types of incentives.** Which of the multiple incentive approaches — financial, regulatory, legal, reputational, and educational — is most appropriate? Will the incentive be a reward or a penalty?
5. **Processes used.** Will recipients of the incentives participate in developing the incentive scheme, or will it be imposed with minimal consultation? Does the contemplated action directly target the desired outcome,

or is it indirect — for example, clean indoor air laws to reduce tobacco use or revenue-enhancing excise taxes to reduce soda use?

6. **Decisional environment.** How supportive is the operative culture to direct or indirect social intervention? For example, how receptive will political and social leaders be to the health sector's seeking change in education, housing, or other social services, according to the potential effect on health?
7. **Funding stream involved.** Is the funding or support stream for the incentive likely to be episodic or sustained? Is it the product of a temporary public-private initiative? Is it an ongoing grant program? Is it embedded as part of a broad entitlement change?
8. **Possible unintended consequences.** What are the ways in which the contemplated incentive might distort the result or lead to new problems?

Hierarchy of Potential Uses

Incentives, explicit or implicit, are inherent in metrics. Even independent of economic components, the mere establishment and monitoring of targets can impact reputation, recognition, and the inclination or disinclination toward alliances and can alter behavior. Because consequences, intended and unintended, can be both real and severe, care is needed in the choice of incentives. In effect, a certain hierarchy of consideration should be operative in their choice:

1. **Do no harm.** The golden rule of any policy is to ensure that its net result is salutary. Attention must first be devoted to understanding and assessing potential detrimental consequences, including consequences of inaccuracy and misuse, and taking steps to avoid them.
2. **Educate.** Choose measurement targets that can educate about issues. Some targets can make a difference in progress merely by being included in the metrics set.
3. **Signal.** Choose metrics that signal the importance of issues, through the structure and reporting of the effort.
4. **Celebrate.** Choose metrics that identify and celebrate the successes of prevention, when prevention's successes may be otherwise silent.
5. **Enable.** Choose metrics that can help forge partnerships and common bonds across sectors with mutual

interests, for example, health with environment, education, and housing.

6. **Motivate.** Identify measures that can help motivate communitywide public action, through information that offers broad perspective about community opportunities and shortfalls, such as MATCH's potential provision of comparative population health information and community ranking.
7. **Empower.** Marshal community support to engage and act on issues with particular "public good" qualities, such as advocacy for healthy school environments, clean water, clean air, and food safety.
8. **Reward.** Structure economic reward systems carefully, given the potential for distortion.
9. **Punish.** Shape sanctions or penalties when necessary, again carefully, given the potential for distortion.

This hierarchy of uses varies by circumstance. For example, punishment could be higher on the list in the case of egregious potential public threat, for example, the potential release of a populationwide health contaminant. Nonetheless, the hierarchy frames important starting considerations.

Conclusion

Our understanding of how metrics and their incentives can enlighten, motivate, change, and advance population health will continue to mature. Addressing the challenges elucidated in the MATCH articles in this issue of *Preventing Chronic Disease* could refocus the resources available in the United States to improve population health.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Creating Incentives to Improve Population Health

Steven Lewis

Suggested citation for this article: Lewis S. Creating incentives to improve population health. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0175.htm. Accessed [date].

Introduction

How do communities improve the health of their populations? For the past century, we have not been required to think deeply about the question because health status steadily improved. Life expectancy increased by 30 years in prosperous countries between 1900 and 2000. But now the question is emerging as one of the most important we face. The rate of “natural” improvement in health status appears to be slowing, and decline is not unthinkable if the sharp rise in the prevalence of chronic conditions such as obesity and type 2 diabetes continues unabated. Research identifying the nonmedical determinants of health has flourished in recent decades. The correlations are well understood, but the causes of health disparities and the extent to which they can be mitigated remain debatable. How do societies come to take population health improvement seriously? One potential pathway is incentives.

Some Sobering Realities

Improving health care is hard; improving population health is even harder, as the articles in this issue of *Preventing Chronic Disease* discuss. Decades of analysis and experimentation have confirmed the following:

1. Targets can be useful but also distracting and unintentionally destructive to the population health agenda (1).
2. Little evidence supports the proposition that population health can be improved with resources freed up by making health care more effective and efficient (2).
3. Pay for performance, so attractive in theory, is fraught with difficulties in practice, among them methodologic problems and moral hazard. As typically understood and deployed, the concept may be particularly inimical to a population health agenda (3).
4. Health status variability is inevitable, but even people who are born with identical health status will have diverse outcomes over the life course because of circumstances and choices. Moreover, establishing causation is elusive because of the complexity of factors that affect the health of both people and communities and the danger of being seduced by ecological fallacies. Some also argue, more controversially, that if health is to improve, we must give up other social goods; the laws of scarcity apply, and there is no positive-sum scenario (4).
5. Experiences in other sectors reveal the mixed and sometimes unforeseeable effect of incentives. In education they have worked in some instances but have also resulted in perverse behaviors (eg, gaming, adverse selection). Creating effective incentives for particular circumstances is challenging, ensuring that the incentives evolve as circumstances change even more so. Many jurisdictions have abandoned merit pay schemes for teachers, and the effect of teacher certification programs appears to have been modest. In health care, a combination of high-quality comparative evidence and incentives is insufficient to achieve the desired practices and outcomes (5). Producing effective and durable reward systems is difficult in health care, and more difficult still in population health (6).

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6. Some policies could plausibly improve population health if applied more vigorously. Some effective programs fail not because of their inherent logic and structure but because of low uptake. For example, 67% of people who are eligible for food stamps are not enrolled in the program (7). Performance measures and rankings can create awareness and a growing sense of responsibility for addressing population health needs and inequalities. However, it is important to sort out whether community health status is a dependent variable (based on how well systems and programs perform), an independent variable (based on need), or both (8).

What Is to Be Done?

Notwithstanding these methodologic challenges, a thread of optimism runs through the incentives articles. Some authors propose that as the evidence gets stronger and more compelling, policy makers will eventually do the right thing. Knowledge about population health inequalities is deep and diverse, but links between policies or incentives and population health outcomes are not well documented. The implicit argument is that a critical mass of demonstration projects, evaluations, and case studies will ultimately have the intended effect on politics and society, and change will occur.

Unfortunately, there is reason for skepticism. If we conceive of population health improvement in terms of reduced disparities, benefits must increasingly concentrate on populations of low socioeconomic status. Experience suggests that narrowing disparities is extraordinarily difficult. We are limited in our understanding of the factors that produce better population health, but evidence suggests that societies with less inequality are healthier (9). The problem is not that we have no clue about how to improve population health or that people oppose improving the health of disadvantaged populations in principle. The problem is that there is no strong political commitment to the pursuit of these aims, no political liability inherent in not achieving them, and no consensus that this goal should be pursued more ardently than other goals (that may actually exacerbate inequalities). The sciences of epidemiology and biostatistics explain the nature, extent, and consequences of population health inequalities, but we must look to the political arts to understand why they are so hard to mitigate.

At the heart of the political dilemma is the reality that population health improvement is but one of many competing values. Individuals and communities steeply discount future health benefits, and population health improvement is a long, winding process whose ultimate benefits may take decades to quantify. A similarly steep discount applies to saving or improving anonymous, aggregate lives compared with individual lives with names and faces. A third factor that steepens the discount rate is that society values health gains attributable to health care interventions more than those achieved through social and economic policies and interventions. In a political context, how health is improved matters as much as whether it is improved — or so it would seem, judging from our enormous investment in health care that delivers virtually zero at the margins, and from the beggaring of investment in nonmedical improvement strategies.

A large public has been persuaded of the value of increasingly specialized and sophisticated health care and health technology, despite the clear absence of effect on health status. This symbolic and empirical devotion to health care is a formidable challenge to a population health agenda. In Canada, we could eliminate poverty (as defined by Statistics Canada's low-income cutoff) for \$25 billion annually (10) — about 20% of publicly financed health care spending. No one is in favor of poverty, but political sentiment does not favor reallocating any part of health care spending to its elimination.

If this analysis is plausible, it follows that generating broader political commitment to population health improvement has to appeal to democratically shared and expressed values that can be converted into a feasible political agenda. But should this case be cast in terms of population health and disparities reduction as the goal of policy, or as the happy effect of the pursuit of other objectives such as economic productivity, reduction in crime and social problems, international competitiveness, and general well-being? The Canadian Index of Wellbeing (11) has been developed to introduce concepts and measures of societal performance that are more meaningful and comprehensive than economically focused measures such as gross domestic product.

We should not overlook the potential contribution of accountants. The costs of disparities are enormous (eg, poorly educated and therefore unproductive citizens; crime, law enforcement, and incarceration; excessive use

of health care that may be ineffective; safety surveillance systems). If voters, particularly the middle class, can be persuaded to endorse policies that enhance population health, governments may respond accordingly.

These reflections may lead to a sense of hopelessness and even nihilism, but we should not confuse a political dilemma with categorical impossibility. Suppose there were literally guns at the temples of senior policy makers, set to go off in 5 years in the absence of emerging evidence of population health improvement and in 10 years in the absence of concrete improvement. I, for one, have no doubt they would survive. If nearly \$800 billion can be authorized in months to stimulate the economy (12), imagine the effect of a small fraction of that amount spent on universal child care, Head Start, micro-lending, tuition vouchers, subsidized fruits and vegetables, massive increases in supervised physical activity, and inner-city health clinic expansion.

Perhaps we should tailor our approach to the reality that population health is ultimately local, a function of community well-being and ingenuity. If communities are the mechanisms of action, we may need to let them figure it out for themselves, supported by community-level incentives. The California Endowment (13) has funded 14 communities to pursue goals such as reduced childhood obesity, increased school attendance, reduced youth violence, and a “health home” for all. Suppose the president or Congress offered municipalities large prizes for achieving concrete health gains in a decade — say, a check for \$100 million for a community of 100,000, or \$1,000 per capita, payable on January 1, 2022 (baseline data would be gathered in 2011, and the clock would start ticking 1 year later). Methodologic issues would have to be addressed, but these are not insurmountable. Such incentives might galvanize coalitions of leaders, business people, educators, and community groups to take population health seriously. If the whole country got the maximum bonus, the federal government would pay \$300 billion (300 million people × \$1,000), or \$30 billion per year. That’s barely the rounding error on the size of the 2009 US economic stimulus package, and the very structure of the investment would guarantee an excellent return on investment in terms of both health and productivity.

Acknowledgments

This manuscript was developed as part of the Mobilizing

Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Principles to Guide the Development of Population Health Incentives

Robert H. Haveman, PhD

Suggested citation for this article: Haveman RH. Principles to guide the development of population health incentives. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0044.htm. Accessed [date].

PEER REVIEWED

Abstract

Improving population health is not simple. Many instruments are available for changing behavior and consequent outcomes. However, the following basic principles should guide development of any incentive arrangement: 1) identify the desired outcome, 2) identify the behavior change that will lead to this outcome, 3) determine the potential effectiveness of the incentive in achieving the behavior change, 4) link a financial incentive directly to this outcome or behavior, 5) identify the possible adverse effects of the incentive, and 6) evaluate and report changes in the behavior or outcome in response to the incentive.

A wide range of financial and nonfinancial incentives is available to encourage efficient behaviors and discourage costly and unproductive ones. Evidence for the beneficial effects of incentive programs has been slow to emerge, partly because such evidence must show how behaviors have changed because of the incentive. Nevertheless, the potential for incentive programs in health care seems large, and research should support their design and assess their effect.

Premise of Performance Incentives

Microeconomics is the study of how individuals, households, and businesses decide to allocate resources. These

decisions are typically associated with decision makers who are closely tied to markets where goods or services are being bought and sold. However, similar allocation decisions are made in large organizations that are not directly connected to markets, such as government agencies, universities, public utilities, hospitals, and schools. The effect of these decisions on the output, quality, and cost of goods and services is used to judge the performance of the organization producing the good or service and of the members of the organization whose decisions contribute to production.

As of 2005, 75% of all private US companies based some part of employee pay on measures of performance determined by market signals, according to the Institute for Corporate Productivity (1). Managers of organizations that are not tightly connected to competitive market pressures must use different performance indicators to induce efficient and productive choices from their employees.

Deciding on performance incentives is not simple because many instruments are available for changing behavior and consequent outcomes. Some of these instruments are straightforward mandates that are imposed on decision makers; others involve financial penalties or rewards based on stated thresholds. Organized communication and consultation among employees, or “governance by committee,” is another way to induce desirable performance.

The following are examples of incentive plans that have been adopted by private and public organizations:

- To promote a productive and trained state work force, a South Carolina program provides scholarship support to college students who maintain normal progress (2).
- In New York City, a pilot program pays parents to be involved in their children’s school performance and health behaviors (3).

- One of the largest labor market policies in the United States, the Earned Income Tax Credit, is a cash incentive for increased earnings targeted at low-income workers.
- Medicare encourages physician training by providing financial subsidies to teaching hospitals to defray training costs (eg, salaries of medical residents and faculty).
- In health care, “pay for performance” is designed to improve efficiency and quality and to lower costs. Under these arrangements, health care providers are compensated for meeting performance measures.

Basic Principles of Effective Incentives

The following basic principles may help clarify which financial and nonfinancial arrangements are appropriate for improving population health outcomes:

Identify the desired outcome. Although obvious, this straightforward principle is often violated. Consider, for example, a payment scheme designed to improve dermatologic screening for patients who are clinically determined to be at high risk of skin disorders. Incentives to reward primary care doctors for referring such patients to a dermatologist should be tied to the actual screening, not to the referral alone. Rewarding the actions of providers or patients for whom change is sought is the key to effective compliance (4).

Identify the behavior change that will lead to this outcome. In designing financial incentives, the desired action should be clearly identified. In the dermatologic screening example, the primary care provider must identify patients at risk, prescribe the activity, and take steps to ensure that the activity takes place.

Determine the potential effectiveness of the incentive in achieving the behavior change. The degree of provider or patient responsiveness to any financial incentive may vary widely. Understanding this response involves determining the extent to which the behavior targeted is amenable to change through the incentive. The size of the financial incentive should be appropriate to the effort required. If the perceived benefit of the action is exceeded by its perceived cost, the incentive will be ineffective. Another consideration in evaluating the proposed financial incentive is the importance of monetary gain for decision makers. A financial incentive will typically

generate less response among wealthy decision makers than among lower-income decision makers.

Link a financial incentive directly to this outcome or the behavior. In the example of improving dermatologic screening, any financial payment should be directly tied to either the final outcome — documented examinations for high-risk patients — or to the actions of the primary care provider, for example, 1) identifying high-risk patients, 2) prescribing a dermatologic examination for them, 3) following up with patients to encourage the examination, and 4) documenting the results of the examination. In 1 option, a flat payment could be attached to each step in this process. Alternatively, payments could be graduated so that the payment for each step of the process would be higher than for previous steps. A graduated payment arrangement emphasizes follow-up activities. A third option could tie the financial incentive only to the final outcome. This arrangement enables providers to emphasize the steps they feel are important to achieving the objective.

Identify possible adverse effects of the incentive. Payments designed to achieve well-defined outcomes sometimes have unintended consequences (5). Because true health care “quality” is difficult to observe, incentives often focus on easily observed metrics like the proportion of patients who receive regular tests or engage in prescribed activities. In addition, people tend to allocate more effort to the activity that is rewarded, resulting in unintended degradation of performance in other areas. In the primary and secondary education sector, pay-for-performance plans have become popular. These plans pay teachers and administrators for improving their students’ scores on standardized tests. Such incentives can be effective, but in many instances they have created perverse and unproductive behaviors such as “teaching to the test,” manipulating test results, encouraging poorly performing students to not take the test, or reclassifying students to artificially increase performance indicators. In most cases, these responses to financial incentives can be traced to faulty designs in the incentive arrangement or faulty measurements of performance (6).

Evaluate and report changes in the behavior or outcome in response to the incentive. Monitoring the results of any incentive arrangement is necessary for its long-term success. In addition to reporting outcomes, other possible effects of the incentive should be studied.

Developing Incentives

A wide range of financial incentives is applicable to population health, each with advantages and disadvantages (7).

Flat payments for documented behavior

In this arrangement, decision makers receive a fixed payment for attaining a target or undertaking an action. Such incentives are simple to describe and administer and are widely used in various policy areas. For example, unrestricted cash payments to low-income families for choices that increase human capital and break the cycle of poverty are being tested in several sites. Such incentives are known as conditional cash transfer programs.

A privately funded New York City program called Opportunity NYC offers cash payments to parents if they document particular actions designed to increase the school attendance of their children, improve their children's academic achievement, and increase their preventive health visits (eg, documented prenatal care for mothers and health care for young children) (3). The payments are substantial and together can raise family income by an estimated 25% to 30% (approximately \$4,000 to \$6,000 annually). Nonprofit partners pay, for example, \$25 for attending parent-teacher conferences, \$100 for a preventive health screening, and \$150 per month for maintaining full-time employment. A similar program, Mexico's Oportunidades, has demonstrated increases in the educational and health outcomes of its participants, including significant increases in school attendance, achievement, and preventive health visits (8).

An advantage of such a plan is that it induces initial action that otherwise may not have been undertaken. However, such a flat payment does not reward continuity of effort after the goal has been achieved. Another disadvantage is that decision makers (in this case, parents) may be paid for choices they would have made anyway. Such payments are "windfalls" to the decision maker and lead to unproductive increases in costs to the payer.

Graduated payments for documented behavior

A variation of the flat-payment arrangement is a schedule that increases payments as documented behavior moves toward the goal. For example, states operate child

support enforcement programs with a mix of federal and state funds. The federal government matches every \$1 a state spends on child support enforcement with \$2 of federal funds. The federal government also offers graduated incentive payments to states as they achieve better performance on specified indicators (eg, the percentage of cases with paternity established or with on-time payments). Most analyses conclude that these incentive arrangements have been effective in increasing total child support collection nationally (9). The advantage of such graduated plans is that they maintain and increase the incentive for sustained efforts toward attainment of the objective.

Financial penalties

Penalizing behaviors that do not meet goals is a common form of financial incentive, especially for environmental targets. The primary example is the "effluent charges" policy that has long been advocated by economists. In 1 variant of this proposal, a target level of emissions (eg, carbon dioxide) would be specified for organizations that discharge the gas. If they do not meet this target, they would be required to pay a fee for each unit of discharge beyond the target level.

Penalty arrangements also might be appropriate for some health care targets. For example, a meaningful target might be that 80% of a primary care physician's patients have blood pressure lower than 140/90 mm Hg. A penalty of \$200 could be imposed for every percentage point that a provider's patient base falls short of the target. If only 75% of the patient base has normal blood pressure after a predetermined length of time, the penalty would be \$1,000. This negative incentive could also be graduated in accordance with the extent to which behavior falls below expectations. Although some adjustment for risk is essential in such an arrangement, the difficulties of specifying an appropriate adjustment must be recognized.

Imposing penalties for inadequate attainment is like imposing a fine; it signals poor performance. Such a signal could lead to provider resentment, discouragement, erosion of loyalty, and opposition to other incentives. From the organization's point of view, imposing penalties avoids a monetary payment, whereas offering incentives does not. Finally, such penalty arrangements could encourage providers to discourage or reject high-risk patients, who would then have to seek alternative care arrangements, potentially resulting in no care or inferior care.

Payment systems for bundled services

Incentive payment systems may be structured to allow the decision maker discretion over the bundle of procedures and processes chosen to attain an objective. Such a bundled incentive focuses the incentive payment only on the overall health outcomes at issue, rather than each of the actions or behaviors that lead to them.

Bundled payment arrangements are common in the private sector, and are often known as fixed-price contracts. For example, a municipality may contract with a private construction company to resurface a road but stipulate only the required characteristics of the resurfaced road, allowing the construction company wide discretion in choosing the best production process to accomplish the resurfacing.

In health care, prospective payment systems provide a single comprehensive payment for an episode of care, on the basis of the diagnosis. In the context of Medicare reimbursement for hospital stays, each patient is classified into a diagnosis-related group (DRG) and the hospital is paid a flat rate for the DRG (after adjusting for outliers or early release), regardless of the actual services provided. The motivation for this financial incentive system is to establish a base payment for providing a typical set of services, thereby eliminating the incentive for providers to charge more for profitable — though unproductive and discretionary — follow-up services or secondary diagnoses. The system lowers costs by reducing lengths of stay, reducing intensity of care, or improving efficiency of hospital operations. However, these incentives may cause providers to manipulate the demand for services, for example, by disaggregating hospital stays into multiple admissions or, in the provision of primary care services, attempting to attract healthy patients.

Moreover, this sort of incentive arrangement can lead to “risk shifting”; for example, by paying a group-specific fixed amount, the payer shifts the risk of variable treatment costs to the health care provider. This shift may encourage excessively restrictive (and thereby inefficient) care than a DRG typically warrants or the movement of patients into an inappropriate DRG.

Nonfinancial incentives

Nonfinancial inducements to enhanced performance are

common. In the private sector, a typical scheme might provide additional paid vacation days to high-performing workers or public recognition such as employee of the month. In the education sector, schools might try to attract teachers and improve their performance by streamlining hiring practices, offering comprehensive mentoring, reducing class sizes, and providing strong administrative support. In selected settings, these incentives can be effective (10).

Nonfinancial incentives may also work in the health care sector. Although people are often constrained in their health care choices, information on the cost and quality of providers could result in a reallocation of demand and revenue toward providers with the best results. If such information were mandated and widely used, hospitals and providers might be pressured to improve their performance in the dimensions indicated (11). Comparative effectiveness research has been proposed to evaluate the benefits, risks, and costs of treatment options. To affect medical treatment and reduce health care costs, the results of comparative effectiveness analyses would have to be not only persuasive but also used in ways that change the behavior of providers and patients (12,13).

Conclusion

Designing good incentive programs is difficult. By focusing rewards on choices that promote health outcomes, quality improvements, and efficiency gains, health care organizations and their patients appear to have much to gain. However, some incentives may foster undesirable competition, may become subjective or political, or may be poorly aligned with the collegial norms of the organization. Evidence for the benefits of incentive programs has been slow to emerge, partly because reliable assessment of incentive arrangements requires detailed research about how behaviors have changed because of the incentives. Nevertheless, the potential for such programs seems large; comparative effectiveness research should be considered for both financial and nonfinancial incentives. Additional research is necessary to support the effective design of incentive programs and to assess them comprehensively.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project

funded by the Robert Wood Johnson Foundation.

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Understanding the Production of Population Health and the Role of Paying for Population Health

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Suggested citation for this article: Mullahy J. Understanding the production of population health and the role of paying for population health. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0024.htm. Accessed [date].

PEER REVIEWED

Abstract

This article considers 2 related themes that address population health outcomes and the contributions to those outcomes by time, place, individual behaviors and choices, and activities of various social sectors. First, what does it mean to “produce” population health, and how can the production of health be understood empirically? Second, through what processes can incentives be modified to improve population health? Among the issues that arise are understanding the mechanisms through which paying for population health works and how the health-producing incentives materialize in various sectors, especially those whose primary functions are not generally viewed as fostering better population health.

Overview

Population health refers to the distribution of some measure of health status across members of a defined population at a defined point in time or during a specified time. Specific attributes of population health — its mean, its across-individual variation, and other attributes — are all properties of this underlying distribution of health in a population. Of concern here are several questions: How do

the population health outcomes observed at any place and point in time arise? How and why do they vary over time and geography? What contributions to population health outcomes are made by people’s behaviors and choices? And how do the activities of various sectors (producers and other institutions, broadly defined) ultimately influence population health outcomes?

I consider 2 related themes that address these questions. First, what does it mean to “produce” population health, and how can the production of health be understood empirically? The basic premise is that people respond to a variety of incentives and constraints (“opportunities”) to make choices that promote or destroy their health. Second, because people respond to incentives to engage in health-enhancing activities, through what processes can incentives be modified to improve population health?

The central issues are understanding the mechanisms through which paying for population health (PPH) works and how health-producing incentives materialize in various sectors, especially those whose primary functions are not generally viewed as fostering better population health. How multiple sectors affect the health of populations and how incentives — financial, regulatory, cultural, psychological, or others — play a central role in the process is our main concern.

Production of Health and Population Health

The Grossman model of health production

Although alternative complementary and competing paradigms have been developed, the model developed by

Michael Grossman in the early 1970s provides a basis for economic analysis of how health outcomes arise (1,2). Grossman's model was based on earlier work on general household production by Becker (3). In a simple version of the Grossman model, people are viewed as producers of health by the choices they make about their behaviors and their use of medical care. As an outcome of this process, lifetimes are more or less "healthy." People are constrained in their opportunities to produce health for various reasons: financial constraints, time constraints, baseline endowments of physical and mental health (known as health capital in the Grossman model), and the social and natural environments and contexts they occupy. Moreover, people may differentially weigh being healthy relative to other things and, consequently, may be more or less motivated to invest in their health even if confronted with the same opportunities to produce health.

The analytical framework that arises from this paradigm involves 2 main concepts: health production functions and choice or demand functions:

$$\text{Healthiness} = f_1(x)$$

and

$$\text{Choices} = f_2(p)$$

where x represents choices, health capital, and social and environmental factors, and p represents constraints and incentives, health capital, preferences, and social and environmental factors. The literature refers to $h = f_1(x)$ as the "structural" health production function and to $h = f_3(p)$ as the "reduced form" health production function. Therefore, $h = f_3(p)$ indirectly. Determining the shape of health production functions is ultimately an empiric matter.

Within a population, people generally differ in the constraints and incentives ("opportunity sets") they face (except that everyone has 1,440 minutes of time to spend each day), in the baseline levels of health capital possessed, in the values placed on healthiness versus other desirable ends, and in their capabilities to produce health via particular choices. This framework also emphasizes that the heterogeneous environments (eg, social, natural, cultural) that people occupy may influence health directly, as well as influence the choices that are made. Because of all these differences among people, the Grossman model inherently predicts that the healthiness within the population will

vary and, thus, likely differ across populations. Virtually all of the empiric work that has been pursued in this field has been based on some variant of the Grossman model's conceptual framework.

Given the scope of this essay, it is not possible to elaborate on all the aspects of this paradigm. Three features, however, are noteworthy. First, the use of medical care is just one of many choices people make to invest in their health; to varying degrees, constraints such as health insurance, genetic predispositions, the value of time, and other factors affect choices made to use medical care. Debates about the productivity of medical care can in principle be undertaken in this conceptual framework. Second, the role of schooling in this framework has been debated extensively; better schooling correlates positively and strongly with better health, but the extent to which schooling (however measured) causes better health outcomes is not well understood (4). Third, health status is multidimensional, and various choices may differentially influence different aspects of health; some choices (eg, exercise) may influence positively a range of aspects of health, while others (eg, prescription drug use) may contribute positively to some aspects but negatively to others (eg, via adverse side effects).

Empiric considerations

To be useful in forming policies and interventions, the Grossman model's conceptual framework must be supported by data. Unfortunately, there are nontrivial empiric impediments to understanding the parameters of the Grossman model, which is a reason why the health production function has been termed a fantasy equation (5). Significant progress has been made in the empiric understanding of health production relationships dating back to the first serious empiric work in the field (6); however, the limitations of using this analytical framework are as notable as the successes. Some of these empiric impediments include the following:

1. The availability of individual-level data on health, health-producing behaviors, and related phenomena has grown substantially in the 40 years since Grossman's original work was undertaken. However, the usefulness of such data has not grown commensurately. Whether the data are from government records or from health care administrative records, confidentiality regulations or other logistical issues

often preclude linking these data to information on constraints, incentives, and environments faced by people. Without such information, the statistical obstacles to understanding relationships that produce population health will be formidable.

2. Data on aggregates of people are less constrained by confidentiality considerations, but there are limits on what can be learned from studying data obtained at aggregate levels because of ecologic fallacy (drawing inferences about people on the basis of empiric analysis that uses aggregate data) and related considerations. There is considerable population heterogeneity in the opportunity sets that people face, the social and environmental contexts that they occupy, and their preferences for health and other valued outcomes. Relying on aggregates of data (eg, geographic aggregates like census tracts or counties) could obscure potentially important within-aggregate heterogeneity.
3. Although considerable information is available on the health-related choices made by people, the Grossman model forces the recognition that such behaviors are self-selected (eg, because of differences in preferences across a population) rather than exogenously or randomly assigned. Consequently, simple regressions of health outcomes on health-related choices do not reveal the causal mechanisms fundamental to the Grossman framework. To circumvent such considerations of self-selection, it may be more instructive in some cases for policy making to directly relate health outcomes and opportunity sets (eg, by estimating the reduced-form health production function described above), thus avoiding or mitigating some of the concerns about self-selection. For instance, although it may be interesting to understand the causal relationship between milk consumption and various health outcomes, it might also be interesting to know — and may be easier to learn — whether dairy support or policies for vitamin D fortification affect health, albeit indirectly. Yet the obstacles identified above often preclude the linkage of suitable data on the opportunity set measures to personal data on health outcomes and other characteristics.
4. Even if these issues were resolved, there remain fundamental measurement issues. One issue is to reconcile the ideal conceptual measures of personal health with those available in our data. Another is how to

summarize a heterogeneous distribution of health in a population in order to quantify “population health” in any particular instance.

Producers and Institutions in the Production of Population Health

Incentives and the production of health across sectors

The production of population health arises from the activities of population members producing health at the personal level, albeit influenced by and involved in social and natural environments in which such productive behaviors may be undertaken and interact socially. In this paradigm, “sectors” only “produce” health to the extent that their actions shape a person’s social and environmental contexts: “sectors” don’t produce health, people do.

If this personal health production paradigm is accepted, then what specific empiric meaning should be given to the notion of the “multisector production of health”? Without abandoning this term — it is useful to the extent that it has served to draw attention away from the health care sector, per se, as the “sector” from which population health outcomes arise — what specific interpretation can be given that is consistent with the personal-based model of the production of health? Instead of conceiving sectors as “producers” of population health outcomes, these different sectors and their activities ought to be viewed as promoters or inhibitors of improved population health outcomes. This seems reasonable to the extent that the policies and activities in which they engage establish incentives or disincentives that influence a person’s choice of health-producing inputs (ie, affect a person’s time, money, and other factors that define their opportunity sets). Consequently, PPH means deploying resources to create incentives. In essence, this framework provides economic and social actors with self-serving reasons to change the way business is done so that those clients affected within their spheres of activity might come to face new and (presumably) stronger incentives to make healthier choices.

The textbook version of this approach is an economy that produces “guns and butter” and that is constrained in the quantities of these commodities that can be produced by the quantities of resources (eg, labor, materials) available at any time in that economy. In this instance, however, “health” and “X” substitute for guns and butter as the 2

outputs of our sector, and the “health” outputs arise indirectly via the health-producing activities of the clients of this sector. For example, the activities of the K-12 education sector influence clients’ health production activities but also affect, for example, their math and reading scores and college acceptance rates.

In this 2-commodity world, the mix of “health” and “X” that actually emerges is dictated by the incentives producers have to channel productive resources into these activities. In general, market or political forces or both will determine these incentives, but we recognize that policy interventions such as PPH can modify the nature and magnitude of the incentives that would be determined by market forces on their own (eg, agricultural policy, in the form of higher price subsidies or supports, would be expected to sway the production balance more toward butter). For instance, in the absence of a PPH strategy, the sector in question may have little or no incentive to provide incentives for its clients to produce health. A successful PPH strategy modifies the incentives facing this sector, resulting in an outcome that implies more “health” at the necessary cost of less “X.” The practical issue is how incentives can be most cost-effectively provided to the various sectors, so that those sectors in turn provide incentives to their respective clients.

Examples

Consider the range of activities in which K-12 policy makers engage that have potential implications for the health-producing activities of their clients. Considering the budgetary constraints and regulatory environments they face, K-12 school boards and administrators enact policies to achieve outcomes across a range of objectives (eg, test scores, dropout rates, vending machine and cafeteria offerings, foreign language classes, athletic team performance). The activities that contribute to these outcomes entail various incentives and disincentives for students to make health-producing choices. In the PPH context, paying for better population health outcomes via activity in the K-12 sector entails using financial and political muscle to change the importance that school boards and administrators attach to the outcomes they produce (eg, more focus on physical education, less on after-school clubs) and the regulatory environments in which they operate (eg, bans on soft drink machines, sponsorships). Over time the investments in after-school clubs could culminate in enhanced levels of human capital of the participants which

in turn could enhance health-producing activities in the adult years.

These same principles apply in more specific contexts, and are illuminating when considering how various “sectors” of the economy (private and public) may be provided incentives via PPH strategies to engage in activities that result in incentives for people to engage in healthier behaviors. Transportation departments can invest more in highway beautification or in road safety; environmental and natural resource agencies can invest more in protecting endangered species or in preventing contamination of air and water; businesses can invest more in decorative art or in workplace wellness and fitness programs. The motivations for such differential investment strategies arise from the manner in which the various PPH strategies are implemented.

Two considerations are noteworthy. First, there are tradeoffs because of the ultimate scarcity of productive resources, at least in the short run; more production of health comes at a cost of less production of “X.” Second, the mix of “health” and “X” produced does not arise randomly but rather by purposive choices made in the existing incentive structures by the people who are the clients of the sectors in question. Understanding how PPH strategies can modify existing incentive structures that are established implicitly or explicitly by the respective sectors — as well as the social and economic contexts that influence health that are under the purview of these sectors — is essential if the PPH approach is to be successful.

Summary

Incentives matter. People make health-producing choices in light of the opportunity sets they face. Public and private sector institutions directly or indirectly establish incentives for people to be more or less healthy because of the incentives they themselves face. Consequently, PPH ultimately implies that financial, political, regulatory, and other resources must be deployed strategically to change the incentive structures to which people and institutions respond in their day-to-day activities. Considerations of the practicalities of how such incentive structures can be modified — and recognition of the tradeoffs that may be entailed in effecting such modifications — ought to be near or at the top of the PPH research agenda.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation. Thanks to Dave Kindig and Stephanie Robert for insightful comments on an earlier version of this essay. Partial financial support was provided by the Health and Society Scholars Program at the University of Wisconsin-Madison.

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Using Social Marketing to Manage Population Health Performance

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Suggested citation for this article: Rothschild ML. Using social marketing to manage population health performance. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0034.htm. Accessed [date].

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Abstract

Population health can be affected by implementing pay-for-performance measures with key players. From a social marketing perspective, people (both consumers and managers) have choices and will do what they perceive enhances their own self-interest. The bottom-up focus of social marketing begins with an understanding of the people whose behaviors are targeted. Desired behavior results when people perceive that they will get more value than the cost of behaving and when the resulting offer is perceived to be better than what is obtainable through alternative choices. Incentives should be offered to consumers; managers should receive motivation for their own behavior and understand how to motivate relevant consumers. Pay can be monetary or nonmonetary, tangible or intangible. Everyone is paid for performance. Some are paid well enough to behave as desired; others are offered a poor rate of pay and choose not to behave.

Organize policy and strategy so that self-interest does what the community requires.

Adapted from LeGrand (1)

Introduction

This article is one in a series published by *Preventing*

Chronic Disease (PCD) that discusses pay for performance (P4P). It considers social marketing as a well-developed managerial paradigm that can contribute to the key components of P4P as it, in turn, contributes to improving population health. Policy makers who show discomfort in engaging in P4P are not avoiding it but are merely paying poorly and allowing alternative choices a more favorable standing. From a social marketing perspective, the question driving this series of *PCD* articles is not “Should we use P4P to improve population health?” but “Should we execute P4P well or poorly?”

According to the concept of social marketing, people have choices and will act to enhance their own self-interests in the constraints of time and place. Any behavior takes place in a setting where alternative choices are available, and each is a combination of short-term and long-term costs and benefits assessed by someone with a personal (often intuitive and implicit) calculus who weighs the choices on the basis of their component features. A P4P offer is chosen if perceived as the best available deal; if not chosen, then either the “pay” was inadequate or the required “performance” was too demanding. In this article, I consider the importance of providing appropriate incentives both to managers and consumers and of assisting managers in motivating relevant consumers.

Certain terms will be used throughout this article. *People* applies to both consumers and managers, *consumers* describes people who ultimately behave to shape population health metrics, and *managers* describes people who can influence the social and physical environmental conditions that make it more or less difficult for people to behave in a certain way. Managers should be motivated to behave as desired, and, in turn, to motivate. Managers exist at many levels (eg, policy makers, manufacturers, teachers, grocers, restaurateurs, counselors). Often, dispa-

rate actors need to work together. In some cases actors will see a common P4P that benefits each, but often each actor requires a P4P offer that provides an individual benefit.

Behavior refers to the observable and measurable action that must occur at the individual level to establish the desired population health metric. Developing awareness and attitude are useful and often necessary, but are not sufficient. P4P may be new to population health, but the concept of appealing to self-interest in exchange for behavior is quite old and is the basis of large parts of 2 core disciplines: economics (2) and psychology (3). Public health issues such as tobacco, drug, and alcohol abuse have long built upon a base of behavior change and positive reinforcement (4,5), but the introduction of P4P into population health has been recent (6).

In commercial marketing, a consumer is offered the opportunity to “perform” an act — for example, purchasing and consuming a soft drink — and is then “paid” or rewarded with a result — in this case, refreshment and a jolt of energy from the sugar and caffeine. In public health, a person is offered the opportunity to “perform” an act — for example, wearing a seat belt — and is then “paid” or rewarded with a result — in this case, an enhanced feeling of safety. In both examples, if the person finds the P4P exchange pleasing, then he will continue to perform and to be paid.

In each case, managers also should be paid to perform. The grocer is paid to stock a soft drink and may be paid more to display it more prominently than soft drinks produced by that company’s competitors. Engineers are paid to develop a seat belt that is easy to use and may be paid more if it also is comfortable to wear. Pay may be monetary or nonmonetary, such as through the esteem of one’s peers for a job well done.

Population health focuses on managing distal macrolevel dependent variable metrics, such as percentage of the population that is obese. Although 90% of health determinants result from individual behavior and social and physical environmental conditions (7), 95% of health expenditures go to treatment rather than prevention (8). In the past, P4P has focused on offering financial incentives for health care organizations and personnel, but an emerging view of population health recognizes that P4P must also include rewarding managers of nonmedical components of social and physical environments (9).

Social marketing considers the same metrics, but dependent variables are more likely to be specific, proximal, microlevel behaviors, such as amount of exercise per week. Managers are rewarded for creating an environment in which exercise can more easily take place; consumers are rewarded for exercising.

Social marketing and population health are complementary. Population health has the goal of changing macrolevel societal metrics. Social marketing is silent as to the selection of metrics but provides strategic insights on how to reach the goal by considering several microlevel individual behaviors that should be changed or maintained to accumulate to a macrolevel societal change. Population health policy makers decide on resource allocations with respect to segments of the population and metrics to change. Social marketing practitioners contribute by developing efficient and effective strategies that lead to behavior changes.

Marketing and Social Marketing

Three general tools are used to manage public health behaviors: education, enforcement, and environment (10,11). Education primarily uses messages to inform and persuade but occasionally can reinforce behavior. Enforcement uses the law to coerce, punish, or threaten to punish in exchange for appropriate behavior. The environment is used to reward desired behavior, to increase benefits, to decrease barriers for desired choices, and to decrease the hassles of daily life. Social marketing is used to manage the environment so that appropriate behavior will result. Although this simple categorical scheme can be used to provide an introduction to social marketing, reality is more ambiguous.

Marketing is “the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large” (12). Social marketing is the application of commercial marketing to nonbusiness situations. The exchange is the fundamental relationship on which market systems are built. Strategies begin with a bottom-up focus that leads to an understanding of the people whose behaviors are being targeted.

In the past, much of what has been called “social marketing” in public health has not been marketing but rather

has been limited to communications (13). Although many communications cases self-define as “social marketing,” few cases are consistent with the previous definition. This distinction is crucial if social marketing is to contribute to P4P.

The environment can encourage exchange through the development of a choice with comparative advantage, favorable cost-benefit, and the convenience of time and place. After the choice is developed, messages are used to describe and advocate. Marketers manage through the use of the 4 *P*'s (product, price, place, and promotion):

- **The product** consists of the bundle of “goods,” or benefits, that a person receives in return for the desired behavior. Anything received is considered P4P and can be monetary or nonmonetary, tangible or intangible.
- **The price** consists of the bundle of “bads,” or costs, that a person incurs to receive the goods. These also can be monetary or nonmonetary, tangible or intangible.
- **The place** considers the time and location for the exchange to occur. It can be a benefit or a cost, depending on its convenience.
- **The promotion** consists of the messages that announce the proposed exchange (the product, the price, the place, and the desired behavior).

The development of the package of costs and benefits must be considered in the desired behavior of both the manager and the consumer.

P4P can be seen as an example of an instrumental stimulus–response–reinforcement model. The presentation of the offer through messages is the stimulus, the desired behavior is the response, and the delivery of the package of goods and bads is the reinforcement. Social marketing gives the manager a tool kit for developing a favorable package of stimuli and reinforcers.

Other major foci that social marketing brings to P4P are an understanding of the following concepts:

- **The person.** Social marketing begins with a bottom-up focus to develop an understanding of people who should be motivated. Barriers that keep behavior from occurring are key and may include environmental difficulties and the hassles of daily life. Motivating benefits emerge from an understanding of the barriers and the desired behavior. After understanding barriers and benefits,

descriptors can be developed on the basis of, for example, demographics, psychographics, and geographics.

- **The segment.** Marketers divide people into groups with similar needs, motivations, barriers, or behaviors, with the goal of maximizing pursuit of the population metric. A segment may be a group that is easiest to target or one that is disadvantaged in some way.
- **The competition.** Whenever there is free choice there is competition, yet too often this is ignored by managers. Broccoli or a jelly doughnut. Safe or risky sex. Binge or moderate drinking. Without understanding the alternative choices and their appeal, the offer may be too weak to be accepted.
- **The position.** The offer must be developed so that it is perceived as the most desirable choice possible at the moment of decision making.
- **The exchange.** An offer of P4P is made.

These points appear to focus on consumers, but they are equally valid for managers who need to overcome barriers in their own hassled lives, who work with insufficient resources, who make decisions from a set of competing alternative opportunities, and who realize a positive outcome for their own careers and organizations.

A Social Marketing View of “Pay”

In the stimulus–response–reinforcement model, pay is the reinforcement. Social marketing considers pay in several ways:

- **Monetary and nonmonetary, tangible and intangible benefits and costs.** Employees may receive the financial benefit of reduced insurance payments if they join a workplace wellness program, but they also may receive recognition for achieving weight loss, social support for joining a walking club, or the ability to more easily play active games with their children. Costs can also be monetary or nonmonetary. These include time (it takes too long to work out), hassle (it takes 2 buses in each direction to use the gym), or ego (embarrassment at showing one's overweight body).
- **Cost-benefit relationship.** Often people do not behave as desired because they are unwilling to do so. The perceived bundle of benefits must exceed the perceived bundle of costs. Pay is the benefit relative to the cost and cannot be considered in isolation.
- **Competitive alternative choices.** In a free-choice

society, the cost–benefit package must be perceived to be more favorable than all alternative choices.

- **Short-term versus long-term costs and benefits of all choices.** Although policy makers may consider long-term good health to be the ultimate pay, consumers and managers often are short-term maximizers. In a simple world there may be only 2 choices: good and bad. “Good” choices, such as exercising and eating healthfully, have short-term costs (eg, learn to cook, recover from painful exercise), and the eventual benefits of good health are large, distant, and not guaranteed. “Bad” choices such as playing video games and eating pizza have short-term benefits (eg, it is fun, it tastes good), and the eventual costs of poor health are large, distant, and not guaranteed. Inspiring people to engage in behavior with long-term benefits or short-term costs when competitive offerings promise instant gratification is difficult. The “tyranny of small decisions” (14) explains that there are many opportunities during the day for immediate gratification (fast-food breakfast, 10:00 AM doughnut, evening video game with ice cream), and these often keep people from moving toward their long-term goal of good health. P4P should consider immediate and future pay relative to the cost–benefit of the desired and the competitive choices.

A Social Marketing View of “Performance”

In the stimulus–response–reinforcement model, performance is the response. Stages-of-change models have long been suggested in both marketing and public health strategies (15), and managers typically express their performance goals relative to these dependent variable responses. Marketing managers understand that behavior is what ultimately must change. Therefore, to contribute to changing population health metrics, P4P must focus on behavior.

Performance requires an examination of the barriers to behavior. Considering benefits without first understanding barriers can result in a weaker stimulus for change.

Barriers must be overcome before benefits are offered. Often people do not behave as desired because they are unable to do so. A consumer may desire the benefits offered by an employer’s wellness plan but may not be able to move toward behavior change until the barriers (eg, lack of ability to cook, lack of proper exercise attire,

fear of injury from exercising, an already overburdened and hassled life) are reduced. Once barriers are reduced, cost–benefit can be considered.

A potential failing of P4P can be misunderstanding the desired performance. An example of this is the use of P4P in health care cases when the terms of the exchange were not properly stated. Some medical facilities and physicians may have performed to maximize number of patients seen or to maximize pay on a per capita basis, rather than to maximize wellness of patients. Prospective exchange partners will interpret the offering through their own lens of self-interest. P4P can be a powerful tool, but it is expensive and must be used with great care.

Who Needs to Receive P4P?

In considering P4P, marketers target 2 types of people in terms of population health metrics: consumers, already discussed extensively, and managers.

Managers are the stewards of social and physical environments but also are people who respond or resist. They too exist in a world of barriers, insufficient benefits, continual hassles, and strong competitive pulls on scarce financial and time resources. At each level of management there is a person who needs to be motivated to behave and who also needs to motivate other people. The 4 P’s are relevant for both the consumer and the manager.

A manager’s self-interest is driven by both the needs of the organization and personal needs. Organizations provide incentives for their managers through pay, performance incentives, personnel reviews, promotions, and the esteem of cohorts and more senior members of the organization. If these incentives are properly crafted, managers will behave in their own self-interest to further the greater interests of the organization. The organization acts in its own self-interest by motivating its managers to achieve the organization’s goals.

For example, until recently most firms did not see the benefit to the firm of providing wellness programs for employees. “We tried to get firms to adopt wellness because it was the right thing to do, but that failed. Now we show them how it reduces costs and increases profit, and that works” (16). P4P has been demonstrated to show savings of more than \$5.50 in medical costs and reduced

absenteeism for each dollar invested in workplace wellness programs (17). Employers are managers who need to be motivated and also should motivate others.

Three major segments of both consumers and managers exist:

- Those who are prone to behave appropriately, and are able to do so, may need only messages to remind them.
- Those who are resistant may need the force of law as motivation (11).
- Those who are aware and motivated but who are unable to behave may be the segment most likely to respond to P4P. Reducing barriers and increasing benefits among those who are unable or unwilling may provide sufficient environmental change to allow behavior to occur.

Some Concluding Thoughts

In 2000, the Wisconsin Department of Transportation chose alcohol-related crashes as a metric of concern. After extensive research, talking to the target of single men aged 21 to 34 years who drove while impaired, Road Crew emerged as a fee-based ride program in rural communities. The program provided consumers limousine rides to, between, and home from taverns so that they would leave their vehicles at home. In the past, men were not able to admit to their friends that they were too drunk to drive, but now they could be seen as “cool” because they used the limousine. In P4P terms, men were paid with an evening of rides in a limousine in return for the performance of not driving.

This program to change proximal behavior was measurable. It was aimed at the population segment most likely to have a motor-vehicle accident while impaired, offered a favorable exchange, and gave more than 85,000 rides in 6 communities over 5 years. It prevented approximately 140 motor-vehicle accidents, reduced motor-vehicle accidents by 17% in relevant communities, saved the citizens of the state approximately \$30 million, and was financially self-sustainable (primarily from ride fees). The population health top-down perspective determined the macrolevel goals, while the social marketing bottom-up perspective led to an understanding of the people whose behavior needed to change and the environmental changes that were needed to facilitate the behavior change (18).

Population health performance metrics can be achieved through paying for specific performances. Programs can be developed through the use of social marketing and its 4 P's. From a social marketing perspective, for P4P to succeed it must accommodate self-interest. The pay may be monetary or nonmonetary but must exceed the cost of the behavior, be better than that offered by alternative choices, and show a short-term as well as long-term benefit.

Much public health work has focused on telling people what to do, under the assumption that if people knew what to do, they surely would change their behaviors to do what is “right.” This has led to less than ideal results, and, in turn, a call for P4P. Perhaps an adoption of the social marketing paradigm can lead to a greater effect from P4P and to more population health successes. Every choice has costs, benefits, and competitive options. It is the task of policy makers to establish the terms of P4P so that they are likely to be accepted by consumers and managers.

Acknowledgments

I thank several anonymous reviewers, Alan Andreasen, David Kindig, Beth Mastin, John Mullahy, Bill Smith, and the members of the Robert Wood Johnson Health and Society Scholars Seminar for feedback on earlier drafts of this paper. This work was funded in part by the Robert Wood Johnson Foundation Mobilizing Action Toward Community Health (MATCH) Grant to the Population Health Institute.

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Making Better Use of the Policies and Funding We Already Have

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Suggested citation for this article: Baxter RJ. Making better use of the policies and funding we already have. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0055.htm. Accessed [date].

PEER REVIEWED

Abstract

The potential for population health reform could be enhanced by assessing whether we have made the most of policies and resources already available. Opportunities to promote population health independent of major changes in resources or public authority include the following: enforcing laws already in effect; clarifying and updating the application of long-standing policies; leveraging government's and the private sector's purchasing and investment clout; facilitating access to programs by everyone who is eligible for them; evaluating the effectiveness of population health programs, agencies, and policies; and intervening to stop agencies and policies from operating at cross-purposes.

Optimizing Existing Resources to Improve Population Health

Proposals to improve the health of Americans typically rely on substantive changes in public policy, additional dedicated resources, or both. For example, some public health leaders have proposed dedicated funding for a "wellness trust." Accomplishing large-scale changes in law, regulation, and funding usually requires mobilization and negotiation among powerful interests and competing priorities, often with uncertain outcomes. Moreover, economic downturn makes resources scarce, and political partisanship makes consensus remote.

Population health policy reformers could also assess whether government agencies have made full and intended use of the policies already in effect and the resources already available. While the chronic underfunding of population health in the United States calls for new policies and programs funded with new resources, better implementation of existing policy may not require new resources. Officials, interest and advocacy groups, and the media need to understand the extent to which public agencies have executed current policies, optimized the use of available resources, and learned from rigorous evaluation using the best available methods. Government also needs to make the most of the authority it already has, better direct the private resources at hand, and get more performance out of current policy assets.

Such assessment, rigorously conducted, is likely to find some work that, done better, would free up resources; activities that should be stopped; and programs that require more investment. Moreover, a proper assessment would suggest how additional resources could be used in ways that multiply benefits. A tobacco tax, for example, deters consumption and can simultaneously fund prevention. Obesity prevention advocates now support similar taxes on sweetened beverages to reduce use and fund nutrition programs (1,2).

Proven, funded measures exist that can enhance the health of Americans without new laws or with carefully targeted new funding. Enforcing and publicizing these measures is likely to make a difference. This is the thinking, for instance, behind states' "click it or ticket" campaigns to enforce long-standing seatbelt laws and social marketing around enforcement of drunk-driving laws. Similarly, parents are beginning to organize to ensure that schools provide their children the physical education that states already require.

Opportunities also exist to apply existing policies and funding streams in ways that could be more effective. For instance, administrative changes in the US Department of Agriculture food stamp education program would allow states to use these dollars to support community environmental changes (now explicitly proscribed) (3), and administrative simplification could greatly facilitate the enrollment of children in the Children's Health Insurance Program (4).

Government and private organizations that have converging interests in improving health could undertake assessments that range more widely than those suggested in this article. Such assessments are needed to identify political and financing strategies that could reduce impediments to making better use of existing authority and funds. Many of these impediments are deeply rooted in the politics of interest groups and inter- and intra-governmental relationships. However, identifying these impediments systematically and devising ways to address them are outside the scope of this article. Moreover, some apparent opportunities to improve health that emerge from systematic assessment may not, on analysis, generate benefits that justify the political effort to achieve them. The purpose of what follows is to clarify the potential to improve population health by using existing policy and resources.

Enforcing Existing Health-Promoting Laws and Regulations

Implementing policy that has already been enacted offers an opportunity to improve population health. For example, physical education and nutritional content of food in schools are covered in school wellness policies required by the Child Nutrition Act and by many state laws (5,6). Without local school champions and active parental involvement, good intentions often have been undercut by failed execution or compromised by competition for space in the school day for other subjects (7). Similarly, Medicaid requirements to provide preventive services for children are commonly ignored. The same is true for many environmental laws and regulations that affect air quality (8), smoking in public places (9), consumer protection with regard to toys and household items, and pedestrian and cyclist safety (10).

Clarifying Expectations for "Community Benefit" From Nonprofit Hospitals

An opportunity to improve population health lies in how the Internal Revenue Service (IRS) and state attorneys general construe the "community benefit" provided by nonprofit hospitals and health plans as a condition of their tax-exempt status. Historically, these community benefits (estimated at \$30 billion annually nationwide) have been poorly defined and inconsistently reported and quantified (11). Three schools of thought have dominated. A traditional regulatory view equates community benefit narrowly with "charity care" (free or discounted episodic care, usually in hospital emergency departments) for low-income patients who cannot pay some or all of the cost. A mainstream perspective in provider organizations counts charity care plus research, health professionals' education, and losses on underreimbursed public programs such as Medicaid. A population health perspective, in contrast, views community benefit as a wide array of community health improvement activities, determined by assessing local health needs (12).

Recently, IRS described 2 categories of activities that may be reported on IRS Form 990 for tax-exempt organizations: "community benefit," comprising the regulatory and provider perspectives described above, and "community building," which includes many of the programs considered community benefit from the population health perspective. IRS intends to analyze 2 years of reporting results before finalizing its requirements. Some population health advocates worry that IRS may determine that community health improvement activities do not count toward community benefit expenditure expectations. In that event, a traditional health fair (where uninsured people are screened free of charge for disease but not followed for treatment) might count, but a large-scale, multiyear, multisector community health initiative to reduce obesity might not qualify. In that case, nonprofit health organizations would have no incentive, other than a mission commitment, to pursue population health improvement initiatives. If IRS makes clear that comprehensive, community-based primary prevention activities and communitywide clinical improvement activities are included as community benefit — and if health care reform at the national or state level gradually reduces the need for traditional charity care — hundreds of millions, even billions, of dollars could become available for population health.

Using the Purchasing and Investment Power of Government and the Private Sector

Another largely untapped resource is the considerable power that public entities have to improve health through their purchasing and investment practices. Many of these actions can be carried out by executive order or by management discretion.

Public agencies wield enormous purchasing power. Two opportunities involve healthy nutrition and environmentally responsible materials procurement. Government agencies can model and reward the purchase of healthy foods through the way they administer federal and state nutrition programs (the Special Supplemental Nutrition Program for Women, Infants, and Children; the Supplemental Nutrition Assistance Program, school meals) (13). Public organizations can directly promote health by selecting healthier foods for their vending machines and cafeterias; purchasing fresh, sustainably (and locally) farmed pesticide- and antibiotic-free foods; and labeling nutritional content (13). Public agencies can vigorously control the public purchase of supplies containing toxic materials with adverse health consequences, such as mercury, lead, bisphenol A, and polyvinyl chloride.

Similar health-promoting strategies could be incorporated into the investment policies of public pension and investment bodies. Investment standards can be disincentives to socially negative activities (production, sales, and marketing of tobacco and firearms, for example) or promote socially positive activities (economic development and green jobs) (14).

By promoting health through purchasing and investment strategies, government could reinforce and encourage the adoption of similar standards in the private sector. Private organizations, both for-profit and nonprofit, wield considerable purchasing and investment power, though it is not as concentrated as that of government. On the other hand, the private sector operates with fewer constraints than government. Many large companies, particularly those with global reach, already have adopted corporate social responsibility policies governing their environmental, employment, economic, and human rights impacts. They have formed trade associations and initiated partnerships with universities and nongovernmental

organizations (such as Health Care Without Harm) to advance these policies and change purchasing practices. The changes adopted by such private companies, and in turn by their supply chains, extend all the way to original producers and to their employees and communities.

Moreover, investment practices of private and nonprofit organizations can also promote health. Nonprofits are a particular opportunity because many of them are funded in part by government and are sensitive to its goals, and others receive substantial funding from endowed foundations, many of which are making socially responsible investments. Although not as powerful as large public employee investment funds, their practices could still influence the prevailing sense of acceptable and appropriate investment policies. Evidence is mounting that socially responsible investment funds — those that screen out tobacco and firearms and sometimes alcohol and pornography — perform equivalently to general equity funds (15,16). More nonprofits are moving to invest proactively in community redevelopment and other activities that involve social determinants of health.

Enrolling the “Eligible but Not Enrolled” Populations in Public Programs

“Eligible but not enrolled” identifies the millions of low-income people who are qualified for but not enrolled in public benefits, including health insurance, food and heating assistance, and social services. An estimated 25% of people who are eligible for Medicaid and the Children’s Health Insurance Program (17) and 34% of those eligible for food stamps (18) are not enrolled in these programs.

Many federal and state dollars are unspent because of inadequate public management rather than political conflict or efforts to control spending or reduce fraud and abuse. Reasons include poor communications, stigma, and administrative barriers to enrollment. Public organizations and the private contractors they hire to administer programs erect such barriers as frequent requalification periods, lengthy application forms, complex documentation requirements, multiple in-person interviews, inaccessible venues for application, linguistic and cultural barriers, or lack of public information (19). Whatever their causes, these barriers often waste time and money in ways that can be calculated.

Food stamps, for example, are 100% federally funded (not counting a small state administrative cost) and generate \$1.80 in economic activity for every dollar expended, yet only recently have states acted to facilitate enrollment (19). Similarly, electronic eligibility determination and application filing have expanded coverage for eligible people and lowered administrative costs (4,20).

Increasing the Efficiency, Effectiveness, and Yield of Government Programs

Resources and authority are wasted when ineffective tactics are employed, interventions are poorly designed or targeted, agencies and policies work at cross-purposes, and evaluation of what works is not timely or well integrated into practice. Many public policies, moreover, undermine population health (for example, abstinence-only education, subsidizing commodity crops that contribute to obesity, and preventing disparagement of “bad food” as a condition for receiving US Department of Agriculture funds).

Interagency coordination to achieve mutual health goals is frequently recommended but infrequently practiced. A notable example of coordination is the California Strategic Growth Council, in which the state’s agencies for health and human services, environmental protection, business and transportation, and natural resources coordinate their efforts related to sustainability and health-promoting changes to the built environment.

Broad-based general community planning offers additional opportunities to improve population health. Concepts such as health impact assessments of government policies and actions represent the European tradition of health in all policies. These concepts inform the new Healthy People 2020 goals for the nation. The public health planning groups established to help California implement its greenhouse gas emission standards also employ these concepts (21,22). Provisions in a small but increasing number of general plans and redevelopment district plans across the country promote health by increasing the walkability and bikeability of communities, improving air quality, and supporting more grocery stores and parks (23). Some communities have established joint-use agreements that link assets of different organizations, such as school athletic fields and county parks, that contribute to health.

Using the Evidence to Design and Target Policies Effectively

Assessment of potential for making better use of existing policy and resources would benefit from more rigorous evidentiary standards for health interventions that affect populations. Large-scale community health interventions often have been criticized for lack of a scientific evidence base. Moreover, arguments among experts about appropriate methods for evaluating population health interventions have impeded use of the most persuasive contemporary tools of evaluation, especially systematic reviews that make careful use of both experimental and observational research designs. For example, systematic reviews conducted for the Centers for Disease Control and Prevention’s *Guide to Community Preventive Services* have demonstrated the effectiveness (as well as the absence of evidence of effectiveness) of numerous public health measures (2,24,25). Another example is a systematic review by the Campbell Collaboration that found that the widely used Drug Abuse Resistance Education program is not effective, thus establishing an argument for reallocating funds. Similarly, the Institute of Medicine’s Committee on an Evidence Framework for Obesity Prevention Decision-Making is developing recommendations that take account of the best evidence in an area in which advocacy sometimes has been ahead of science.

Incentive programs could be assessed for their contribution to population health. For instance, payment-for-performance schemes could reward improved performance in targeting clinical preventive services to reduce disparities that result from race and socioeconomic status.

Practicing What You Preach: Government as Example

Public agencies’ practices could be assessed to measure the extent to which they embrace risk reduction and harm reduction (such as eating healthy food, using clean needles, and encouraging condom use), openly acknowledge and address health issues (such as domestic violence and workplace safety), and reward behavior that contributes to health (such as economic development, public transit as a substitute for automobile use, environmental justice). By assessing its role in promoting health, government could set an example for private-sector organizations and nonprofits.

Indeed, private and nongovernmental organizations may more easily make health-promoting organizational changes that reflect the aims of public policy. Nongovernmental organizations have some latitude in deciding how to implement public policy — for example, prohibiting indoor smoking, sorting recyclables, providing ergonomic assessments for workers, subsidizing mass transit, or ensuring regular breaks and family leave. Moreover, nongovernmental organizations could also lead through voluntary practices — for instance, offering lactation spaces for breastfeeding mothers, stocking healthy food in vending machines, opening stairwells for regular use, providing bike stalls and showers, subsidizing gym memberships, or encouraging people to stay home when they are infectious. Such voluntary action could prompt public organizations to adopt similar measures.

Conclusion: Get More out of What We've Got

The United States faces enormous population health challenges. Policy change and reallocation of public resources are essential to improve population health. Assessment is the first step in making existing policy and resource allocation more effective. Assessment, at every level of government, in nongovernmental organizations, and in communities, is necessary to select opportunities to improve population health and then devise political and reallocation strategies to attain them.

Acknowledgments

An honorarium was provided to the author by the Mobilizing Action Toward Community Health (MATCH) initiative based at the University of Wisconsin. This manuscript was developed as part of the MATCH project funded by the Robert Wood Johnson Foundation. The support of Loel Solomon, Dan Fox, David Kindig, Elisa Wong, Michelle Ashe, and Virginia Irwin in preparing this manuscript is gratefully acknowledged.

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Paying for Performance in Population Health: Lessons From Health Care Settings

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Suggested citation for this article: Asch DA, Werner RM. Paying for performance in population health: lessons from health care settings. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0038.htm. Accessed [date].

PEER REVIEWED

Abstract

The appeal of pay-for-performance in health care derives from the conceptual view that paying doctors and hospitals more to deliver better care will encourage them to deliver better care. What lessons can be learned from the successes and failures of pay-for-performance in health care settings that apply to pay-for-performance in population health? We argue that pay-for-performance requires conditions that are not easily met in population health settings. Pay-for-performance has focused on narrow clinical problems whose success depends on identifiable actors with the motivation and resources to change clinical processes or outcomes. In contrast, population health has broad goals, many antecedents, and no single, identifiable fiduciary (a person who holds assets in trust for a beneficiary). Nevertheless, with careful attention, conditions for successful pay-for-performance in population health might be met.

Introduction

One reason pay-for-performance has been adopted in health care is that people like the idea that doctors or hospitals should be rewarded for high-quality care. They particularly hate the reverse: that doctors and hospitals get paid regardless of the quality of care they provide.

Indeed, the appeal of pay-for-performance in health care is sustained even in the face of at least 2 other conceptual issues that might argue against it. First, societal views of financial incentives are mixed. Paying people more to do what they were supposed to do in the first place conflicts with notions of professionalism. Should we pay doctors more to treat patients well when treating them well should be the minimal standard? Might putting a price on a professional goal to promote its success cheapen its value, rather than enhance it (1)? Could financial incentives applied in some settings crowd out professional behavior in others, causing elements of care that lack incentives to become neglected?

Second, explicit incentives may undermine intrinsic motivation and professionalism and thus are rarely used in other professions. Although there are exceptions (eg, sales representatives, financial managers, and some teachers and athletes), rather than being praised for the clever ways these financial arrangements align stakeholder interests, explicit incentive systems are often scorned for their failures or their unintended consequences. In general, we are comfortable with market-based incentives that reward those who build better mousetraps, but professions rarely use explicit systems. Against this backdrop, the firm hold taken by health care pay-for-performance systems, based on concept alone, is surprising.

The allure of pay-for-performance systems in health care derives from the intuition that financial incentives will help to achieve health care-related goals. Implementing that intuition requires 4 conditions (Box): First, there must be some stakeholder willing to pay for performance. Second, there must be some agent with the ability to achieve that performance who can, if successful, be paid. Third, there must be some measures of that performance on which to judge success and base payment. Fourth, in

the end there must be some evidence that the approach achieves its overall goals or at least that the system on the whole produces more good than harm. What does the experience with these 4 conditions in health care settings tell us about how pay-for-performance might work in population health settings?

1. Someone willing and able to pay for performance.
2. Someone able to achieve that performance who can be paid.
3. Measures of that performance on which to judge success and base payment.
4. Evidence that the system as a whole produces more good than harm.

Box. Four conditions for pay-for-performance in health care.

Who Pays Whom?

In health care, various stakeholders have revealed their willingness to pay for performance. These include payers such as insurance companies or government agencies like the Centers for Medicare and Medicaid Services, individual provider organizations that create incentives for clinicians within their systems, or organizations like the Veterans Health Administration with combined payer and provider roles.

Similarly, doctors and hospitals have revealed their willingness to be paid for performance. Since doctors and hospitals are used to being paid for the care of patients, it is a relatively small step to adjust those payments — for example, with a bonus or a withhold for providing better or worse care to their patients against some measures. More importantly, doctors and hospitals are already in the business of delivering health care, they typically have the tools to do so, and they generally see delivering health care as their responsibility and within their authority and ability.

Finding analogous stakeholders in population health is less clear. Even if we presume that national or regional governments have a stake in population health and can be the payer, who are the agents of population health who can be paid? Could hospitals and doctors be the agents of population health and accountable for its gains? Could we assign people, rather than patients, to doctors and hospitals and judge the doctors and hospitals by the health of their assignees whether they receive health care or not? To make that work, hospitals and doctors would have to shift their focus from health care, the process they are

comfortable with, to health, the outcome at least implicitly they hope to achieve. Most hospitals and doctors take responsibility only for those people who walk in their doors and consider only a limited set of health care-related health conditions. Typically, they do not consider a population of people who are not patients, elements of those people's health that are not connected to health care they provide, and exposures or outcomes that may play out over the life course. Accountable care organizations (ACOs) are clinical provider groups responsible for the outcomes of a defined population and the costs of achieving those outcomes (2). By emphasizing populations, not patients, and health outcomes (including population health care cost) rather than health care processes, ACOs might redirect the focus from patients to people and move closer to population health goals. These activities could be advanced by investments in health information infrastructure and by objective and comparative measures of community health.

Indeed, even if we could shift the focus of doctors and hospitals from patients to people, we would face the additional challenge that health care plays a small role in population health. Instead, population health is the product of a wide range of social, biological, and environmental forces, including education, income, social status, genetic endowment, physical exposure, personal behavior, and social context. The comprehensiveness that makes this model so appealing also makes it hard to find people whose job it is to make it better.

If hospitals and doctors are not the agents of population health, we might assume there is some other entity to be paid — a body accountable for achieving population health goals. Because the inputs to population health are multiple and tangled, this body might take the form of a collaborative spanning groups concerned with education, health care, transportation, housing, environment, and other areas that reflect the complex causal pathways leading to health. Questions would remain even if such bodies were created. Are performance payments to the body itself, in the form of more resources to accomplish goals? Or are they payments to individuals of the body — payments that would go into the pockets of people rather than into the budgets of programs? Are there second-tier payments for performance? For example, do these bodies distribute performance bonuses to those who help them achieve their goals — good school teachers, for example? And, if so, might these bodies begin to look more like an intermediate form of government itself: broadly

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constituted, acting through others, with institutional rather than individual budgets?

How Do We Measure Performance?

The substantive challenge in paying for performance in health care settings has been developing and implementing measures. Cynical observers might have predicted that physicians and hospitals would be most engaged about the money at stake. But instead, most of the dialogue has focused on whether the clinical measures make sense for patient goals and whether they treat physicians and hospitals fairly.

Structure, process, and outcome

In health care, performance measures can be divided into those that reflect the structure of care (eg, use of intensivists in intensive care units), processes of care (eg, screening for colon cancer), or the outcomes of care (eg, the risk-adjusted mortality for coronary artery bypass graft [CABG] surgery). Sometimes the process measures reflect items almost entirely in the operator's control (whether colon cancer screening was ordered) but sometimes these measures reflect elements not entirely in the operator's control and require substantial patient participation (whether the patient received colon cancer screening). Sometimes the outcome measures reflect clinical events that anyone would consider important (mortality), but often the outcome measures are intermediate clinical outcomes such as control of blood pressure, cholesterol, or blood glucose that are linked with outcomes patients care about but which are symptomless themselves.

To advance population health, we must decide whether to measure the distal outcomes we care about, such as life expectancy and its distribution across population segments. These outcomes are a large part of what most people mean when they discuss population health. Focusing on them would appear to align measures with goals, but their distant horizon limits their usefulness — particularly if we want to find, reward, and encourage the people responsible for achieving them. In health care, when we worry about cardiovascular disease, we often do not wait to measure outcomes like heart attacks. Those outcomes are too rare at the level of the individual provider, too multifactorial to clearly tether cause and effect, and too far in the future to provide the kind of immediate

reward that motivates good behavior. Instead, we substitute intermediate markers reflecting control of glucose, blood pressure, lipids, and tobacco use. Those markers are appealing because their place on the causal pathway gives them the added credibility of mediators (3), because we can measure them easily and precisely, because we have tools at our disposal to influence them, and because we can identify the people responsible for doing so. However, analogs in population health are hard to find. Our understanding of the causal pathways toward population health is limited. We must determine the intermediate markers and mediators for sweeping population health goals and whether to measure structural determinants of health (eg, good schools) or the processes toward that goal (eg, wealth or income redistribution plans embedded in tax policies, incentives to foster civic groups and their resulting social capital).

Measurement

In the abstract, measures must be reliable, valid, and inexpensive to collect, and they must quantify events of sufficient frequency to sustain stable estimates over time. Only a small slice of the activities in health care settings meet these criteria. Hofer and colleagues (4) found that even for a condition as prevalent as diabetes — for which glucose levels are frequently measured — individual physicians would need more than 100 patients to provide measures of those intermediate markers statistically reliable enough to distinguish their performance from that of their peers. Yet more than 90% of physicians in busy primary care settings care for no more than 60 such patients (4).

Population health measures may be substantially less constrained by these limitations. Large populations (eg, geographic or political regions, racial/ethnic subgroups) can probably support sufficient observations for stable estimates. However, population health measures may face a different challenge because many important questions in population health reflect the distribution of health outcomes across diverse population subsegments. Reporting the mean life expectancy of the United States, for example, misrepresents a population health story that is as much about heterogeneity as it is about a central tendency. An examination of racial differences in the management of localized prostate cancer in Pennsylvania simultaneously revealed that whites were more likely to get surgery than blacks, that whites and blacks were equally likely to get

surgery, and that blacks were more likely to get surgery than whites (5). All of these results were correct but reflected answers to subtly different questions that relied on different parsing of the same aggregate data.

Fairness and resistance to gaming

A substantial concern in pay-for-performance in health care settings has been that conventional approaches are susceptible to gaming as clinicians or hospitals manipulate their circumstances to get ahead. One common performance metric in primary care settings is the percentage of patients with diabetes who have a glycosylated hemoglobin level (a measure of intermediate-term glucose control) below a particular threshold, usually 7%. On its face, the measure seems credible and useful, but physicians seeking to improve performance on this measure could overdiagnose the disorder, overtreat it, avoid or disenroll patients who belong to a high-risk group or have difficulty controlling their blood glucose levels, or relocate the practice to an area with better resources to help patients with controlling their diabetes (6).

These manipulations may sound exaggerated, but some events surrounding New York State's program of public reporting of CABG surgical mortality suggest they occur. Evidence of such manipulations is mixed (7). To some, the program looked like a huge success because CABG mortality in New York State dropped (8). However, public reporting for CABG mortality in New York was followed by a lower severity of illness among those patients operated on (suggesting that surgeons were avoiding sick patients) (9); an increase in the severity of illness of patients from New York operated on in hospitals in contiguous states near the New York State border (suggesting transfer out of state, where mortality was not publicly reported) (10); and a widening of racial disparities in CABG surgery (suggesting that surgeons used race as a proxy for an increased risk of a poor outcome and preferentially avoided minority patients) (11).

Paying for performance in population health might be considerably less susceptible to this kind of gaming. Jurisdictions (or whatever might define the denominator or population) are not so easily manipulated, and population health goals are not typically linked with diagnoses or conditions whose definition can be easily shifted. Still, results that can be achieved in affluent and poor areas differ considerably. Achieving fairness in

paying for population health performance may be even more challenging because the underlying causes of differences in health are broad and fundamental (12) and hard to overcome one by one.

A resulting concern is that pay-for-performance will likely reward programs or areas that have better resources, penalize those that do not, and thereby widen disparities in care. For that reason, pay-for-improvement initiatives have been proposed in health care so that clinicians are not judged against fixed and uniform standards but against their ability to improve measures from their own baselines. These approaches might be proposed for population settings as well.

Priority

One of the concerns clinicians raise about performance measurement is that it seems to focus on the wrong things. Only a small fraction of patient conditions or complaints are measured. Most never can be, because the evidence for the right approach is insufficient or because the circumstances happen too infrequently to provide stable measurement. And even though some performance measures are firmly evidence-based (eg, considerable evidence suggests that screening for colon cancer saves lives), such performance measures may still focus on the wrong things. Stakeholders worry as much about what is not measured as what is measured because elements of care that are not measured may lose priority, and what is *measurable* has no necessary connection with what is *important* (13). These concepts underlie concerns that performance measurement can lead to "teaching to the test," as attention is diverted away from the items that trouble patients and toward the items for which measurement systems exist.

Setting priorities in population health might be easier than setting those in individual health care settings because population health goals reflect big thinking and large targets. Patients have individual goals: "I want my knees to stop hurting"; "I do not want to die from breast cancer." Population goals are more general: "Extend life," "reduce disability," "promote health." Everyone can accept the priority those broad goals have and feel their personal relevance. In contrast to health care priorities, population health priorities are more typically expressed as basic goals that are more uniformly accepted.

Does It Work?

There is scant literature about the effectiveness of performance measurement in improving health care (14) and even less about the effectiveness of the more specific approach of using financial incentives paired with performance measurement (15,16). General evidence suggests that measuring performance on specific indicators (eg, success with glycosylated hemoglobin measures) improves performance of those indicators (17,18). But those measures of success might be too narrow. Success on the measured indicators does not reveal what happens to unmeasured indicators. In 2 studies, unmeasured activities did not decline in the setting of performance measurement (19) and other quality improvement activities (20), but the concern remains.

Furthermore, improvements in glycosylated hemoglobin may not improve overall health or life expectancy. In a cohort study, Higashi and colleagues (21) observed a positive association between life expectancy and the number of clinical performance targets patients had met in their health care. In another study, hospitals with better performance in process measures for the care of patients with acute myocardial infarction also had slightly improved risk-adjusted mortality for this condition (22). However, many studies have found no relationship between process measures and outcomes (23,24).

Conclusions

We have learned a great deal about paying for performance in health care through developing and implementing pay-for-performance programs. Because little evidence exists that pay-for-performance (in its current form) reliably improves health care, our greatest lessons may be about the potential problems with pay-for-performance: what does not work and what can go wrong. Despite past failures and unanticipated consequences, substantial optimism remains that paying for performance can be part of the solution to improve health care quality. Indeed, the problems that have been uncovered have been seen less as reasons to give up and more as lessons to lead improvement.

Attempts to improve population health through paying for performance will probably follow similar patterns. The specific actors and measures will need to be considerably different, but it seems likely that any process that moves

forward will face similar challenges in the form of both failures and unintended consequences. The sense of priority about the goals of population health and the sense of optimism about the process of paying for performance will probably determine whether any early failures are seen as discouraging or as opportunities to make the system better.

Acknowledgments

Rachel Werner is supported by a Veterans Affairs Health Services Research and Development Career Development Award. This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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SPECIAL TOPIC

Realizing and Allocating Savings From Improving Health Care Quality and Efficiency

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Suggested citation for this article: Fox DM. Realizing and allocating savings from improving health care quality and efficiency. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0028.htm. Accessed [date].

PEER REVIEWED

Abstract

International efforts to increase the quality and efficiency of health care services may be creating financial savings that can be used to improve population health. This article examines evidence that such savings (ie, a quality/efficiency or value dividend) are accruing and how they have been allocated and assesses the prospects for reallocating future savings to improve population health. Savings have resulted mainly from reducing the number of inappropriate or harmful interventions, managing care of people with chronic disease more effectively, and implementing health information technology. Savings to date have accrued to the revenues of public and private collective purchasers of care and large provider organizations, but none seem to have been reallocated to address other determinants of health. Furthermore, improved quality sometimes increases spending.

Introduction

The rapid growth of an international movement to improve the quality (including the safety) and efficiency of health care services has led to speculation about whether any resulting savings can be used to improve population health. This article explores the limited evidence about

whether improvements in the quality and efficiency of health care services yield net savings (ie, a quality/efficiency or value dividend) and scantier evidence about how savings to date have been allocated.

The possibility that a portion of any dividend from improving the quality and efficiency of health care services can be used to address other determinants of health has recently attracted interest in several industrial countries that provide universal coverage. A select committee of the British Parliament recommended in 2007 that the National Institute of Health and Clinical Excellence (NICE) offer more guidance about what health services to “disinvest” from and how to reinvest the savings in clinical and community health interventions. Australian researchers recently proposed criteria for disinvestment and reinvestment by government health agencies and documented support for such a program among policy makers (1). Donald Berwick, an American who is an international leader in quality improvement, argues on the basis of international experience that it is feasible to achieve the “triple aim” of “improving the experience of care, improving the health of populations, and reducing per capita costs of health care” (2).

Searching for a Quality/Efficiency Dividend in the United States

The search for a dividend as a result of improving the quality (including safety) and efficiency of health care services in the United States began in the 1980s. Expenditures for health care had been increasing for several decades at a rate higher than general inflation. By the end of the 1970s, most policy makers for health care

had concluded that any expansion of access would require slowing the rate of increase in spending.

The recession of the early 1980s exacerbated concern among employers and union leaders that the international competitiveness of American industry was declining for reasons that included employment-based health care coverage. To address this decline in competitiveness, American corporations reimported from Japan techniques of scientific management that had originated in the United States earlier in the century. Business leaders applied these techniques to all aspects of their business, including spending for health services.

Executives and physician leaders of large health provider systems also accorded considerable attention to what would soon be called *quality improvement science*. Managers of hospitals and health systems had begun in the 1970s to identify with private sector executives rather than with their predecessors, for whom careers in health care were extensions of philanthropic service or public administration. These managers were particularly aware of the increasing number of their patients who were covered by the self-insured benefit plans of large firms that engaged in formal quality improvement. As a result of incentives in the Employee Retirement Income Security Act of 1974 (ERISA), more than half of workers and their dependents were enrolled in these plans by the late 1980s.

Policy makers for health care in the federal government joined the quality improvement movement during the Reagan administration, when the Health Care Financing Administration (HCFA, now the Centers for Medicare and Medicaid Services) imposed prospective payment for Medicare Part A (hospital) benefits. Disease related groups (DRGs), the regulatory tool for prospective payment, had been devised to improve efficiency and quality by measuring how hospitals used resources. The co-investigator for the research project that conceptualized DRGs, John D. Thompson, was strongly influenced by analytical methods to improve quality and efficiency in hospitals that Florence Nightingale had devised in the 1850s and 1860s (3). As a result, DRGs had a dual purpose from their introduction into policy: to contain the growth of public spending and to create incentives to reduce the average length of hospital stays and the overuse of ancillary services.

HCFA addressed quality more explicitly during the second Reagan administration. In 1986 it began a contro-

versial project that compared, and published, death rates among hospitals. A year later the administrator of HCFA, William Roper, was lead author of an article in the *New England Journal of Medicine* that advocated measuring the effectiveness of health services to pay, eventually, for what worked. In response to the Omnibus Budget Reconciliation Act of 1987, HCFA and external researchers, led by John Morris, devised what became the minimum data set for measuring and reporting the quality of care in residential nursing facilities.

Beginning in the late 1980s, states used their authority to regulate health plans and facilities to encourage transparency about outcomes and quality. Public agencies in New York and Pennsylvania, for example, compared death rates of hospital patients who had cardiac surgery. In California, a new public agency collected information from hospitals, including data about outcomes. Many states required health plans to make public the data they had reported to the National Committee on Quality Assurance, a nonprofit organization.

The measurement of quality in clinical practice and the dissemination of techniques to improve it accelerated during the 1990s. The Institute for Healthcare Improvement trained, advised, and inspired many health care professionals and leaders of provider systems. Managed care plans used evidence about quality to select clinicians and hospitals for their networks. They used the controversial methods of managed care to control costs by increasing efficiency as well as by curtailing use.

In parallel with the quality improvement movement, researchers were collaborating internationally to improve methods for evaluating the effectiveness and efficiency of health care technology and care processes. Systematic reviews were a powerful tool for identifying bias in research about interventions and then pooling data from multiple studies to increase statistical power. Eighty-seven systematic reviews appeared in the international literature in 1988, the year before publication of the first set of reviews evaluating an entire field of care. During the next 2 decades the number of new and updated systematic reviews published each year grew to more than 2,500. Moreover, by the first decade of the 21st century an increasing number of reviews were comparing the effectiveness of competing interventions. During the same years, advances in methods of improving health services occurred in the disciplines of economics and decision sci-

ence. Perhaps most important, the evolving methods of analyzing cost-effectiveness yielded more precise estimates of relative value for money.

Insurance plans and public agencies increasingly used findings from research on effectiveness and efficiency to inform decisions about coverage. The Blue Cross/Blue Shield Association created a program to assess health technology in 1985, building on work it began in the 1970s. Other organizations, commercial and nonprofit, provided technology assessment to provider organizations by subscription. A new international organization, the Cochrane Collaboration, set standards for, produced, and published systematic reviews. The federal Agency for Healthcare Research and Quality (under an earlier name) began in 1997 to commission research evaluating the effectiveness of interventions from organizations it designated evidence-based practice centers (4).

A committee of the Institute of Medicine shocked the health sector and the media in 2000 when it estimated that 80,000 to 100,000 unnecessary deaths occurred in hospitals each year. A year later, the committee published recommendations for “crossing the quality chasm,” revealed by these deaths and other evidence of inadequate care (5).

By the turn of the new century, the rapidly evolving methods for measuring and improving quality and evaluating the effectiveness and comparative effectiveness of interventions were informing policy and practice in the United States and other industrial countries. The chief medical officers of integrated delivery systems and many other large provider organizations urged greater use of what was commonly (if controversially) called evidence-based health research in clinical decisions. The Veterans Health Administration had, since 1993, begun to make significant and widely publicized improvement in quality under the leadership of Ken Kizer. Berwick and the Institute for Healthcare Improvement stimulated and documented quality improvement as a result of “learning collaboratives” of physicians and hospital staff (6).

In 2001, states began to use evidence of comparative effectiveness to establish formularies, called preferred drug lists (PDLs), for Medicaid and other public programs. Three states began collaborating in 2003 to commission, finance, and make publicly accessible systematic reviews of drugs in particular classes. The number of collabora-

tors had grown to 17 by 2009 and included a Canadian intergovernmental agency. Forty-five states had PDLs in 2009. Evidence accumulated that research-based PDLs improved quality and controlled the growth of cost (7).

But much evidence of the effect of other quality improvement activities on expenditures was inconclusive. In the 1990s, most practitioners of quality improvement and evidence-based health research prioritized improving outcomes over cost savings. Nevertheless, in 1998 Shortell and colleagues cited several reports of savings as a result of continuous quality improvement. Intermountain Health Care, for example, reported \$30 million of annual savings from “60 ongoing clinical improvement initiatives.” Most of the studies the authors located, however, assessed evidence from a single site and used “relatively weak” designs, primarily “before-and-after observations” (8).

Five years later, in an article that has been cited frequently, Sheila Leatherman and colleagues asked whether “improving health care quality cost money or save[d] money.” The authors concluded that “even where analyses do exist, the answer varies with the stakeholder’s viewpoint and the time frame examined” (9).

Subsequent research, especially in the United Kingdom, documented that improving quality sometimes led to improved outcomes and fewer adverse events but at additional cost (10). The chairman of NICE emphasized in 2009, for example, that “in practice [NICE guidelines] tend to add to the cost of providing care” (11).

The Current Search for Savings

Little evidence shows that improving quality and efficiency in clinical settings yields savings that are large and sufficiently identifiable to be reallocated. In 2003 Leatherman and colleagues described 3 perspectives for linking quality and cost: business, economic, and social (9). Under their definition, a business case for savings would be made if providers realize a return on their investment in a reorganized care process in a “reasonable time frame.” An economic case would be persuasive if “discounted financial benefits exceed discounted costs, whether they accrue to patients, employers, providers or payers.” A social case would be evidence of any “benefit to the individual (patient) or to society of improved health status and productivity, regardless of cost.”

Leatherman and other colleagues subsequently documented the weakness of the business case for quality and efficiency. In 2005 they reviewed and summarized articles in the American literature that contained sufficient data to calculate a return on investment to providers. They found only 15 articles that met their inclusion criteria and concluded that “scant attention is currently paid in the quality-of-care literature to the cost of implementing quality-enhancing interventions” (12).

In 2008 Leatherman, again with other colleagues, reported on a “demonstration project designed to measure the business case for selected quality interventions in high-risk high-cost populations in Medicaid managed care organizations.” They concluded that savings would result mainly from interventions “that have potential for short-term return on investment and primarily seek to reduce avoidable emergency room and inpatient hospital utilization.” They warned, however, that managed care organizations would be wary of quality improvement that achieved savings because Medicaid agencies might reduce capitation rates as costs declined (13).

In contrast, the Center for Health Care Strategies (CHCS) argues that the interests of Medicaid agencies and managed care organizations can be aligned. CHCS has devised and, in collaboration with the Commonwealth Fund, is promoting tools with which state Medicaid programs can conduct “return on investment analysis” to “lower costs without sacrificing quality of care or enrollment capacity” (14).

Elliott Fisher and colleagues recommend policy to achieve savings linked to quality improvement on the basis of their research at Dartmouth on unwarranted regional variation in the use of health care. Their studies have documented “marked regional differences in spending [for Medicare] . . . after careful adjustment for health.” Because integrated delivery systems “offer great promise for improving quality and lowering costs,” Medicare policy should foster “local organizations’ accountability for quality and costs through performance measurement and shared savings payment reform.” The savings would be shared among physicians and health systems. This proposal has attracted considerable attention in the media and among policy makers because Fisher and colleagues estimate that approximately 30% of Medicare spending is unnecessary (15).

Researchers at the RAND Corporation reached a similar conclusion, using different methods. A RAND report of 2005, still quoted by the media in 2009, estimated that substantial savings would result from improved quality and efficiency. RAND researchers estimated that if 90% of hospitals and physicians adopted health information technology, the combined savings from improved health, safety, and efficiency would during the next 15 years total approximately 6% of 2009 spending for health care.

Other researchers are less optimistic about potential savings from avoiding the overuse, misuse, or inappropriate use of care. Bentley and colleagues, for example, devised a “typology of operational waste,” which they define as duplication of services, inefficient processes, overly expensive inputs, and “quality defects that result in rework or scrapping.” They found that such waste amounted only to 1.9% to 3.4% of US health care spending in 2006. They also found it difficult to “identify clinical procedures that are *unambiguously* wasteful” (16).

Other recent studies found only limited savings as a result of improving the coordination of care (17). A 2007 study of countries that are members of the Organisation for Economic Co-operation and Development described evidence of “cost efficiency” as a result of better coordination as “inconclusive” (18). A review of 15 randomized trials of the effects of care coordination on hospitalization, quality of care, and health expenditures among Medicare beneficiaries concluded that, “Coordination programs without a strong transitional care component are unlikely to yield net Medicare savings” (19).

Some experts emphasize political and cultural barriers to accruing savings by reducing the volume of ineffective care. Bryan and Graeme Haynes, for example, listed many interventions (eg, use of antioxidants for the prevention of cancer and cardiovascular disease) that are still used although persuasive research has demonstrated that they offer no benefits or can be harmful. Then they describe how “vested interests” work to “make us forget that the justification for their promotion has been gored” (20).

Anecdotal evidence, however, continues to encourage optimism about generating a value dividend, despite the discouraging research findings I have surveyed. Large provider organizations, for example, report savings as a result of quality improvement in particular service lines. Examples include Ascension Health, the Geisinger Health

System, Sutter Health, and Kaiser Permanente. Many experts on quality improvement claim that the Swedish county of Jönköping is achieving the lowest per capita costs and highest quality among jurisdictions in that country.

Conclusion

Both research and anecdotes support the generalization that any dividend that has accrued to date has reduced costs mainly for public purchasers, health plans, and provider organizations. Moreover, such savings have improved the general revenue of these organizations instead of having been reallocated for particular purposes.

There is persuasive evidence, for instance, that many American states are achieving substantial savings in spending for pharmaceutical drugs in public programs by using PDLs that rely on systematic reviews. These savings offset other expenditures for Medicaid and the health benefits of public employees (7). The state of North Carolina is an exception. Under its Community Care program, in statewide operation since 2005, case managers and physicians collaborate to “improve and coordinate care across 1,200 medical practices serving more than 884,000 Medicaid recipients.” The state allocates savings achieved by the program to hiring additional staff for the 14 regional networks that administer it (21).

Even in countries with universal coverage and strong commitment to addressing broad determinants of population health, savings from improving value accrue mainly to general revenue. A senior official in Jönköping, replying to my question about the allocation of savings that he estimated to be 2% of the county’s health expenditures, wrote: “Our savings go directly to pensions, investments and improvement work, so they are hard to put the finger on as 1 single thing” (personal communication, 2009). Similarly, there is no evidence that savings in Britain, as a result of the implementation of findings from studies conducted by NICE, have been allocated for purposes other than health care.

A recent study explored the feasibility of reallocating resources from health care in Amsterdam to “sustained population-wide health improvement.” The authors found that the “municipality held a public health perspective but did not use it to really govern the health system.” The sickness fund with the largest market share “had no interest in

targeting healthcare to the needs of the Amsterdam population.” An executive of the fund said that “[w]e do not represent public interests! We represent our customers.” After reviewing relevant literature in the context of their findings, the authors concluded that, “Population health considerations are not central to European health reforms” (22).

Two economists claim that research in their discipline that purports to inform policy makers about how to create value dividends has, perversely, caused spending to increase. The standard method for economic evaluation of health services, Birch and Gafni argue, leads to “an increase in health care expenditures” rather than to savings as a result of flaws in the standard method for calculating “incremental cost-effectiveness ratios” (ICERs). They propose that, instead of calculating ICERs, purchasing organizations pay for new technologies only when their “adoption leads to an unambiguous increase in health gains from available resources.” However, the method they recommend for estimating health gains assumes that policy makers would ration care (by ceilings on resources) and would disinvest from technologies that do not improve health (23).

Other experts doubt that improving overall population health would have the highest priority when a value dividend is reallocated. “Societal goals,” Bentley and colleagues write, “override basic cost-effectiveness analysis considerations of cost and value.” For example, “as a society we may prefer to provide care to the sickest, most vulnerable patients, even though our money could buy greater improvements in life span or quality of life if used for another purpose” (16). Policy makers are likely, that is, to ration spending to improve overall population health to avoid rationing health care.

Many people steeped in American health politics would likely agree. Any future savings from improving the quality and efficiency of health care in the United States would most likely be allocated to expanding access (best case) or to slowing the inexorable growth of spending (probable case). Like the illusory Cold War or peace dividend that was reinvested in hot wars and homeland security, any dividend from health care could also finance responses to unanticipated epidemics and disasters.

Acknowledgment

This manuscript was developed as part of the Mobilizing

Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Accountability Metrics and Paying for Performance in Education and Health Care

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Suggested citation for this article: Witte JF. Accountability metrics and paying for performance in education and health care. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0046.htm. Accessed [date].

PEER REVIEWED

Abstract

The track record in paying for performance in education is not good; nevertheless, emphasis on accountability and performance has gained momentum in the last 25 years. This emphasis includes systems of merit pay, career ladders, and national board certification. The general failures of these efforts have led some reformers to suggest that teacher pay be directly related to student value-added performance. This suggestion remains controversial but is also the hottest topic in paying for performance in education. Although many similarities exist between education and health care, major differences may make it even harder to install pay-for-performance systems in health than in education. If those systems are to be tried, experiments should begin in a bottom-up fashion at the unit level, rather than being imposed systemwide.

Introduction

The track record in paying for performance in education is not good; nevertheless, the issue has gained momentum in the last 25 years. Although education and health care share several similarities — for example, both are professionally labor-intensive and have flatter hierarchies than other fields — their differences may make installing pay-for-performance systems more difficult in health care than

in education. Because of the amount of money spent on each of these fields and their role in society, however, even small changes that enhance performance and accountability will yield considerable benefit.

In each field, system-level incentives should be distinguished from individual-level incentives. In education, the system levels are the district or school, and the individual levels are primarily teachers. In health care, the system levels would be units such as clinics or hospitals and departments within those units. The individual levels would be caregivers, including doctors, nurse practitioners, physician assistants, nurses, and aides. Accountability and incentive systems at the system level would differ from those at the individual level.

This article summarizes accountability, performance metrics, and reward systems in education for possible use in health care. First, I describe advances in education, emphasizing changes in accountability and achievement measures. Second, I review salary systems and individual- and system-level incentive and accountability efforts in education. Finally, I discuss the implications for health care of these efforts in education.

Changing Emphasis on Student Achievement and Institutional Performance

The modern era in accountability in American education approximately dates from the publication of *A Nation at Risk* (1) in 1983. That national report was a scathing attack on the quality and competitiveness of American schools. Before that time, emphasis on student achievement or achievement-based accountability was lacking. Instead, emphasis was on education inputs and equity in resources.

That emphasis began to change, first through state actions, often led by governors, and later by the 2002 reauthorization of the Elementary and Secondary Education Act, known as No Child Left Behind (NCLB). Today, all states have achievement test score data in multiple subjects in grades 3 through 8 and 1 grade in high school. Data on grade retention and high school graduation are vastly improved. In some states, administrators and researchers can follow the achievement progress of individual students, allowing study of education growth from grade to grade. As required by NCLB, data are also made available to the public on the achievement performance of individual schools and districts. For schools that fail to meet performance standards, sanctions can be imposed. These changes amount to a revolution in terms of data, data availability, and a shift from a focus on education inputs to student outcomes. They also provide the potential for institutional and teacher accountability.

Salary Systems, Paying for Performance, and Other Reward Efforts in Education

Methods of paying teachers have evolved over time. In the 19th century, education was generally limited to children of affluent families and took place in students' homes. Teachers were paid in room and board and often migrated from home to home (2). As schools became widespread in the mid-19th century, salaries were often arbitrarily based on sex, education, and the grade of the classroom. The inequities of differentiated salary scales between men and women were the target of emerging teachers' unions and women's equality movements. The result was the single-salary schedule first adopted in 1921. This schedule applied to all teachers and was based solely on years of experience and the teacher's education. The idea caught on quickly and, by 1950, 97% of school districts had adopted the single-salary schedule (2). Although it persists as the foundation of teacher compensation in public schools today, attempts to build incentives for performance have been proposed repeatedly in the last 3 decades. An underlying difficulty is that people disagree over what defines performance.

Merit pay

The idea of merit pay has gained considerable attention during the past 25 years, although little systematic research shows the effects of merit pay on student achievement. Existing research suggests somewhat negative

effects; however, these studies have several problems. First, "merit pay" encompasses a range of approaches to teacher evaluation and reward, but most merit pay rewards come either as one-time bonuses or as advances on the salary scale (3). Second, unmeasured selection problems may exist, both in terms of teachers, where missing variables may be the real driver of results, and for students, who may be nonrandomly assigned to teachers. Third, the best estimate of the number of public districts at any given time that are participating in some form of merit pay is 10% to 15% (3,4). Finally, merit pay plans do not last long in school districts. Of the plans in existence in 1983, 75% were gone by 1993 (5). In a study by Ballou, only approximately 25% of merit pay plans survived during a 6-year period (3).

Two reasons explain why merit pay plans in education do not persist. First, the characteristics of teaching make assessment of and support for incentive pay plans difficult, if not impossible. The art of teaching is hard to translate into objective measures and is a joint product of many people, and the links between teaching and student achievement are elusive (6). Second, teachers' unions oppose merit pay (4). One study compared pay-for-performance systems in public and private schools by using data from the national Schools and Staffing Surveys for a 6-year period (3). The percentages of schools and districts with merit pay plans were approximately the same in public and private sectors. However, that was driven by Catholic schools, which represented more than half of private schools. For the most recent year of the data (1993), the percentages of districts or schools with some form of merit pay plan were public, 12%; Catholic, 10%; other religious, 21%; and nonsectarian private, 35% (3). Catholic schools may have been under resource constraints, but other private schools demonstrated that merit pay plans could exist in high numbers. Public schools with collective bargaining agreements (64% of schools surveyed) had considerably fewer merit pay plans and lower plan survival rates than did schools with a "meet and confer system" (7% of schools) or that had no unions (29% of schools). The proportion of salary attributed to merit pay was 0% for schools under collective bargaining but 4% for schools with no union (3). Thus, the union environment affected the creation, longevity, and effect of merit pay plans.

The reasons for union opposition have, in part, to do with disagreement over what constitutes high performance and how it should be measured. The Obama Administration,

in “Race to the Top” funding competitions, stresses the need to use student achievement test data as part of merit pay systems. Because unions often resist these methods, surely as the exclusive definition of meritorious performance, many unions refused to sign off on state proposals, and some states refused to apply at all.

Career ladders and national board certification

Another approach to incentives in education has been to try to define certification categories. Since teachers traditionally are either probationary or not, the only route to advancement is to leave teaching and become an administrator. To alleviate this problem and to reward successful teachers, states and districts have created various career ladder opportunities. Career ladder systems differ in terms of how the ladders are set up, how teachers advance, and what rewards they receive. Beginning in 1987, a national board certification process was established for individual teachers.

As with merit pay, only recently have rigorous, empiric studies assessed the effects of these programs on student achievement. One of the best studies was of the Tennessee Career Ladder Evaluation System, which began in 1985 (7). The system was rigorous in terms of evaluative criteria and standards. The design of the program included consequential rewards; moving from probationary status to the third (top) rung of the ladder could add up to \$10,000 to a teacher’s base salary. Teachers moved up after extensive evaluations by principals and state officials.

However, as with merit pay studies, investigators found mixed results on achievement. One study found that having a teacher on a higher rung of the career ladder increased achievement in math but not reading (7). However, that result was confined to teachers only at the first of 3 possible rungs of the ladder. Equally problematic was a program audit that found that 95% of those who attempted that rung were given the certificate; 69% of teachers were on the first rung, and only 7% in were on rungs 2 or 3. After 2 years, the program was made voluntary, and it was terminated by the state legislature in 1997 because of a lack of funds.

The only national-level career development system is a certification process begun in 1987 by the National Board of Professional Teacher Standards (NBPTS). That process, which is voluntary for teachers, allows national

certification after a screening and assessment process that includes construction of teaching portfolios (including video recordings of instruction); evidence provided by students, parents, and colleagues; and assessments of teaching practices, methods, and pedagogy. The process usually takes several years. Many states provide application grants and monetary rewards for completing the certification process.

Three major studies have assessed the effects of NBPTS certification on student achievement and teacher effectiveness. Two studies in North Carolina found varying degrees of positive effects for teachers who achieved national board certification (8-11). The studies found significant differences in student achievement for future board-certified teachers before their application to the NBPTS program, termed a “signaling effect.” The results showed that these advantages persisted after certification, but the advantages over noncertified teachers were small and, in some cases, not significant. The results may have been due to selection effects: better teachers may have sought certification.

The most recent large sample study evaluated elementary and high school teachers in Florida by using a gain score analysis similar to that used in North Carolina. However, unlike the North Carolina studies, investigators found neither a prior (signaling) effect nor significant differences after certification (12). The authors concluded, “Based on our findings for Florida, the efficacy of NBPTS as a tool to improve student learning appears questionable. The 2 main potential benefits are to identify and reward productive teachers and to encourage teachers to improve their teaching skills. Our results suggest that NBPTS does neither, at least when teacher productivity is measured in terms of student achievement gains soon after a teacher becomes certified” (12).

Explicit schemes to create a pay-for-performance system, including merit pay or teacher ranking systems, have not been successful in implementation or in having consistent effects on student achievement. These results have led scholars and some educators to recommend a more direct approach, by paying teachers for how much their students learn over time.

Growth and value-added models

State standardized tests, especially given the yearly testing requirements of NCLB, supply the necessary data

to track student progress longitudinally. NCLB requires only reporting and accountability at the school or district level with cohort scores, but many states have noted that a fairer system would hold schools accountable for growth that individual students make from year to year. Although the language in this area is not always clear, I refer to change metrics as “growth scores” when they are recorded with an estimated yearly change as the basic measure; “value-added” describes a sequence of changes and projected growth patterns that are created for individual students.

Growth and value-added models address problems of selection bias for teachers. Because students may not be randomly assigned to teachers, under most state reporting systems, a teacher who attracts or is assigned lower-achieving students will be penalized if judged solely on a yearly cohort score. That lower achievement is related to student and family characteristics and perhaps prior education. Growth scores assume that the historical accumulation of these family and educational resources is captured by including the previous test in estimation models.

Controlling for prior level of achievement may not be sufficient, however, because achievement depends not only on a starting place but also a rate of growth. For example, a student who begins school at a lower level of achievement may have a steeper learning curve than a student with higher prior achievement. In this case, the yearly growth will be an invalid indicator of what was accomplished in that year. However, if a sequence of annual scores is available for each student, an average rate of progress can be determined, and we can estimate future projected achievement. This projection or trajectory can then be used as an expectation of the value added by a school or teacher over time. In this model, both the starting differences and the growth rates of students are taken into consideration, and either schools or teachers could be judged on how well students do on the basis of their projected outcomes.

Theoretically, future deviations from the trajectory (residuals in a statistical model) could be linked backward to prior teachers. This procedure would construct a value-added model for rewarding teachers. Such a model was first suggested and implemented in Tennessee (13); in recent years, a variant has been suggested as a tool for use in the teacher tenure process (14).

Implementing such a reward system at the teacher level

would be associated with many problems, and integrating it into a school-level accountability system, as required by NCLB, would be even more problematic. Using value-added models to evaluate programs, which means system accountability, should be distinguished from using them to judge individual teachers. Measurement and other errors in tests are particularly problematic when the sample of students is small, as in the case of an individual teacher (15). This limitation explains a troublesome finding that teacher rankings that use value-added models are highly inconsistent from year to year (C. Koedel, unpublished data). If value added is an accurate estimate of teacher quality and effectiveness, one would expect stability over time. Measurement problems are explored in detail elsewhere (16).

Value-added methods are still the hottest topic in paying for performance in education. The approach has been used, the student-linked data records are or will be available in most states, and the method will probably be an option for states if NCLB is reauthorized in the future.

Summary of Accountability and Performance Efforts in Education

In the past 25 years, the resources and data available to provide system-level accountability (either school or district) have improved, generating a stronger focus on student outcomes as the appropriate measure of accountability, reward, and sanctions. According to state and federal mandates, districts and schools are under pressure to increase achievement. Schools and districts are being found “in need of improvement” under NCLB — a status made available to the public. They are also facing increasing sanctions for successive years of failure.

Several conclusions can be made concerning this movement to system accountability. First, the “report card” era, applied to states, districts, and even schools, that began in the Reagan administration, has subsided. Second, NCLB, its system replacement, has been met with widespread unhappiness, and if the current administration’s legislative proposals are adopted, may be essentially dismantled, eliminating in particular any punitive actions against schools.

System-level accountability has yet to be translated into successful teacher accountability, despite many efforts to

install merit pay, career ladders, certification systems, and most recently, directly rewarding teachers for student success. Translating system-level accountability into individual accountability may be even more difficult for health care because of the more complex nature of the organizations and services in that field.

From Education to Health Care

Education and health care share several characteristics when it comes to accountability and performance. Both can be examined in terms of system-level or individual accountability. As in education, system-level accountability in health care has improved in terms of measuring performance through organizational report cards, audits, and ratings of hospitals, nursing homes, and other facilities (17).

Both systems also share a hierarchy that directly affects and limits the implementation of individual-level performance incentives. Both hierarchies are flat in the sense that movement upward is generally unrelated to performance and depends primarily on credentialing and time on the job. Unlike most other public and private organizations, in education and health care, simply doing a job well will rarely allow a person to be promoted to a higher-level job. This problem cuts off the central means of reward that exists in government, the military, and the corporate world: promotion as a reward for doing a job well. The efforts in education with merit pay and career ladders can be interpreted as artificially instilling organizational advancement; unfortunately, as with most things artificial, these efforts have routinely failed.

Flat hierarchies shift the burden of reward and sanction to paying people for performance on the job. Although standard personnel practices, such as annual reviews by supervisors and peers, may be the most likely road to determining performance, union environments in both fields may make this difficult. Attempts to create performance metrics that may be more objective than supervisor judgment have been the result. In education, that led to exploring value-added assessments based on longitudinal student achievement.

The final issue is whether performance-based systems will be easier or more difficult in health care. Individual-level performance metrics will be as difficult to create and

implement in health care as they were in education, if not more so. Health care hierarchies are more complex, they deal with a broader range of clients, they provide more diverse services, and they require more teamwork. In education, after all is said about joint production, school missions, and multiple stakeholders, for most of the day a single teacher is behind a closed door with students who are trying to accomplish more or less the same tasks. Although we argue that we need to judge education outcomes on more than performance on standardized tests, those tests certainly help, and the list of other performance measures mentioned is usually small.

Compare this with a routine procedure in health care, vivid in my recent memory — the colonoscopy. For a 2-hour procedure, no fewer than 11 people were involved, each performing a different function that would be evaluated on different criteria using (presumably) different metrics. To be sure, some areas of health care require fewer people and simpler tasks (such as laboratory diagnoses, routine physical examinations, immunizations), but many other areas are even more complex than a colonoscopy.

Finally, if my analysis of education is correct, with the lack of consistent success of individual-level performance accountability methods, the outlook for following those approaches in health care is even bleaker. What then to do? First, system-level performance and accountability procedures are not trivial accomplishments. This implies the need for top-down approaches of oversight and responsibility, furthering those installed in education and health care during the last decades. Second, the only reasonable approach to individual performance metrics, other than falling back on credentialing and experience as reward markers, is from the bottom up, on a unit level, with a supervisor evaluating individual employees. The complexity of the tasks, services, and patient mix in health care suggests that any overarching system would be doomed to failure. The bottom-up, unit-by-unit approach is probably being used in most instances already. Incremental tinkering and experimenting with objective measures tailored to units and jobs, with oversight by responsible supervisors, might not be a radical enough solution for many, but it still might be the right approach.

Acknowledgments

This manuscript was developed as part of the Mobilizing

Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Population Health Rankings as Policy Indicators and Performance Measures

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Suggested citation for this article: Oliver TR. Population health rankings as policy indicators and performance measures. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0040.htm. Accessed [date].

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Abstract

Population health rankings can be used by various actors for different purposes. This article examines those potential uses and concludes that the chief promise of population health rankings lies in 2 areas. The first is to help set agendas — stimulating awareness, motivation, and debate over means to improved health outcomes. The second is to help establish broad responsibility for population health and the need for multisectoral collaboration to improve outcomes. A new performance regime based on rankings will require more research to establish causal pathways and relative determinants of health, as well as stronger evidence about the effects of public and private interventions to guide investment strategies. Finally, leaders who develop and promote population health rankings must further develop the technical community needed to translate the response to the rankings into constructive public debate and policy development.

Introduction

Citizens and their leaders are bombarded by information about individual and population health. Information comes via scientific reports, mass media, commercial advertising, government surveys and statistics, and simple word of mouth from family, friends, colleagues, and acquaintances. What information do they pay attention to

and with what consequences?

The question is relevant because population health improvement relies on the skillful production and effective use of information. A core element of a new initiative, Mobilizing Action Toward Community Health (MATCH), involves the development and dissemination of population health rankings for all counties in the United States. These rankings are one of several recent efforts to systematically measure and compare the population health or health systems of countries, states, and communities. They represent one category of research-related activities needed to better establish relationships among the multiple determinants of health and guide future investment for population health improvement (1).

This article examines how population health rankings can inform and structure public debate and policy development. It considers how such rankings are a form of *policy indicators*, measures that help monitor social conditions and at times prompt action to improve those conditions (2). It also considers such rankings as part of a *performance regime* intended to draw greater attention to, and establish greater accountability for, population-wide health outcomes (3,4). In these roles, rankings serve primarily as a tool for democratic governance of a complex system that affects population health rather than management of a specific public health agency or program (5,6).

Possible Uses for and Responses to Population Health Rankings

Population health rankings combine both forms of what Charles Lindblom and David Cohen referred to as “professional social inquiry”: 1) systematic data gathering and reporting and 2) statistical manipulation and analysis of

social data (7). Although there are modest methodologic differences, the new MATCH rankings are modeled after the county health rankings developed by the University of Wisconsin Population Health Institute (UWPHI) (8).

The MATCH project, a collaboration of UWPHI and the Robert Wood Johnson Foundation, has produced 50 state reports, ranking counties from first to last in each state (9). The rankings are created on the basis of current *health outcomes* (5 measures of premature death, self-reported health, and birth outcomes) and *health factors* as predictors of future health outcomes (23 measures related to clinical care [20% of total], health behaviors [30% of total], social and economic factors [40% of total], and physical environment [10% of total]). Each county receives an overall ranking for health outcomes and health factors, as well as a rank for each category of health factors (9).

Overall, the rankings “are designed to summarize the current health of the counties, as well as the distribution of key factors that determine future health” (8). More specifically, they are intended to raise “awareness of variation in populations’ health [and] appreciation of the variety of factors that affect populations’ health and that are amenable to influence by public- and private-sector programs and policies” (10). As such, they are a potentially important contribution by researchers, serving what Carol Weiss calls the “enlightenment function” in shaping public understanding and policy debates (11,12).

However, the influence of population health rankings is potentially much broader and more complex. Population health rankings or other system performance measures are more than expert analysis of social conditions; they constitute a political act. Deborah Stone explains, “Measures imply a need for action, because we do not measure things except when we want to change them or change our behavior in response to them.” Moreover, “Counting is often part of a deliberate effort to stimulate creation of a natural community by identifying a statistical community in order to demonstrate common interests” (13). Indeed, the UWPHI intends that its county health rankings help establish stronger community identity and collaboration: “By taking a broad perspective on the factors that influence health — health care, health behaviors, socioeconomic factors, and the physical environment — we hope to encourage all community stakeholders to work with health departments and health care providers as partners in the public health system.” (8).

The key message of this article is that a set of public statistics, whether produced by public or private organizations, can be used by various actors for different purposes. The data can be used by individuals and organizations acting alone or participating in a collective decision. Those actors, in turn, can be motivated by self-interest or their vision of the general welfare.

Multiple audiences for performance measures

Most performance measures, whether in public health or another social domain, have many potential target audiences (5), 3 of which are the following:

1. The general public, as citizens or consumers of services. The mass media play a role in mediating between the production of performance measures and the public response to them.
2. The community of experts, including scientists, policy analysts, service providers, and other stakeholder groups and organizations. These actors are critical in legitimizing perceptions of a problem and refining the problem definition, as well as responding to a perceived problem with plausible solutions.
3. Policy makers in both public and private institutions whose priorities and leadership skills shape the nature and degree of response to performance measures, including shifting resources, altering incentives, or avoiding blame. Policy makers at different levels — local, state, or national — have different responsibilities and different policy tools at their disposal.

The level of awareness, likelihood of response, and capacity for effective response vary depending on the audience. Furthermore, a given audience is likely to be more influential in certain aspects of the policy process than in others.

Multiple uses for performance measures

Technical information and analysis, however skillfully prepared and relevant, usually play a limited role in social problem solving (7). Decision makers routinely arrive at decisions by relying on ordinary knowledge and learning through experience and through interactions that are driven by political compromise. Nonetheless, scholars have identified many ways in which performance measures shape the process of policy development.

Problem identification and agenda setting

Population health rankings, as policy indicators, help to identify and define problems and thereby help set the policy agenda. Indicators can serve as a “warning” to policy makers and move a particular issue higher on their list of priorities (5,11,14,15). They provide an opportunity for media attention and advocacy to spotlight a problem, frame it, and create new venues for action (16,17).

The creators of the Wisconsin County Health Rankings suggest that the simplicity and competitive nature of those performance measures have translated into considerable media attention across the state. That attention has been parlayed by county health officers into many uses, the most frequent being educating county board members or other policy makers in their community (18).

The county rankings, both in Wisconsin and now in MATCH, are intended to be produced and disseminated annually. The longitudinal nature of the enterprise raises the question of what will have the most impact: the initial county health rankings or subsequent changes in counties’ rankings over time. The impact may depend on the stability of the rankings’ methods and its inputs for health factors and health outcomes. Changes in the composite measures must be shown to reflect genuine changes in performance rather than random statistical variation (6,19). If counties’ rankings are highly volatile from year to year, their validity and importance may be discounted. If instead they are seemingly immutable over several years despite what local officials consider to be concerted efforts to improve population health, then they may also come to be distrusted and discounted. Another factor in the influence of the rankings may be how familiar local policy makers are with them and whether the creators of the rankings or other intermediaries have been able to engage and educate receptive experts and community leaders on their value (10,18).

Policy design

A second use of population health rankings or other performance measures is providing what Weiss calls “guidance” to policy makers in how to respond to widely acknowledged problems (11,12). The critical issue here is not responsiveness but effectiveness; if leaders do something when confronted with a serious social condition, will their response solve or at least reduce the extent of the

problem? This role depends heavily on experts, on whom leaders rely to develop and evaluate options for new policies and programs (14,20).

Donald Moynihan also describes how performance information (eg, rankings, report cards) can have a “purposeful” use in improving existing programs and service delivery. “Performance data would be used to better allocate resources, make decisions about strategy, reengineer processes, motivate workers, and usher in a new era of accountability” (4).

The capacity of population health rankings to guide policy design depends on the awareness users have of the underlying model of health determinants. In the UWPHI model, separate measures of socioeconomic conditions, behaviors, environmental conditions, and health services alert users to which of those factors boost or weaken the overall county ranking. An accompanying database describes an array of policies and programs and the strength of the evidence of their potential effect on health outcomes (21). What is not yet established is whether community or state leaders believe they have necessary guidance from the rankings and menu of potential interventions to invest in options most likely to improve population health or, even if they have necessary information, whether it is insufficient because other obstacles prevent their communities from adopting the most effective options for population health improvement. As noted earlier, policy makers and organizational leaders will pursue changes even without solid knowledge of the causal factors that underlie the performance measures (3,7).

Policy adoption

A third use of the information provided by population health rankings is overtly political: contesting parties may use the rankings as “ammunition” to support their established policy and programmatic preferences (3,4,11). One would expect that groups or organizations that are either beneficiaries of programs related to population health or potential targets of regulation would be most likely to mobilize in response to performance measures and attempt to use them to their advantage. There is little empiric evidence about whether stakeholders will mobilize and whether this mobilization is focused on narrow problems and populations or broader-based collaboration and action.

Usefulness and Effectiveness of Performance Measures

Organizations that are responsible for a community's health are perhaps the most important users of population health rankings or related performance measures. How county boards, public health departments, and health care organizations respond to rankings is likely to critically affect public debate and policy development.

Responses can be active or passive, functional or dysfunctional. Functional responses focus on process improvement, input reallocation, management focus and style, and mission enhancement. Dysfunctional responses focus on "cream-skimming," deception, and blaming the messenger for poor performance (4,5,22). Organizations may resort to goal displacement, shifting their focus to outcomes with more favorable performance measures or over which they have more control (3). These dysfunctional responses are most likely to occur when measures are linked with substantial incentives, are easy to manipulate, or omit important factors in performance.

Communicating with target audiences

The responses of community leaders and other stakeholders are heavily influenced by the quality of the performance information and the context in which it is used. In their detailed study of organizational report cards, Gormley and Weimer found that effectiveness was related to the content (validity and comprehensiveness), communication (comprehensibility and relevance to the appropriate audience), and capacity for organizational responses (reasonableness and functionality) (5).

The developers of the UWPHI population health rankings have emphasized comprehensiveness and comprehensibility. In its current state, the science is more vulnerable to attacks on its credibility. Stone warns, "Numbers can create the illusion that a very complex and ambiguous phenomenon is simple, countable, and precisely defined" (13). Similarly, Lindblom and Cohen urge researchers to avoid a "misplaced pursuit of authoritativeness"; they believe technical analysis is most influential when it confirms the ordinary knowledge of citizens, policy makers, and other issue experts (7). The UWPHI developers are careful to acknowledge the methodologic limitations and suggest the rankings are just one of many tools that should be used for community health assessment and improvement (18).

Perhaps the biggest challenge is communicating the relevance of population health rankings to leaders and organizations outside the conventional boundaries of public health and encouraging multisectoral responsibility for health determinants and outcomes (23). Complex systems and programs limit accountability and make the use of performance measures more difficult because verifying whether and how inputs and outputs connect to outcomes is difficult (4,24,25). Conversely, developing measures of system performance that connect a range of inputs, such as education, housing, and environmental conditions, to population health may attract attention from a wider set of organizations and leaders. In fact, extending outcome measures beyond population health to more general values, such as net economic benefit, subjective well-being, and equity, is desirable (2).

Causal models to guide action

To guide both expert analysis and public debate through the challenges posed by complex systems, it is necessary to pair policy indicators, such as population health rankings, with causal models. "[Policy choice] requires not only information on conditions of well-being or justice but also causal knowledge about how to promote them" (2).

Strengthening the underlying causal model of health determinants is critical to the long-term influence of population health rankings because the contributions of each major category of determinants and the weight of measures in each category require further empirical validation (1). Furthermore, attention must be paid to the sensitivity of composite measures to changes in the weighting structure (19). Incomplete measurement, uncertain weighting of measures, and distance of measured inputs from desired outcomes are common problems in systems of performance measurement (5).

Incentives for improving performance

A final concern is whether the incentives established by performance measures are properly aligned with the goal of population health improvement. Information about organizational performance, or community performance, must affect the flow of resources through either consumer decisions or public budgets (5).

One problem is that community health has little competition for customers. Advocates for population health rankings

cannot hope to achieve the same response as, say, standard achievement scores for public school districts and individual schools. However, population health rankings conceivably may affect prospects for local economic development by influencing recruitment and retention of employers.

Another problem is that community leaders or public health officials who face evidence of poor performance may argue that rankings or scorecards actually measure community needs, not system performance. Measures are often used to legitimize or dispute claims for resources and privileges (13). Communities with effective advocates or strong stakeholders may secure more resources, and those that lack strong leadership and stakeholders will likely suffer a further loss of resources and have continued poor performance.

Performance assessment can have some positive effect if the results threaten the reputation of organizational and community leaders. Fear of embarrassment is perhaps the most powerful motivator for organizational leaders. Reputation affects leaders' professional standing among peers, organizational morale, degree of oversight from government officials and consumer advocates, and managerial discretion for leaders over resources and operations (5,26-29).

Although powerful incentives for population health improvement may be desirable, they carry the risk of being manipulated either to protect personal reputations or promote favored courses of action (22). Duncan MacRae, Jr, stresses the importance of selecting indicators that are not susceptible to bias from entities that produce data to be used in performance measurement or that have the potential to be affected by the performance measures (2). To avoid efforts to alter or obscure population health rankings, researchers should engage community leaders and especially their public health colleagues to convert attention from poor performance into a renewed commitment for collaboration and improvement. An interactive dialogue among key stakeholders has the potential to foster both shared mental models and stronger commitment to performance (3).

Implementation of Population Health Performance Measures

MacRae argues that researchers and others interested

in establishing new indicator systems must recognize certain key features of the process. First, the process is both political and technical; indicators cannot be developed or sustained without input from interested groups as well as experts. Second, institutionalizing an indicator at the national level may take a long time, even decades. Trial and experimentation are essential for testing usefulness, and local experience can facilitate later national use. Third, indicators may prove to be less intelligible and less relevant to policy than initially thought, and widespread adoption and use are likely to require advance testing of reliability and relevance. Finally, different political communities — particularly states and localities — have different goals and means of action and, therefore, different information needs. For all these reasons, he argues that we “must be skeptical of rapid development of practical information systems, and of design by experts without continuing participation of users” (2).

Conclusion

Rankings can serve an important function in the development of a new performance regime that is dedicated to population health improvement. Population health rankings contribute to agenda setting — stimulating awareness, motivation, and debate over means to improved health outcomes — and help establish broad responsibility for population health and the need for multisectoral collaboration to improve outcomes and future rankings. However, the comprehensiveness of the new paradigm is a double-edged sword. Rankings and other population performance measures are limited by the complexity and ambiguity of accompanying models of health determinants, which in turn may limit broad mobilization, selection of policy options, and clear accountability for results. Therefore, a new performance regime will require further research to establish causal pathways and determinants of health, as well as stronger evidence on the effect of public and private interventions to guide investment strategies.

Expecting the general public to be the impetus for population health improvement is unrealistic. Action and long-term improvement depend heavily on the relationships between health leaders and other community leaders and those between state and local leaders. Improvement also depends on incentives, material and nonmaterial, to address threats to health outcomes and monitor trends.

The most powerful motivation for improvement may be the reputations shared by state and local leaders based on the publicity associated with population health rankings.

Finally, public health leaders who develop and promote population health rankings must also expand and strengthen the technical community that is needed to translate the response to the rankings into constructive public debate and policy development. Communication with the public, mass media, and political leaders outside public health is critical for establishing a new paradigm of thought and action that recognizes health as more than health care and infectious disease control.

Acknowledgment

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Learning From the European Experience of Using Targets to Improve Population Health

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Suggested citation for this article: Smith PC, Busse R. Learning from the European experience of using targets to improve population health. *Prev Chronic Dis* 2010;7(5). http://www.cdc.gov/pcd/issues/2010/sep/10_0041.htm. Accessed [date].

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Abstract

Health targets have become a widely used instrument to promote population health. We describe the experience in England, where the use of targets has reached the most advanced stage of development, and other European countries. The experience demonstrates that targets may change the behavior of a health system, probably to a larger extent than many other policy instruments, if incentives are aligned correctly and if measures to deal with unintended effects are put in place.

Introduction

Health targets are a tool designed to improve health and health system performance. They have been widely used in Europe, and governments that use them express a commitment to achieving specified results in a defined time and monitoring progress toward broader goals and objectives. Targets may be quantitative (eg, an increase of the vaccination rate by X%) or qualitative (eg, the introduction of a national screening program), and they may be based on health outcomes (eg, reduction in deaths) or processes (eg, screening activity). The introduction of the concept into the health sector is often traced to the publication of

the World Health Organization's *Health for All* strategy in 1981 (1).

A large body of literature reflects the growing and sustained interest of governments in health targets and their role in the health system (2). This literature distinguishes aspirational, managerial, and technical targets, ranked in terms of the extent to which they prescribe what should be achieved and how (3). We discuss the experience in Europe with health targets as a means of promoting population health, with a particular focus on England where the use of targets has reached the most advanced stage of development (4).

Targets in the English Health System

The first concerted attempt to introduce targets into English public health was the *Health of the Nation* strategy, launched in 1992 (5). The intent was to encourage local health authorities to focus on securing good health for their population. Initially, 5 key areas were selected for action: coronary heart disease and stroke, cancer, mental illness, HIV/AIDS and sexual health, and accidents.

In 1998, an independent evaluation of *Health of the Nation* concluded that its "impact on policy documents peaked as early as 1993; and, by 1997, its impact on local policy-making was negligible" (6). Health authorities thought they had more pressing concerns than public health, and therefore concentrated on operational issues such as reducing waiting times and securing budgetary control.

When Tony Blair became prime minister in 1997, his government was committed to evidence-based policy,

systematic priority setting, and explicit performance targets throughout public services. In 1998, his government implemented a series of public service agreements (PSAs) with each ministry to signal priorities for all government activity. These priorities were a series of specific objectives, expressed as a measurable target, and were expected to be achieved in a designated time.

A distinctive feature of PSAs was the intent to focus on the outcomes of the public services, rather than operational activities. The PSA process signaled the government's determination to make the management of public services more transparent and to give departments clear statements of priorities. To illustrate the issues, we use the 2004 PSA targets in health and health care, which were based on 4 broad objectives (7): 1) improve the health of the population, that is, increase life expectancy at birth to 78.6 years for men and to 82.5 years for women by 2010; 2) improve health outcomes for people with long-term conditions; 3) improve access to services, in particular waiting times; and 4) improve the patient and user experience.

A central role of the health ministry was to devise operational instruments that transmit these national PSA targets to the local level. The most important initiative was developing a system of "performance ratings" for individual National Health Service organizations. Every organization was ranked annually on a 4-point scale (0-3 stars) according to a series of approximately 40 performance indicators intended to reflect the objectives of the National Health Service, as embodied in the PSA targets (8).

Performance ratings have improved some aspects of health services (9). For example, long waits for nonurgent inpatient treatment were rapidly eliminated. Moreover, targeted aspects of English health care have improved markedly compared with health care in Wales and Scotland, which have no PSAs or performance ratings (10).

It has proved less straightforward, however, to establish effective local targets from objectives such as reductions in deaths from heart disease and cancer, reductions of health inequalities, and reductions in rates of smoking, childhood obesity, and teenage pregnancy. Local managers have concentrated on readily managed aspects of health care, and public health has not received the sustained managerial attention given to the targets for health service delivery (11).

The PSA system has nevertheless led to sustained monitoring of the chosen population health targets and health disparities, and the ministry is held accountable for performance. The health inequalities targets have been regularly monitored by an external advisory group, but it is not clear why and how the targets were chosen, whether the observed improvements are attributable to the efforts of the health ministry, and what action should be taken when the measured performance indicated a possible failure to achieve a target (12).

A parallel initiative has been the development of a quality and outcomes framework (QOF) incentives scheme for primary care physicians (general practitioners). The QOF is one of the most ambitious attempts yet to combine clinical quality targets and incentives into physician remuneration (13). It emphasizes clinical prevention, and the earnings of individual practitioners are at risk if they do not meet quality goals. The intention is that the primary care interventions it encourages, such as smoking cessation advice, blood pressure and cholesterol control, and regular monitoring of chronic disease, will lead to a healthier population and will reduce future health care expenditures. Regrettably, researchers have been hampered in efforts to evaluate its success in improving health by the lack of reliable baseline data against which to measure improvements in health attributable to the QOF (14).

Targets have certainly delivered noteworthy successes in England, such as the more equitable management of coronary heart disease across ethnic groups (15). However, alongside the improvements in many of the measured targets are widespread reports of adverse side effects (16). Examples include neglect of unmeasured aspects of performance (eg, clinical priorities being sacrificed in the pursuit of reduced waiting times), distorted behavior (such as refusing to admit patients to accident departments until a 4-hour waiting time target was achievable), and fraud. Unintended and adverse responses such as these were predictable. They reflect the potential power of targets in affecting behavior but also emphasize the need to consider the incentives inherent in any targets regime and the need to use counteracting instruments where necessary (17).

Discussing the Lessons

Drawing on the experience of England and case studies

from other countries (2), we discuss 6 lessons that arise from the use of population health targets.

Who should choose the targets?

In principle, it seems laudable for an elected government to set out its objectives and targets in an explicit fashion. Targets serve many purposes, but one is to enhance the accountability of government to parliament and the electorate. Lack of an adequate accountability framework may lead to the failure of target setting to achieve its objectives. For example, in Hungary, where accountability arrangements were not aligned with the public health focus of targets (18), achievement was monitored at the national level, but no mechanism secured the commitment of organizations and practitioners capable of influencing outcomes.

The English process succeeded in that much of the public debate surrounding targets referred less to the principle of setting targets and more to the details of what those targets should be. Disagreement remains about the processes by which priorities are chosen and targets set. For example, there is an argument that the health service professionals should have more say in influencing the nature of targets, when outcomes rely so heavily on their engagement and commitment. However, the priorities and working practices of those professionals may impede progress toward better performance. To some extent, outcome-related targets seek to challenge traditional ways of delivering services and will, therefore, at times come into conflict with the professions.

Some commentators argue that service users should have more say in setting targets. Wide consultation with user groups can identify priorities for improvement. However, particularly in population health, setting objectives involves considerations beyond the immediate beneficiaries of a particular service, such as the taxpayer perspective, the interests of future users, and the interests of users of other services. The user perspective cannot be the sole influence on priority setting.

Consensus and ownership have nevertheless been seen as imperative to elicit acceptance of country-based targets. In Catalonia, health councils were created at the central and provincial levels to encourage citizens' groups to take an active part in target setting (19). In Flanders, local health networks were established to encourage the exchange of information between local organizations

and offer a focal point for preventive actions (20). France established national and regional health conferences that allowed stakeholders the opportunity to debate existing health problems and foster partnerships (21).

Any government seeking to implement population health targets should reach consensus concerning the choice of objectives and the nature of the targets by consulting with relevant stakeholders. However, uncritical accommodation of every interest group would render the target process meaningless; for example, it could lead to an unwieldy proliferation of priorities. A prime role of government is to balance conflicting claims on public resources, and targets should, in the end, be an explicit and succinct statement of the government's choice in that respect.

How many targets should be chosen?

Multiple objectives are an inescapable characteristic of health services. However, one of the intentions of any targets regime is to focus on a limited number of objectives. Many schemes have failed to recognize this, for example in Italy (100 targets) and Andalucía (84 targets) (22). In England, after some early failures, later PSAs focused on a reduced number of targets.

If a domain is not included in the targets regime, this is not necessarily an indication that it is unimportant. Rather, the key focus of targets should be where change is required, and maintenance of standards in other domains should be secured through other instruments, such as routine regulation, inspection, or market mechanisms.

When should outcomes be used as a basis for targets?

In principle, a focus on outcomes should enable health care providers to look beyond traditional organizational boundaries and ways of delivering their services. However, some outcomes are intrinsically difficult to measure. Even if they can be measured, outcomes such as reduced deaths from smoking can take years to materialize, beyond the lifetime of most governments. Furthermore, many public health outcomes are particularly vulnerable to influences beyond the control of health agencies. Each of these difficulties offers those agencies an excuse for apparent failure and can undermine the targets process.

Conversely, the use of process measures can distort behavior and lead to unintended effects. For example, the

QOF “smoking cessation” target may have led to an undue emphasis on delivering advisory consultations without any attention to outcomes in the form of sustained cessation. If such process targets are used, additional assurance may be needed to ensure that the desired outcomes have been secured. Although outcome measures address what matters and are less vulnerable to distortion, there will be occasions when a carefully chosen process measure — one that evidence shows is clearly linked to the eventual outcome — may form a more effective basis for a target.

How should targets be quantified?

Once objectives have been identified, a central feature of the debate becomes how the associated targets should be set, in terms of the measurement instrument to be used and the level of attainment to be required. The literature suggests that targets should be SMART — specific, measurable, achievable, realistic, and timed (3). The Royal Statistical Society (23) presents a set of desirable general principles for setting targets, which include following:

1. Indicators should be directly relevant to the primary objective or be an obviously adequate proxy measure.
2. Definitions need to be precise, practicable, and consistent over time.
3. Indicators should be straightforward to interpret and avoid perverse incentives.
4. Indicators should be based on adequate sample sizes, and technical properties of the indicator should be satisfactory.
5. Indicators should not impose an undue burden in terms of cost, personnel, or intrusion on those providing the information.

In practice, few targets regimes have adhered to principles such as these. For example, Swedish public health targets were not explicit enough to act as a lever for operational action (24). Some targets might be little more than unattainable aspirations, while others can be secured with little effort on the part of ministries. Furthermore, conflicting pressures exist in any targets regime. To be effective managerial instruments, targets should be stretching but attainable, suggesting (for example) a 1 in 3 risk of failure. However, few governments would want to be confronted with such a high proportion of failures. From an accountability perspective, a government would wish to think that all targets could be attained.

This scenario occurred in the Netherlands during the early 1990s, where the secretary of state for health avoided using quantitative health targets because of the political accountability those targets would create (3). Similarly, Russia has experienced politically driven target setting, where the targets set were neither relevant nor necessary. Health was seldom a priority on the policy agenda in the Union of Soviet Socialist Republics or subsequently in the Russian Federation, and generally, when targets were set they were broadly defined, infrastructure-oriented, and almost never outcome-oriented. In many cases, the targets required no change in policy to achieve them (25). It is difficult to see how this tension can be satisfactorily resolved, unless the political process becomes mature enough to recognize that some failure is inevitable and not necessarily adverse if progress is being secured.

How should cross-ministerial targets be handled?

Given the many determinants of health, involving actions by organizations in various sectors, effective coordination among responsible actors has emerged as a key issue. In particular, a focus on health outcomes sometimes gives rise to strategies that are not obviously attached to a particular ministry, leading to the need to specify “joint” targets that transcend departmental boundaries. These are particularly important in the public health domain. An assessment of the English childhood obesity PSA target found no ready solutions but advocated much stronger collaboration between national and local government and stronger engagement with nongovernmental organizations (26). Cross-sectoral targets give rise to problems of coordination, persuasion, and engagement that must be addressed if they are to be successful.

Where this coordination takes place will depend on the governance structures already in place and the forums in which key actors can meet. This may be easier where responsibility for health lies in local or regional government, as in Scandinavia. Other countries have faced a different challenge with intersectoral targets. Although they have stressed the need to involve the many sectors whose actions contribute to health, they have often not included the health care sector itself. By not including that sector, health targets become a peripheral issue, thereby diluting the potential effect of that sector (27).

How should national objectives be transmitted to local organizations?

Attainment of national targets usually relies on improvement in local organizations charged with delivering services. It would, however, be inappropriate to set the same targets for every locality regardless of its existing level of attainment and the difficulty of the local circumstances. Organizations already performing well would have no incentive to improve, whilst those with disadvantaged populations might stand no chance of success and become alienated. If such regimes were sustained, it may become difficult to recruit key managers and professionals in disadvantaged areas, exacerbating existing problems. As a result, many countries have introduced more subtle targets regimes for local organizations, seeking to encourage all organizations to improve in the chosen measures, from whatever baseline they start.

The tension between national objectives and local discretion has become an unresolved issue in targets regimes. In England, the “must do” nature of local health targets put pressure on some local organizations, precluding any serious consideration of separate local priorities. The prevailing lack of flexibility was highlighted in a report by the Audit Commission (28) that criticized the neglect of local government discretion in earlier PSA targets. There is now increased interest in England on public reporting of local levels of attainment, regardless of which agency is nominally accountable (29). In short, targets programs have often been disseminated in a top-down manner with little effort to ensure involvement of key actors at the grassroots level (27). For the future, a sense of ownership and accountability needs to be developed among those who implement health targets.

Conclusion

Health targets have become a widely used instrument to promote population health. The lessons we have described demonstrate that targets may secure a real change in the behavior of a health system, probably to a larger extent than many other policy instruments, if incentives are aligned correctly and if measures to deal with unintended effects are put in place.

Acknowledgments

This article is based on a previous, more extended version prepared for the Robert Wood Johnson Foundation’s MATCH project, whose support we gratefully acknowledge. The work relies on the authors’ previous work for the World Health Organization, in particular the book *Health Targets in Europe: Learning from Experience*, which Professor Busse co-edited with Matthias Wismar and others whose input we explicitly acknowledge.

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Challenges and Opportunities for Population Health Partnerships

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Suggested citation for this article: Shortell SM. Challenges and opportunities for population health partnerships. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0110.htm. Accessed [date].

The Mobilizing Action Toward Community Health (MATCH) articles in this issue of *Preventing Chronic Disease* discuss ideas, policies, and practices that can be used to produce a healthier population in the United States and globally. The articles pose the following questions: 1) How do we best measure long-term wellness at the population level?, 2) How do we provide incentives to organizations to accomplish better population health?, and 3) How can effective cross-sector partnerships be formed and implemented to help accomplish the task?

The articles in this issue have done a good job, for the most part, of summarizing what we know or at least what we think we know about successful partnerships. They highlight the many challenges of forming cross-sector partnerships, given the different goals, objectives, and cultures of potential partners. They also provide ideas and evidence for overcoming some of these challenges; the importance of leadership, governance, measurement and accountability, focus, and trust are all emphasized. What these discussions lack is consideration of the inter-related practices and behaviors that may prove useful, given widely varying community contexts — geographic, political, economic, and social. Some examples of what is missing that I suggest as a basis for further discussion include the following:

1. Partnerships need to be both internally and externally aligned. Partners should achieve domain consensus among themselves with sufficient overlap of goals and should understand what is expected of the partnership by external groups.

2. The partnership should gain legitimacy and credibility within the community. Drawing on the developing literature on social capital would improve this process (1).
3. Partnerships can gain legitimacy by understanding their centrality in the political economy of the community. Social network concepts involving direct and indirect ties, the strength of ties, network density, and structural holes are relevant.
4. Every partner has a core competence and comparative advantage. Partnerships can fail because individual members either overestimate or underestimate their comparative advantage and misdiagnose their core competence.
5. Leadership should be explored more fully: the kind of leadership needed, the kind of partnership that can deliver it, and the stage of the partnership's life cycle that is best suited for it. The role of individual leadership versus organizational leadership should be discussed (2).
6. Forming a partnership has a transaction cost. The literature on transaction cost economics originally developed by Williamson may be relevant (3).
7. The process of selecting partners, including tradeoffs and timing, should be more fully explored.
8. Population health improvement can be perceived as simply a resource for organizations to advance their own agenda and cause.

In addition to pursuing these ideas, we may take the following actions to improve population health. First, we may consider the *Healthy People 2020* objectives, which will depart from the past by emphasizing the underlying environmental and social determinants of health. They may provide a stimulus and framework for considering population health improvement.



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Second, we should consider population health improvement in the context of health care delivery system reform. The article by Hester, for example, highlights the developing Vermont experience with accountable care organizations (ACOs) (4). These entities are accountable for the cost and quality of care provided to a given population of patients; they can be linked to population health improvement objectives by expanding the chronic care model to recognize community contributions to health. A promising approach is to recognize the patient-centered medical home (PCMH) model of primary care delivery as the foundation for ACOs (5). Payment reforms could achieve positive health outcomes by using the framework of ACOs and PCMHs. For example, one approach would be to provide bundled or capitated payments to public health departments that would in turn work with ACOs and PCMHs to provide cost-effective care to defined populations.

Third is the concept of community health management systems (CHMS) that would be organized along the lines of local security and exchange commissions as quasi-administrative, publicly accountable bodies (6). The CHMS may be a partnership or coalition of the local health department; community organizations; ACOs made up of local hospitals, physician practices, and other provider entities; and related health care providers. CHMS would have 3 functions: 1) assess and prioritize the health needs of the population from a multisectoral approach; 2) organize the community's assets, resources, and competencies to deliver the needed services; and 3) be held clinically and fiscally accountable for the health outcomes produced. They would deliver an annual report to relevant political bodies in the community. The success of the CHMS and related concepts depends on the availability of relevant population-based metrics for health outcomes and on payment incentives that encourage integration of the multiple sectors involved in producing population health.

Incorporating these suggestions could advance our understanding of effective cross-sector population health partnerships. Expansion of the knowledge base will help to promote the spread of such partnerships across the country. National health care reform legislation provides additional impetus and opportunities for such achievement because it emphasizes ACOs and PCMHs by providing financial incentives for their development and increases funding for health promotion and wellness programs.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Focusing on Solid Partnerships Across Multiple Sectors for Population Health Improvement

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Suggested citation for this article: Bailey SBC. Focusing on solid partnerships across multiple sectors for population health improvement. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0126.htm. Accessed [date].

Introduction

Partnerships create a way forward when no clear solution exists and no single entity can claim the necessary expertise, authority, or resources to bring about change. Cross-sectoral partnerships are needed to mobilize community action and improve population health.

The Mobilizing Action Toward Community Health (MATCH) articles in this issue of *Preventing Chronic Disease* reveal compelling themes, issues, and recommendations for improving population health. These include many challenges, such as how to scale up successful partnership efforts (1,2), determine if and how partnership activity can be correlated with changing health metrics (1-5), expand the use of incentives for improvement (1,3,4,6), and strengthen groups' distributive leadership and governance (1,2,4-6).

Building Blocks for Effective Multisectoral Partnerships

The MATCH articles identify characteristics that are needed to build and sustain successful partnerships: 1) social value, 2) common goals, 3) rewards and incentives, and 4) comprehensive and coordinated approaches.

According to Wei-Skillern, the driving force of social entrepreneurship is the creation of social value rather than personal or shareholder wealth (1). She describes a form of networking that leverages organizational resources and expertise to achieve greater social impact. The network approach does not necessarily require more resources; rather, the goal is to make the best use of existing resources.

Fawcett et al assert that systems require interconnectedness to support effective and sustained efforts to change conditions (7). Having common goals helps create a unified sense of mission and encourages collective engagement to improve community health. This is best realized if a comprehensive and coordinated framework is adopted, such as the 2002 Institute of Medicine (IOM) framework for collaborative public health action in communities (8). The IOM framework outlines 12 collaborative processes that can facilitate change and improvement in population-level outcomes.

Lessons from the Healthy Communities movement

Pittman discusses some consistent patterns and themes of the Healthy Communities movement: strong distributed leadership and governance, existence of a health status improvement focus that distributes the broad-focused community intervention into its various and targeted parts, metrics to help guide the local efforts, accountable leadership, well-supported infrastructure, and an investment in data systems that integrate across efforts (2). This movement lays the foundation for what the European Union has adopted as health in all policies, which shifts the emphasis from individual lifestyles and single diseases to societal factors and actions that shape our everyday



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living environments. This approach serves as a motivator for all available measures in all policy fields.

The call to build a new generation of intersectoral partnerships

Mays asserts that large-scale implementation partnerships affecting communities most at risk remain rare in practice (4). The paucity of this type of partnership may be because of the nature and constraints of public and private funding mechanisms. Funds are usually allocated for a limited time and come with many regulations. There is often not enough money to go beyond the pilot. Pilot projects too often remain just that. Moving to implementation requires broad support, proven value, and additional resources.

Incentives for the business community

Workforce health, the community's health, and metrics that are appropriate for businesses can foster business sector engagement in population health. We may be at the cusp of a paradigm shift as business leaders become aware of the cost savings associated with a healthy workforce. If business leaders understand the close relationship between employee health and community environments, the decision to be involved in population health improvement is an easy one. Many examples exist of businesses participating in initiatives to strengthen community health and developing internal workplace initiatives on their own. As Webber and Mercure acknowledge, people operating from a business mindset may not internalize the value or relevance of typical population health measures (5). However, metrics (such as the burden of disease) can influence business decisions, such as where to locate a business.

Leadership, governance, and standards

Partnerships can and should be viewed as social networks in which breadth, density, and organizational centrality are features that influence performance. Other characteristics include clear goals, effective leaders who see beyond the boundaries of their organizations, accountability, and a well-supported infrastructure.

There is a potential economic basis for governance that promotes well-being in a country or region. Fox suggests that governance could be strengthened by creating and according political protection to public organizations (3).

Performance and accreditation standards for government public health agencies represent opportunities for strengthening incentives for partnerships. For 3 years, 2005-2007, approximately 750 communities used Mobilizing for Action through Planning and Partnerships to conduct community assessments and develop partnerships (9). Additional promising models should be developed and tested, such as the state of Vermont's Community Based Payment Reform (6).

The Difficulty of Determining Direct Correlation or Causation

From a research perspective, isolating the effects of partnerships on community-level health behaviors remains a challenge. Better systems are needed for measuring and reporting what happens in a community. Communities and programs evolve over time, including changes in leadership, participants, levels of participation, and environmental contexts. These complex and dynamic variables and circumstances limit the degree to which rigorous evaluation may be applied to partnership structure, function, and achievement. The value of metrics in guiding local efforts, providing a form of accountability and transparency, and creating a constituency for local political support and policy change is not lost on communities. An integrative data system would help researchers to measure the effect and effectiveness of multisectoral policies and intervention.

Ultimately, health outcomes should be the measure on which any health intervention is judged. However, the patience and commitment required to improve population health outcomes over the long term run counter to our strong cultural desire for instant answers and immediate gratification. Such a system, based only on short-term change, is incompatible with the provision of meaningful incentives for population health improvement. Going forward, systems must be developed and institutionalized to reward the longer term upstream solutions.

Conclusion

This group of articles provides diverse perspectives on partnerships for population health improvement. In considering them, the following recommendations emerge for research and practice:

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1. Invest in data systems that can better integrate the multiple sources of data affecting population health.
2. Develop incentives for policy actions and leadership while blunting disincentives for participation.
3. Adopt a network mindset to overcome the seemingly intractable barriers to achieving population health. This involves creating social value and having common goals.
4. Create opportunities for cross-sector networking and collaboration to build relationships between and among leaders.
5. Develop and advocate for sustained funding mechanisms as opposed to short-term grants.
6. Establish metrics to inform and motivate cross-sectoral action — with emphasis on including partnerships with the business community.

Partnerships for population health improvement help us make better use of existing resources, and they expand the dialogue to businesses, faith-based organizations, education, commerce, public safety, housing, transportation, decision makers, and community members. However, in the context of this young discipline of population health, many questions on partnerships require further exploration. These include questions that relate to organizational partnerships, costs, leadership characteristics, and community dynamics.

Implementing the recommendations would likely have unintended consequences. Recognizing health in all policies could lead, for example, to increased competition for finite resources across sectors. However, potential benefits for community health justify both the risk and the effort.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Improving Public Health System Performance Through Multiorganizational Partnerships

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Suggested citation for this article: Mays GP, Scutchfield FD. Improving public health system performance through multiorganizational partnerships. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0088.htm. Accessed [date].

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Abstract

Public health activities in the United States are delivered through multiple public and private organizations that vary widely in their resources, missions, and operations. Without strong coordination mechanisms, these delivery arrangements may perpetuate large gaps, inequities, and inefficiencies in public health activities. We examined evidence and uncertainties concerning the use of partnerships to improve the performance of the public health system, with a special focus on partnerships between public health agencies and health care organizations. We found that the types of partnerships likely to have the largest and most direct effects on population health are among the most difficult, and therefore least prevalent, forms of collaboration. High opportunity costs and weak and diffuse participation incentives hinder partnerships that focus on expanding effective prevention programs and policies. Targeted policy actions and leadership strategies are required to illuminate and enhance partnership incentives.

Introduction

Public health activities in the United States are implemented through the combined actions of multiple

government and private organizations that vary widely in missions, resources, and operations. Public health agencies serve as focal points, but these agencies rely heavily on their ability to inform and influence the work of others. Public health delivery systems thus are complex and adaptive systems that operate through the interactions of multiple heterogeneous actors. Without strong coordination mechanisms, these systems may perpetuate large gaps and inequities in the availability and effectiveness of public health activities and substantial inefficiencies in performance (1). In other sectors, interorganizational partnerships and alliances have been used to coordinate action in ways that improve information flow, reduce duplication of effort, achieve economies of scale and scope, and accelerate adoption of effective practices (2).

Recognizing these issues, the Institute of Medicine's 2003 review of the nation's public health system called for "a new generation of intersectoral partnerships" that span the many different sectors of organizational activity that affect population health and that coordinate activities across these sectors (3). Partnerships that integrate medical care and public health approaches to achieve comprehensive health improvement are particularly important. In this article, we examine evidence, uncertainties, and emerging opportunities regarding the use of partnerships to improve the public health system.

Conceptual Framework: Partnerships as Collective Action

Public health partnerships are forms of collective action undertaken to promote health and prevent disease and injury in populations at risk. Collective action occurs when



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organizations agree to coordinate activities in pursuit of shared objectives (4). Partnerships may benefit member organizations by allowing them to share information and expertise, human and material resources, or intangibles such as reputation, trust, and visibility. Partnerships may allow organizations to combine operations and realize economies of scope and scale in the production of public health services. Similarly, partnerships may allow coordinated delivery of related programs and services, potentially resulting in a larger combined impact on population health. In these ways, partnerships allow organizations to pursue objectives that may not be possible through independent actions.

Partnership formation in public health depends on the range of organizations available in a given community and the ability and willingness of each organization to contribute to public health activities (5,6). For some activities, economic incentives may encourage organizations to contribute voluntarily — such as the opportunity to gain revenue, reduce costs, or achieve visibility and recognition that confers a political or marketing advantage (7,8). Many organizations also may have noneconomic motives to contribute, such as an altruistic mission to improve health and social welfare (9). Policy and regulatory actions, such as the requirement that tax-exempt hospitals meet community benefit standards, may motivate contributions. Like other public goods, however, public health activities may not generate sufficiently powerful incentives to ensure that they will be fully provided by voluntary action (10,11). In some cases, noncontributing organizations benefit from the public health activities performed by others, such as when health insurers realize cost savings from tobacco use cessation programs or vaccination programs (12). A traditional role for public health agencies is to directly provide beneficial activities that are underperformed by others, while also stimulating contributions by other organizations to minimize unfair benefits (5). An agency's success in these endeavors will influence partnership formation.

Concepts from behavioral economics suggest that collective actions may falter even when participation incentives are strong. Organizations often fail to value accurately the expected gains from collective action because of common decision errors, including inconsistent information, risk aversion, mistrust, and tendencies to favor the status quo (11). A fundamental challenge for public health professionals is to improve understanding of the expected value

of partnerships among key stakeholders and to use policy and leadership strategies to enhance the incentives and blunt the disincentives for participation.

Current Evidence and Uncertainties About Partnerships

Partnership incentives

Partnerships provide a structure in which organizations can cooperate in producing activities designed to promote health and prevent disease and injury, but organizations will participate only if they have sufficient incentives. The perception of health care providers or payers that participation in a partnership will enhance revenues or reduce costs by increasing the reach and uptake of cost-effective prevention programs and services is an economic incentive. However, the magnitude, distribution, and timing of such financial gains or cost savings are areas of considerable uncertainty and depend heavily on the nature and success of the partnership (13,14). Partnerships designed to increase the reach of underused but highly cost-effective clinical preventive services — such as smoking cessation, influenza vaccination, aspirin use, colorectal cancer screening, or family planning services — may reduce future medical care costs, especially if the partnerships target services to the populations at risk and allow implementation costs to be shared among multiple organizations (15,16). Similarly, partnerships designed to increase implementation of and compliance with nonclinical public health programs and policies — such as smoking bans, seat belt laws, and environmental changes that promote nutrition and physical activity — may produce cost savings by reducing disease burden and the future need for medical care (17,18). Such partnerships for nonclinical interventions may have the added economic advantage of low implementation costs.

The strength of economic incentives for partnership formation depends not only on the magnitude of expected cost savings but also on the timing and distribution of these savings. Partnerships to promote colorectal screening, for example, involve time lags of a decade or more before cost savings from disease prevention can be expected, while partnerships that enhance tobacco control or vaccination coverage may generate a mix of short-term and longer-term savings. Time lags weaken the economic incentives for public health partnerships, especially for

investor-owned organizations that operate under short-term financial expectations and for employers and health insurers that experience turnover in their covered populations over time (19). Health care payers such as health insurers, employers, Medicare, and Medicaid stand to gain most directly from partnerships that enhance the delivery of cost-effective preventive services under current payment policies. Some physicians and hospitals may lose revenue as a result of public health partnerships that reduce medical care use (20). On the other hand, some providers may realize savings from partnerships that target segments of the population that are uninsured and would otherwise require uncompensated medical care. The expected distribution of these economic gains and losses in a community shape economic motivations for participating in partnerships.

Research suggests that partnership incentives may depend partly on the size and market position of contributing organizations. Organizations that serve large segments of the community have strong incentives for partnership because they stand to gain large shares of any public goods produced through collective action (8,21). Small organizations may achieve economies of scale through partnerships by producing public health activities collaboratively that would be inefficient or unfeasible to produce independently (22). Organizations that fall between these 2 extremes may face diminished incentives.

Many organizations pursue public health partnerships primarily for noneconomic reasons, such as the desire to reach new target populations, expand the quantity or quality of services, and influence high-priority health issues. Noneconomic incentives often attract organizations with closely compatible missions, resulting in a preponderance of government and nonprofit participants in many public health partnerships (5,8). Partnerships that include both economic and noneconomic incentives may appeal to other participants.

Partnership functions

Partnerships provide a structure for accomplishing several public health functions, including information exchange, planning and policy development, and implementation of programs and policies. Partnerships focus on information exchange by supporting surveillance, epidemiologic investigation, needs assessment, and research translation activities. Contemporary examples include

sentinel provider networks for influenza, syndromic surveillance systems, and health registries such as those for monitoring cancer, vaccination, and communicable diseases. More recently, some communities have formed partnerships to support the exchange of electronic health information for clinical decision making as well as public health surveillance and research. Research suggests that the quality of information generated through such partnerships depends partly on the nature of the relationships among participants (23).

Planning and policy development partnerships promote coordination and reduce duplication among organizations that otherwise work independently. Often these partnerships form as a result of communitywide assessment and performance measurement processes that identify unmet needs and opportunities for coordination, such as the National Association of County and City Health Officials' Mobilizing for Action Through Planning and Partnerships program, or the Centers for Disease Control and Prevention's National Public Health Performance Standards program. In some cases, these partnerships also function as advocacy coalitions that develop and promote policy proposals of common interest (24). Tobacco control coalitions are successful contemporary examples that work to secure smoking restrictions and tobacco tax increases in many states and communities.

Implementation partnerships bring organizations together to collaborate in delivering public health interventions. The focus on implementation can allow these partnerships to have more direct and immediate health effects than those focused exclusively on information exchange and planning. However, the success of these endeavors hinges on their ability to focus on evidence-based interventions, target interventions tightly to populations at risk, and pursue implementation on a sufficiently large scale (17,18,25,26). Success is likely to depend heavily on information exchange and planning and policy development activities. For this reason, large-scale implementation partnerships often develop only after other, prerequisite forms of collaboration have succeeded (5). Additionally, these partnerships may demand more human and financial resources and require more sacrifice of organizational autonomy and control than other forms of collaboration. Consequently, participating organizations may face substantial opportunity costs — alternative pursuits and individual interests that must be sacrificed — to make these partnerships successful.

Some of the most successful implementation partnerships use external funding to diminish opportunity costs. Prominent examples include federally funded initiatives such as Steps to a HealthierUS, Racial and Ethnic Approaches to Community Health Across the U.S., and most recently Communities Putting Prevention to Work — all of which focus on preventing chronic diseases and reducing health disparities through community-level, multiorganizational actions. The realities of high operating costs but limited external funding mean that these types of partnerships reach a small number of communities nationwide. Moreover, the time-limited nature of external funding creates uncertainties about long-term sustainability of the partnership. Success in securing ongoing financial support and in expanding geographic reach depends heavily on the partnership’s entrepreneurship and ability to document health and economic gains (13).

Partnership composition and structure

Partnerships are social networks formed among organizations; consequently, the substantial body of knowledge about social network structure helps to elucidate these collaborations (27,28). Network breadth reflects the array of different actors, which determines the amount and type of organizational resources that may be contributed. Network density measures the amount of interconnectedness between organizations, which facilitates their ability to work together. Network centrality reflects the relative influence of a single organization within a partnership, which can be important for coordinating and focusing collaborative actions. Both theory and research suggest that these constructs may influence partnership functioning, but their magnitudes and mechanisms of effect in public health are largely unknown.

Evidence suggests that both the breadth of organizations contributing to public health activities and the scope of their participation has been increasing in recent years. A study of partnerships in US communities with at least 100,000 residents found significant increases in the types of organizations that participate in public health activities from 1998 to 2006 (29,30). Not surprisingly, local and state government agencies were among the most frequent contributors to public health partnerships (Table), but hospitals, physicians, community health centers, and universities significantly increased their participation over time.

Research also shows that public health partnerships

generally adhere to 1 of 7 distinct structural configurations based on network breadth, density, and centrality (Figure) (29,30). Three of these configurations support a broad and comprehensive scope of public health activities, of which 1 configuration relies heavily on the work of government public health agencies and 2 others delegate considerable responsibility to other partner organizations. Two partnership configurations deliver an intermediate (conventional) scope of public health activities and differ primarily in the centrality of the local public health agency in these activities. The final 2 configurations deliver a limited scope of public health activities and differ in both the centrality and density. Partnerships frequently migrate from 1 configuration to another over time, with a trend toward supporting a broader scope of activities and engaging a wider range of organizations.

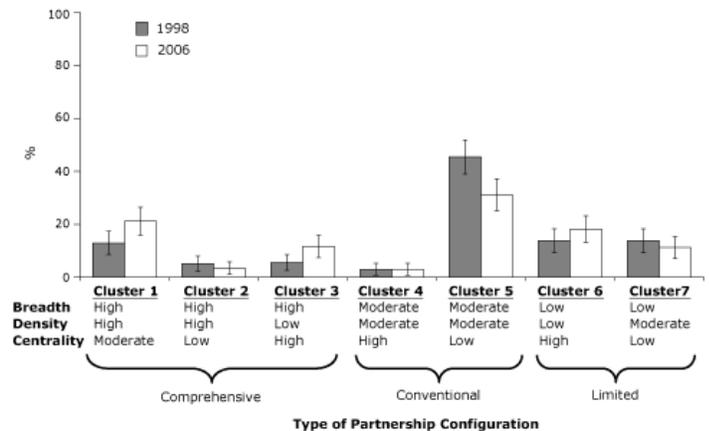


Figure. Prevalence of 7 public health partnership configurations, 1998 and 2006. Error bars represent 95% confidence intervals. Data were obtained from a survey of the 351 agencies that responded in both years (29,30). Seven configurations were identified through multivariate cluster analysis, each one distinguished by network breadth, density, and centrality. Breadth represents the array of actors involved in the partnerships; density represents the amount of interconnectedness between organizations; and centrality represents the relative influence of a single organization within a partnership.

Recent evidence suggests that partnerships operate somewhat differently in small and rural communities, where human and material resources are generally more limited. A recent network analysis of rural public health systems finds that smaller communities have fewer organizations available to address local health needs and therefore rely more heavily on the local public health agency to play central roles (31). In larger rural communities, public health partnerships tend to fragment into

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specialized collaborations, and the public health agency plays more peripheral roles. In the smallest communities, partnerships achieve more density when the local public health agency operates under centralized state governance, but in larger communities decentralized governance appears to foster denser partnerships, perhaps through enhanced autonomy and opportunities for entrepreneurship. These findings imply that partnership strategies should be tailored to the size of the community, the governance and legal environment for public health, and the types of activities to be undertaken through collective action. Considerable uncertainties remain about which partnership network structures work best in which public health settings.

Partnership outcomes and impact

Evidence for the influence of public health partnerships on population health is limited but has grown in recent years alongside the larger evidence base supporting population-based disease prevention interventions (25). Measuring the effects of partnerships is complicated by the long time periods often required to change health behaviors and outcomes at a population level, the many confounding factors that simultaneously influence health endpoints of interest, and the fact that partnerships may have diffuse effects on multiple public health programs and outcomes. Nevertheless, a comprehensive evidence review found that among 34 reviewed studies of public health partnerships, 10 produced evidence of improved population health outcomes potentially attributable to partnerships, including such outcomes as incidence of lead poisoning, adolescent pregnancy, infant mortality, and motor vehicle crashes (32). Another 14 studies found evidence of behavior change attributable to partnership activity in areas such as tobacco use, alcohol use, physical activity, and safe sexual practices. The strongest of these studies, however, suggested that the effects on health behaviors may not be as large as intended (33). Another set of 22 studies suggested that partnerships generated beneficial changes in policies, programs, or environmental conditions such as the adoption of smoking bans, changes in school lunch menus, or the creation of exercise trails and community exercise groups (32). These types of partnership effects could be expected to produce population health improvements over time if appropriately sustained. However, these studies relied on case study research designs that could not establish definitively that observed changes were attributable to the partnerships.

Nevertheless, this review and more recent studies collectively suggest that partnerships can produce beneficial outcomes under the right circumstances (34-36).

Evidence concerning the economic impact and cost-effectiveness of public health partnerships is an area largely unaddressed in the empiric literature, as is the more general question of the cost-effectiveness of community preventive services (13,14). Producing this evidence requires measuring the direct and indirect costs of participating in public health partnerships, including the opportunity costs that organizations incur. Obtaining valid measures of such costs is likely to require the active engagement of partnering organizations such as through practice-based research networks and participatory research methods. Such evidence is likely to be highly influential in shaping both government and private-sector decisions about contributing to partnerships.

Policy Implications and Future Prospects

A growing body of evidence and experience suggests that multiorganizational partnerships are promising mechanisms for improving public health practice. However, the types of partnerships likely to have the most direct effects on population health are among the most difficult, and therefore least prevalent, forms of collaboration. These implementation partnerships are those that focus on expanding the reach of proven but underused interventions and policies through collaboration among public health agencies, health care organizations, and other stakeholders. To succeed in improving population health, such partnerships must target programs and policies tightly to populations at risk, implement activities on a sufficiently large scale, and maintain fidelity to key program and policy components over time. If successful, these partnerships can serve as vehicles for transforming public health practice from a diverse collection of activities and organizations into an organized and accountable delivery system for public health interventions.

Because the opportunity costs associated with these types of partnerships are high, policy and administrative actions are needed to strengthen the incentives for partnership formation. Better systems for measuring and reporting on the delivery of effective prevention programs and policies at the community level are needed to raise awareness of gaps in implementation and opportunities

for collaboration. Accreditation systems and performance standards that are being developed for government public health agencies can be tailored to create incentives for partnerships (37). Moreover, the 2010 federal health reform law creates opportunities for adapting both medical care and public health funding streams to reward partnerships that expand the implementation of effective but underused prevention strategies. Collectively, these changes could serve as incremental steps along a path toward the more comprehensive pay-for-population health approaches that realign incentives for health improvement (38).

Beyond incentives, successful partnerships are likely to require changes in organizational culture, values, and strategy that can be achieved only through strong organizational leadership. Partnerships require leaders who can elucidate the participation incentives and constraints faced by individual organizations and identify shared objectives and compatible interests. Collaborative leadership can reveal the potential gains from partnerships and help organizations commit to difficult but beneficial public health actions that cannot be accomplished through independent endeavors.

Acknowledgments

This paper was originally prepared for the University of Wisconsin's Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation. Support for this research was provided by the Robert Wood Johnson Foundation's Public Health Practice-Based Research Networks Program (award no. 64676). Dr Mays also was supported through a Clinical and Translational Science Award from the National Center for Research Resources (award no. 1UL1RR029884).

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Table

Table. Partnerships Between Local Public Health Agencies and Selected Organizations, 1998 and 2006^a

Type of Organization	Agencies Reporting Partnerships ^b With Selected Organizations, N = 351			Scope of Activity ^c in Partnerships		
	1998, No. (%)	2006, No. (%)	P Value ^d	1998, %	2006, %	P Value ^e
State government agencies	343 (98)	348 (99)	.20	37	47	.01
Local government agencies	322 (92)	339 (97)	.02	32	51	.001
Federal government agencies	155 (44)	215 (61)	.001	7	12	.04
Physician organizations	299 (85)	325 (93)	.006	20	24	.27
Hospitals	339 (97)	351 (100)	.004	37	41	.40
Community health centers	179 (51)	297 (85)	.001	12	29	.001
Nonprofit organizations	334 (95)	335 (95)	.95	32	34	.60
Faith-based organizations	NA ^f	286 (82)	NC	NA ^f	19	NC
Community-based organizations	NA ^f	325 (93)	NC	NA ^f	32	NC
Health insurers	159 (45)	186 (53)	.07	9	10	.57
Universities	230 (66)	275 (78)	.001	16	22	.07
Schools	NA ^f	315 (90)	NC	NA ^f	28	NC
Employers and business groups	NA ^f	269 (77)	NC	NA ^f	17	NC

Abbreviations: NA, not assessed; NC, not calculated.

^a Data were obtained from a survey of all US local public health agencies that serve communities with at least 100,000 residents (29,30). These 497 agencies represent approximately 17% of all local public health agencies nationally but serve approximately 70% of the US population. Each agency was surveyed in the fall of 1998 (78% response rate) and again in the fall of 2006 (70% response rate). Data pertain to the 351 agencies that responded in both years.

^b Defined as participating in 1 or more of 20 core public health activities.

^c Defined as the mean proportion of activities undertaken through partnerships, based on a list of 20 core public health activities.

^d Calculated by using χ^2 test.

^e Calculated by using equality of proportions test.

^f Data element was collected in 2006 only.

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Multisectoral Lessons from Healthy Communities

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Suggested citation for this article: Pittman MA. Multisectoral lessons from healthy communities. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0085.htm. Accessed [date].

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Abstract

The healthy communities movement can provide insight into population health efforts in the United States, particularly in the context of recent health care reform. The movement has evolved from multisector partnerships that focused on improving the health, well-being, and quality of life for people and the social determinants of health to partnerships that focus more on chronic disease prevention, health equity, and environmental change. Evaluating the effects of community programs on population health has been challenging for a number of reasons. More metrics need to be developed for population health that will address inequities and focus policies on long-term health effects.

Healthy Communities as a Population Health Strategy and Social Change Model

The healthy cities and communities movement provides a context for developing and reviewing population health efforts. The healthy cities movement in Europe predated and informed the healthy cities and communities movement in the United States; the concept grew from a premise that “cities must be looked at as interrelated complex ecological organisms in which housing, transport, city planning, economic development, and many other facets interacted with health and medical issues” (1). The World Health Organization adopted Healthy Cities in 1987 (2) when 11

healthy city pilot projects were launched, and approximately 1,200 cities and towns from 30 countries were participating by 2008, moving from individual projects to a movement with coordinated efforts with common goals.

In the United States, healthy communities partnerships were convened by public and private health care and public health organizations, municipalities, foundations, and local civic organizations. They typically sought to build local support for health improvement activities by engaging diverse partners around a shared vision and a collaborative agenda that included multisectoral systems change. Bethel New Life in Chicago is an example of business and faith communities coming together in a grassroots effort that addressed the environment and later included jobs as well as improvements in housing and health (3). Equally effective were top-down efforts driven initially by funders, or elected officials and sideways-initiated efforts when community-based organizations initiated the efforts with government or businesses. Local context, community assets, and priorities drove the work of these partnerships, but, for sustainability and transformation from an initiative to a local movement, there had to be shared power. In many cases, partnership objectives included not only specific improvements in health but also development of community resources, capacities, and policies oriented to improve health. In this article, I will discuss how the healthy communities movement influenced current population health policies in the United States.

Multisectoral Partnerships: the 1990s to the Present

In the 1990s, multisectoral partnerships became more influential; such partnerships were voluntary agreements between 2 or more people or entities to work collaboratively



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toward a shared outcome. Prominent examples were 1) the Community Care Network Demonstration among hospitals, health care organizations, and community group representatives from business, education, and religious organizations, and 2) the Turning Point Initiative, a partnership of the public health sector and community organizations. These programs were fueled by investments from private foundations and government agencies as a result of changes in state and local responsibility for health care programs. Also aiding this growth was increased recognition of the contributions of systems thinking (a way of understanding the relationships among a system's parts) and the social determinants of health (the importance of social factors such as income and where one lives in determining an individual's health) (4).

Multisectoral partnerships have exhibited some consistent patterns and themes, including strong distributed leadership in which no single individual or organization is the appointed leader on all issues but everyone shares in the governance. Often a charismatic leader may initiate the effort, but sustainable initiatives require broader leadership and transparent governance and decision-making processes with identified and, ideally, funded staffing. The very structure and leadership of a collaboration can determine the types of initiatives that are undertaken.

The initiatives typically have a health status improvement focus, informed by the social determinants of health. Classically, the initiatives take the form of multisectoral public-private collaborative partnerships focused on measurably improving the health and well-being of people, the quality of life, and the social determinants of health in the communities in which they live. Unlike organizational programs that address symptoms, these partnerships provide local communities with proven strategies and models to create and sustain positive, lasting policy changes for healthy living.

Such endeavors have been complemented by growing governmental efforts to help bring about reform by creating indicators and setting public goals to enhance health and avoid disease. Many states adopted or developed state-level *Healthy People* (5) goals; awareness and use of the goals extended beyond public health agencies into health care providers and community organizations. One lesson from community initiatives is that metrics — measures of performance — help guide local efforts to address problems defined by the community and provide accountability and

transparency to the work being done. Metrics, such as the number of children on school lunch programs and walkable routes to school, have been connected to interventions addressing childhood obesity in a community (6,7). Metrics also help create a constituency for local political support and policy change. In 2002, indicators based on multiple metrics about parents reading to their children influenced a coalition to support and promote reading among clients in the federal Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) program in Seattle-King County, Washington (8).

Current Initiatives and Trends

Although most of the population health initiatives of the 1990s have concluded, approaches in the 2000s focus more on chronic disease prevention, health equity, and environmental change strategies. CDC's ACHIEVE communities (Action Communities for Health, Innovation, and EnVironmental ChangE), which by 2013 will have 200 participating communities, are leading examples for new prevention models for health care reform (9). Communities Putting Prevention to Work, which received \$650 million through the federal American Recovery and Reinvestment Act to focus on obesity and tobacco use, builds on programs such as ACHIEVE to produce measureable outcomes from community collaboration. Kaiser Permanente, the nation's largest integrated delivery system and a leader in the healthy communities movement, identified 10 design principles for multisectoral community work. The principles are based on the emerging evidence base and Kaiser Permanente's experience working with community partners. These principles are consistent with those of other preeminent healthy communities and are part of Kaiser's community benefit work (10).

Evidence for Action

Determining the effectiveness of community programs can be difficult because of changes in leadership, participants, resource allocations, and external environmental factors as well as the dynamic nature of the communities in which these programs are embedded. Limited data systems, resources, or technical expertise to implement comprehensive evaluations also hinder measurement of effectiveness. With these challenges, evaluators have not been able to link healthy community or multisectoral

community-based partnerships to overall improvements in population health, in part because few evaluation time frames are long enough to capture distal measures of health outcomes. Health information technology resources being developed to implement health reform can also inform community programs. That said, lessons from community-based initiatives show proximal and intermediate process measures (ie, a reduction in emergency department visits for ambulatory care sensitive conditions such as asthma or pneumonia, or an increase in screening rates) that can inform future health systems work.

Conrad and colleagues (11) described 3 lessons in their evaluation of the national Community Care Network (CCN) Demonstration. The project's 25 public-private partnerships in communities around the nation were responsible for addressing access to health care and lack of health insurance and for focusing on community prevention and the health of residents with the fewest resources. The American Hospital Association's Health Research and Educational Trust (12) managed and disseminated the findings from the project funded by the W.K. Kellogg Foundation. The evaluation concluded that although the sites did not measurably reduce health and social service costs in their communities, they achieved some of their objectives, particularly in the areas of community health focus and community accountability. However, few of the partnerships crafted the kind of population-based information systems needed to track community health outcomes or the tradeoffs in reallocating resources among competing uses in the community as a whole. New information tools will facilitate these processes in the future.

The lessons from the CCN Demonstration and some examples of health improvement initiatives can be summarized as follows:

- **Lesson 1: Community-based initiatives are less likely to produce measurable results in health behavior unless the program *unpacks* the broad-focused community intervention into its various parts and continually measures progress on those component parts and their contribution to the larger goal of community health improvement.** This finding by Conrad and colleagues (11) is consistent with the message that smaller visible wins are necessary to keep a collaborative process engaged and working toward larger goals. Broad, vague goals without measures to show progress along the way are

challenging to sustain. According to Wagner and colleagues (13), the Kaiser Family Foundation Community Health Promotion Grant Program in the western United States and the CCN Demonstration faced similar challenges in many of their demonstration sites.

- **Lesson 2: Focused interventions are more likely to produce community health improvement if they are targeted to a clearly defined community population and implemented and managed by a small number of accountable organizational entities.** The Community Health Promotion Grant Program evaluation by Wickizer et al (14) emphasized the importance of clear processes and theories of interventions and accountability to the community. Examining this same initiative, Wagner (13) found a general failure to achieve the targeted health outcomes and suggested that future "efforts should focus on developing theories and methods that can improve the design and evaluation of community-based interventions." The Healthy Carolinians initiative of the Turning Point program that supported both state and local policy change around healthy communities identified 4 success factors in their community health initiatives: gaining communitywide buy-in, establishing and maintaining data-driven decisionmaking, involving the community to ensure community-determined priorities, and collaborative interventions and evaluations (15). In their comprehensive review of more than 2 decades of collaborative partnerships, Roussos and Fawcett (16) found some notable population-level outcomes for conditions amenable to short-term impact. For example, although not strong enough in the authors' view to draw conclusions about the effects of partnerships on population level outcomes, a partnership that focused on 1 objective with short-term impact resulted in a 43% reduction in lead poisoning in New York City within 4 years, following 10 years of higher rates before the partnership.
- **Lesson 3: The broader the intervention focus and the more varied the target population, the more separate program components will need to be integrated to achieve positive community health outcomes.** The Turning Point program evaluation by Baxter (17) stressed building and integrating capacity within partnerships by creating strategic links and engaging in collaborative decision-making processes driven by scientific evidence. Cheadle et al (18) evaluated the California Wellness Foundation's Health

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Improvement Initiative in communities with broad-based partnerships. Volunteerism alone was found to be insufficient to create community-level systems change; rather, a well-supported infrastructure was critical to success. Lasker and Weiss (19) concluded that the potential value of a diverse group of people in a community health collaborative is enhanced by the following: 1) obtaining more accurate information about community concerns and priorities; 2) helping participants understand how different programs and services do or can interrelate; 3) combining statistical and qualitative information to understand the root causes of problems and create potential solutions; and 4) providing a broader understanding of the local history, culture, values, and politics. In a follow-up study of community participation in 5 partnerships, Lasker and Guidry (20) found that people most affected by a problem, who could give the most insight into it, are usually marginalized by the process and have little voice in determining what will be done to help them. To achieve the “promise of community participation,” processes need to be created to include these historically excluded people, giving them “influence where it counts.” Community participation research has focused on methods that include as much of the community as possible (21).

Incentives for Change

The community or population health approach is gaining interest in many policy sectors because the lack of health care coverage for millions of people and the cost of health care have raised fundamental concerns:

- Are our public and private investments and policies aimed at optimizing population health outcomes and eliminating disparities?
- With health reform upon us, there are additional questions about whether the monetary and other incentives in the health care system, and other systems that directly affect and provide cobenefits to health status (such as agriculture, education, jobs, and energy), are aligned with producing improved health outcomes.
- Have we unwittingly ignored and externalized the causes of ill health, allocating most of the financial rewards in the health system solely to treating disease?

As a nation we finally have health reform that moves beyond the finance and delivery of care services and can

embrace the science and practice of prevention and the determinants of health. As long as incentives and reimbursements in the health care system remain primarily tied to treating diseases rather than promoting health outcomes, we will never effectively address (or properly encourage and reward) what contributes to good health in the first place.

Investing in Health

Given the rising costs of chronic disease, it is instructive to examine the drivers or underlying forces behind the leading causes of death — smoking, poor diet, physical inactivity, and other contributors such as lifestyle, behaviors, and socioeconomic status (22). The health field model (23) provides a framework for examining the effects these factors have on health and premature deaths. Poverty and lack of education are among the most substantial drivers of poor health and premature death (24). Consequently, the greatest leverage point to addressing health outcomes is a focus on social policy and environmental factors.

If we agree that population health is a societal investment, guidelines and metrics should be developed with a national agenda for investment that takes into account the variation in the levels at which communities start the improvement process. This places America’s communities — and their role in advancing public policies that affect the determinants of health — at the heart of the solution and the locus of positive change. Improvements in population health are inextricably linked to the health of the community environments where we live, love, work, shop, eat, go to school, and worship. The factors that build people’s health are the same factors that build the health, wealth, safety, and vitality of families and communities.

A more integral world view and new approaches for measuring return on investment to local, state, and national priorities are essential to identify direct and demonstrable cost savings and revenue contributions associated with improvements in population health. When rooted in local-level entrepreneurship, new investments in businesses that have social dividends concurrently stimulate the economy, reduce poverty and violence, and save billions of dollars in costs to the health care and criminal justice systems. These are the kinds of investments that produce the quality of human capital needed to stimulate and drive our postindustrial economy.

Conclusion

Community coalitions voice a common refrain: "How do we connect what we are envisioning and prioritizing locally with state and national policy-making processes?" In effect, they are naming the frustrating chasm between local and regional civic governance processes and policy processes in statehouses and in Washington, DC. This is a chasm that President Barack Obama vowed to bridge in general and specifically in the American Recovery and Reinvestment Act and the community prevention funding committed to health reform.

Whether at the level of personal decision, corporate practice, or collaborative partnership, building a healthier community has become an expressed priority across the country (25). Lessons from past population health improvement efforts suggest that to achieve demonstrable health improvements, community initiatives will need to have the following:

- a clearly defined vision for well-understood problem(s) for which there are measurable goals, evidence-based intervention strategies, and shared accountability for success;
- a disciplined focus on a small number of goals;
- a socioecologic approach that affects multiple aspects of the issue through multiple stakeholders;
- support for the infrastructure, including data, to implement successfully; and
- an intervention that lasts long enough to create a sustainable change.

Chronic illness prevention and inequities in health status are 2 fruitful starting points for population health efforts. Other leverage points with momentum and enthusiasm include implementation of health care reform; new interests of specific sectors (eg, hospital community benefit and businesses' focus on costs and productivity); social networks; and environmental health awareness.

Learning from case studies and limited evaluations offers insight into actions that can sustainably improve economic, ecologic, social, and population health at all levels and can be integrated into efforts to reform health care in the United States. However, more research-based evidence is needed concerning how to spread effective population health interventions and how to evaluate their return on investment. We have never been in a better position to

integrate financial incentives for population health than we are today. The Obama administration's commitment to changing the status quo of inequitable health in the United States and multisectoral leadership can improve the health of all Americans. Now is the time to develop and test incentives and mechanisms that will prioritize population health outcomes.

Acknowledgments

I have no professional or financial affiliations that would bias the preparation of this manuscript. The original draft of the article was prepared for a presentation at the University of Wisconsin Mobilizing Action Toward Community Health (MATCH) Conference in October 2009. The Robert Wood Johnson Foundation paid me to participate, and the honorarium was contributed to my organization, the Public Health Institute. The final manuscript submitted was significantly modified from the original. No institutional review board review was necessary. I thank Lisa Stauber and Carolyn Newbergh for help in preparing the article.

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Building Multisectoral Partnerships for Population Health and Health Equity

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Suggested citation for this article: Fawcett S, Schultz J, Watson-Thompson J, Fox M, Bremby R. Building multisectoral partnerships for population health and health equity. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0079.htm. Accessed [date].

PEER REVIEWED

Abstract

Poor performance in achieving population health goals is well-noted — approximately 10% of public health measures tracked are met. Less well-understood is how to create conditions that produce these goals. This article examines some of the factors that contribute to this poor performance, such as lack of shared responsibility for outcomes, lack of cooperation and collaboration, and limited understanding of what works. It also considers challenges to engaging stakeholders at multiple ecologic levels in building collaborative partnerships for population health. Grounded in the Institute of Medicine framework for collaborative public health action, it outlines 12 key processes for effecting change and improvement, such as analyzing information, establishing a vision and mission, using strategic and action plans, developing effective leadership, documenting progress and using feedback, and making outcomes matter. The article concludes with recommendations for strengthening collaborative partnerships for population health and health equity.

The Problem

Poor performance in achieving population health goals is all too familiar. So is the accompanying every-decade

ritual in the United States: the announcement of a new round of planning to create health goals for the nation (eg, *Healthy People 2020*), followed by a wave of enthusiasm and then disenchantment (eg, “the problems with the data arise from . . .”), search for the guilty (eg, “but they were never at the table”), punishment of the innocent (eg, “with this reorganization, our agency looks forward to . . .”), and reward for the uninvolved (eg, “we should never forget that America offers the world’s highest-quality health care”).

Lost in this drama are the numbers: for the 281 measurable public health performance objectives tracked for *Healthy People 2010*, only 10% met their targets (1). Although progress was made toward meeting nearly 50% (n = 138) of the objectives, 20% (n = 57) grew worse. Disparities in health outcomes for ethnic minorities also remain a failure. One of the most glaring disparities is in the African American community, in which 48% of adults suffer from a chronic disease compared with 39% of the general population. Why do we keep falling short of the bars we have set for ourselves in population health and health equity?

Several factors contribute to these poor results. First, multiple and unconnected sectors lack shared responsibility for outcomes. Consumers, providers, insurance companies, employers, and government agencies all vie for individual advantage in our fragmented health care system, avoiding responsibility for unimpressive outcomes. Second, the health care system lacks cooperation and collaboration in achieving population-level goals. Emmanuel and Fuchs (2) characterize this as “the myth of shared responsibility.” Third, no public or private entity has overall responsibility for improving population health. This situation contributes to a willingness to proclaim victory for hard work, rather than meaningful improvement



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(3). Finally, moving toward improved population health and health equity requires understanding what works and what does not, and a willingness to agree on the price we pay for each. Sustained cooperation and shared responsibility among stakeholders in different sectors of a comprehensive public health system are necessary (4).

The public health response promotes community partnerships and cooperation as represented in the essential services. Public health agencies have come to recognize that community partnerships are a necessity in health improvement and that major health initiatives require community coalitions (5). Results are mixed, but the empirical evidence base for the effectiveness of partnerships to improve population health is growing (6-9).

In response to these problems, we offer a framework to guide collaborative action to improve population health. We also outline key processes for promoting community/system change and population health improvement. We conclude with 7 recommendations for strengthening collaborative partnerships for population health and health equity.

Challenges in Building Collaborative Partnerships for Population Health

Collaboration is difficult to establish and maintain. First, stakeholders often have differing goals or understanding of the problem, which leads to disagreements and a devaluing of others' preferred strategies and approaches. Partners who share responsibility for naming and framing the problem may find it easier to bridge those differences. Having common goals makes it easier for stakeholders to see their potential contribution to healthier communities.

Second, stakeholders often focus narrowly on only a few of the many factors that contribute to the problem. They typically use interventions to address these through familiar channels of influence; yet improving population health requires comprehensive and coordinated approaches that address 1) multiple personal and environmental factors (eg, knowledge and skills, access to services and support, policies and living conditions), 2) multiple sectors (eg, health, education, government), 3) multiple ecologic levels (eg, individuals, organizations, communities, broader systems). Stakeholders are more likely to see the work *they* do as particularly needed; thus, shared responsibility among organizations working in multiple sectors is rare.

Third, working at multiple ecologic levels is challenging. Different determinants of health have different areas of policy action and related actors (eg, Medicare, federal officials; air quality, regional actors; school nutrition, local people). Few partnerships coordinate collaborative action across multiple levels. Fourth, working together requires flexibility on the part of stakeholders' organizations and those who fund them. Yet many nonprofit organizations and governmental agencies have policies that limit their capacity to share resources and responsibilities.

Fifth, measurement of accomplishments is also a challenge. Many initiatives do not have accurate or sensitive measures of success at the level of the whole community. Changes in the community or system — the unfolding of new programs and policies — need to be measured to see what was actually implemented and its contribution to more distant population-level outcomes. The merit of longer-term efforts is difficult to assess and adjust to without such measures of environmental change.

Sixth, incentives for population-level improvement, such as outcome dividends, are rare. Without effective incentives for improving population health, the time and effort of collaborating with partners may go unrewarded. Working together across organizations is challenging because of competition for limited funding. The prevailing contingencies of reinforcement help secure discrete resources for individual organizations, not groups of organizations to improve population-level outcomes for which responsibility is shared.

Seventh, our knowledge of how to effect change in communities and systems to produce substantial improvements in population health is limited. We need a better understanding of how key collaborative processes, such as action planning or community mobilization, can yield environmental changes that will improve population health. Stakeholders may lack the experience or training required to make the community or system changes needed to affect public health.

Finally, public health has promoted best practices or programs that work as a way to ensure that the most effective approaches are implemented. The problem is that evidence-based programs are typically tested with small numbers of individuals and evidence of comprehensive and context-appropriate strategies that actually improve population health is rare. Researchers and practitioners

have begun to reorient their efforts to population health using frameworks and related processes (9-12).

Framework and Processes for Collaborative Action

We have adapted the Institute of Medicine framework for collaborative public health action in communities (Figure 1) (4,8). This framework, like other related frameworks (11), is iterative and interactive, with interdependencies between the phases and related processes. For instance, the first phase (assessment and collaborative planning) is oriented to indicators of success, such as reduced rates of childhood obesity or diabetes, that define the endpoints noted in the last phase (achieving improvement in population health and health equity). Emerging evidence suggests that 12 collaborative processes, such as action planning and making outcomes matter, may facilitate change and improve related outcomes in population health (Figure 1) (9,13,14).

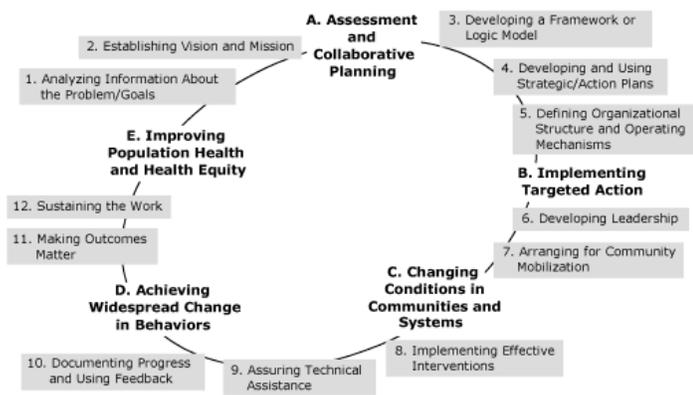


Figure 1. The sequential, iterative, and interactive components (A-E) of a framework that guides communities’ work to improve population health and 12 collaborative processes associated with the components. This framework is adapted from the Institute of Medicine framework for collaborative public health action (4).

Assessment and collaborative planning

This first phase helps focus the attention of multisectoral collaborations on a common purpose. The process of *analyzing information* about candidate health concerns involves assessing strengths and problems (needs and resources) in the community (11,15). This process helps to pinpoint health concerns for priority attention and to identify those who may be able to contribute to the effort.

This analysis often examines the related personal factors (eg, knowledge, skills, genetics) and environmental factors (eg, access, exposures, and opportunities; services and supports; policies) that influence population health outcomes. Critical analysis requires attention to social determinants of health, such as income inequality or social exclusion, that affect exposures and consequences and related disparities in population health outcomes. Through a multi-sectoral approach, representatives from different sectors of the community affected by the problem — such as health care providers, state or community organizations, business, and faith communities — are involved in naming the problem and goals related to the ultimate outcome. The process of *establishing a vision and mission* helps to communicate a common purpose that transcends the work of individual agencies and efforts (15,16).

Developing a framework or logic model helps clarify the approach used by the collaborative. It visually displays the expected pathway for how the effort will move from “here” (current level of the problem or goal) to “there” (changes in communities or systems and related improvements in priority population health outcomes) (15,17). The process of *developing and using strategic and action plans* further articulates how the community can move from vision and mission to attaining objectives (11,13,15). The planning process should include as agents of change those most affected by the issue, as well as those in a position to change communities and systems, such as leaders in business and government. Action planning should result in clearly identified changes to be sought in the community and system and who will do what by when to bring them about.

Implementing targeted action

This second phase involves taking action to bring about community and system changes, including implementing different evidence-based programs and policies that may lead to population health improvement. The process of defining a clear *organizational structure and operating mechanism* is necessary to assure effective and sustainable multisectoral partnerships (16). Initiatives should identify explicit roles and responsibilities of partners, such as what community members and organizational leaders will do, to focus their actions on changing conditions that affect priority health outcomes.

Developing effective leadership for the multisectoral collaboration and its partners also is crucial since it

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enhances the capacity of an effort to mobilize for change and improvement (13,15). Leadership roles and responsibilities should be distributed across the partners to allow for ownership and responsibility for contributing to change and improvement in shared outcomes (18). *Arranging for community mobilization* involves designating people to support change efforts. This helps to assure accountability for changing programs and policies to be sought in different sectors (13,14).

Changing conditions in communities and systems

The purpose of taking action is to facilitate changes in the community and broader system. Community/system changes refer to new or modified programs, policies, or practices facilitated by the collaborative partnership and related to its mission of improving population health. Changes in communities/systems are intermediate markers of success; discovering the conditions under which they are associated with improved outcomes in population health is a key research question for the field (19). *Implementing effective interventions*, those programs and strategies known to work, ensures that the partnership's comprehensive intervention can contribute to improvement in outcomes. *Assuring technical assistance* can increase the capacity of the multisectoral collaborations by enhancing core skills and knowledge to effectively implement key processes, such as action planning and community mobilization, and planned interventions such as evidence-based programs and policies (13). This phase should also address key social determinants of health such as income inequality and social exclusion that may contribute to disparities in health outcomes through differential exposures, vulnerabilities, and consequences.

Changing behaviors and improving population health

The ultimate goal of multisectoral partnerships is to achieve widespread behavior change and improvement in population health outcomes and health equity. The process of *documenting progress and using feedback* allows for ongoing assessment of intermediate outcomes (community/system change) and population health outcomes to allow for adjustments (13,19). *Sustaining the work* through ongoing investment of activities and resources helps to ensure the continued viability of multisectoral collaborative partnerships.

Finally, the process of *making outcomes matter* involves

using incentives to strengthen collaborative efforts (13,15). For instance, annual funding installments can be made contingent on evidence of progress; recognition and awards can be delivered for outstanding achievement; and tax incentives can be used to reward improvement in population health outcomes. The prevailing contingencies of reinforcement are typically too delayed, too small, and not contingent on performance. Group contingencies, such as outcome dividends or dollars returned to the community based on savings from improved outcomes, could be effective in sustaining collaborative action to improve population health. In a hypothesized community health and wellness system, the savings from improved population-level outcomes might be combined with other funding to help sustain the effective efforts of collaborative partnerships (20). In empirical case studies with community health coalitions, contingencies such as announcement of grant renewal contingent on evidence of changes in the community were associated with increased rates of documented changes (21). In a case study of outcomes-based contracting, contractors reported improved linking of funding investments and better accountability in a state health department's community partnership program (22).

Improvement in population health outcomes requires the continued engagement of 1) multiple agents of change (eg, community residents, state and local organizations), 2) working across sectors (eg, businesses, health care), 3) over time (eg, multiple years), and 4) across ecologic levels (eg, city, state). Multisectoral collaborations operate as complex adaptive systems that require interconnections to support effective and sustained efforts to change conditions. To promote change and improvement, differential consequences (ie, incentives and disincentives) also must take effect at levels corresponding to needed action (eg, community, state). Matching incentives with indicators of progress at appropriate levels could help maintain efforts of actors at different levels in changing communities and systems.

Recommendations for Strengthening Population Health Partnerships

We conclude with 7 key recommendations for strengthening collaborative partnerships to assure health for all:

1. *Establish monitoring systems to detect progress in achieving population health and health equity.* The

public health infrastructure should ensure that data on indicators for all priority health concerns and related behavioral risk factors are made available to the public. Data should be available at regular intervals and at the level of those working together to promote health and health equity (eg, neighborhoods, rural communities). Monitoring systems should also report data for populations experiencing health disparities (eg, differences in outcomes associated with gender, race/ethnicity) and related social determinants of health.

2. *Develop and use action plans that assign responsibility for changing communities and systems.* Action plans should be developed that pinpoint specific changes in communities and systems to be sought — and who will do what by when to bring them about. Action plans change the ecology for engagement by highlighting opportunities for partners to bring about a new or expanded program or policy in those sectors in which they have the most influence.
3. *Facilitate natural reinforcement for people working together across sectors.* Principles of behavioral science suggest the importance of ensuring contingencies of reinforcement that are large and immediate enough for people to continue working together. For instance, arranging public recognition at group meetings, and media communications can help ensure that people's engagement in group efforts result in social and other forms of reinforcement.
4. *Assure adequate base funding for collaborative efforts that is sufficient to improve population-level outcomes.* Commitments of public and private foundation resources should be large and long enough to change conditions in communities and systems sufficiently to achieve the goal. For instance, to improve levels of physical activity enough to achieve outcomes of public health significance may require a base funding of \$100,000 per year or more for at least 5 years.
5. *Provide training and technical support for those working in collaborative partnerships.* To ensure a competent workforce, training should be available in core competencies required for this work (23), including skills in assessment, planning, implementation, evaluation, advocacy, and developing partnerships across disciplines and sectors. This training should be widely available through interdisciplinary courses and Internet-based supports. For instance, the 7,000-page Community Tool Box (<http://ctb.ku.edu>) provides free access to training materials and just-in-time supports for collaborative action. Technical support should focus on implementation of key processes or mechanisms that affect the functioning of collaborative partnerships; for instance, in helping partnerships to develop and use action plans, document progress and use feedback, or make outcomes matter (13,14).
6. *Establish participatory evaluation systems for documenting and reviewing progress and making adjustments.* Participatory evaluation systems should be established to enable community and scientific partners to work together to monitor and reflect on what is happening. Data on community/system change help measure the intervention over time. Measurement of the amount and type of community/system change actually brought about (eg, by goal, duration, sector, change strategy, place) can help to estimate the potential effect of a collaborative partnership on outcomes (24). Online documentation systems can support review of rates of community/system change and associated contributions to population health improvement (19), as seen in the hypothetical relationship between community changes and associated improvement in a population health outcome (Figure 2). When online graphs of change efforts are accompanied by reflection, questions (eg, what are we seeing, what does it mean), and supports for improvement (eg, how to encourage participation or counter opposition), they can further support collaborative efforts (19).
7. *Arrange group contingencies to ensure accountability for progress and improvement.* Early in the collaborative partnership, group contingencies, such as annual renewal of grants for core support based on evidence of progress, should heighten group members' engagement in change efforts (24). In later years, group contingencies might take the form of bonus grants or outcome dividends for improvement in population health outcomes or reduced disparities (20). The size of the outcome dividend, the amount returned to the collaborative partnership, should reflect the estimated return on investment of demonstrated improvements in population health outcomes (eg, dollar savings from investments that reduce rates of obesity).

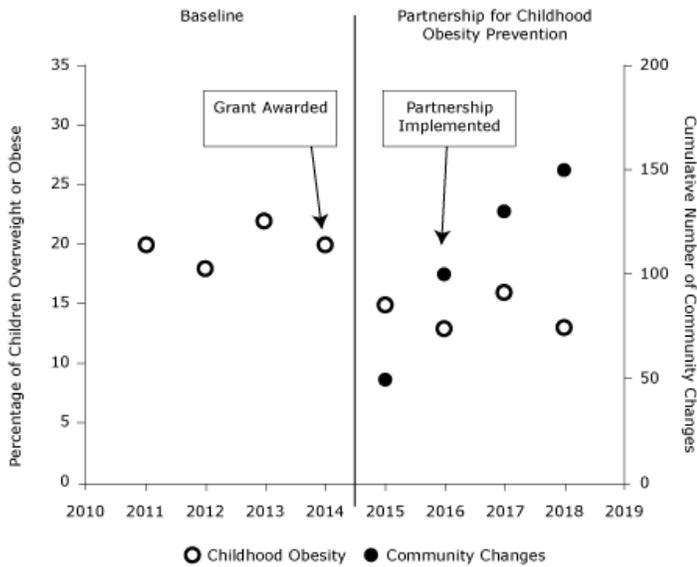


Figure 2. Hypothetical relationship between community changes (ie, every new or modified program, policy, or practice) facilitated by a partnership to prevent childhood obesity and associated improvement in a population-level outcome (ie, percentage of children who are obese or overweight). The vertical line indicates the start of the collaborative partnership to prevent childhood obesity.

These recommendations aim to ensure conditions — including monitoring and feedback systems, training and technical support, and group incentives for progress — that can foster the success of broad collaborative partnerships (25). Such conditions should make it easier and more likely for multisectoral partnerships to achieve progress in improving population health and health equity.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Multisector Partnerships in Population Health Improvement

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Suggested citation for this article: Woulfe J, Oliver TR, Zahner SJ, Siemering KQ. Multisector partnerships in population health improvement. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/nov/10_0104.htm. Accessed [date].

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Abstract

Many new initiatives for population health improvement feature partnerships of leaders and organizations across multiple sectors of society. The purpose of this article is to review 1) the rationale for such partnerships as an important, if not essential, tool for population health improvement; 2) key organizational and contextual factors that appear to be associated with effective multisector partnerships; and 3) the limited evidence regarding the effect of such partnerships on population health outcomes. We conclude that systems thinking — accounting for the collective effect of many actors and actions — is essential to organizing and sustaining efforts to improve population health, and to evaluating them. More research is needed to understand how and why multisector partnerships are formed and sustained and the conditions under which multisector partnerships are necessary or more effective than other strategies for population health improvement. Research on and evaluation of multisector partnerships also need to incorporate more standard measures of partnership contexts, characteristics, and strategies and adopt longitudinal and prospective designs to accelerate social learning in this area. Finally, studies of multisector partnerships must be alert to the value of such initiatives to individuals and communities apart from any direct and measurable impact on population health.

Introduction

In response to the call of the Institute of Medicine for multisector partnerships (1), many new initiatives for population health improvement feature partnerships of leaders and organizations across multiple sectors of society. These partnerships typically include representatives and resources from various substantive issue areas — for example, education, economic development, transportation, agriculture, and health — and span the business, nonprofit, and governmental sectors. The purpose of this article is to review 1) the rationale for such partnerships as a tool for population health improvement, 2) key organizational and contextual factors that appear to be associated with effective multisector partnerships, and 3) the limited evidence regarding the effect of such partnerships on population health outcomes.

The Case for Multisector Partnerships

During the past 3 decades, efforts to improve population-wide health outcomes have moved toward community organizing and collaboration. Community organizing refers to the unit of analysis and action, shifting the focus from individuals to systems, rules, social norms, or laws to affect health behaviors and outcomes (2). This ecologic approach recognizes the connection between health and social institutions, surroundings, and social relationships (3).

Collaboration refers to the process of system change, shifting the focus from the responsibilities and effectiveness of individual institutions to their relationships and collective effect on population health. In particular, efforts have increased to involve many sectors of a community in pursuit of better health outcomes and the economic and social benefits thought to be associated with such



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outcomes. The rationale behind multisector partnerships is that, because no single organization or sector has full control over the determinants of population health, effective solutions require interorganizational coordination and collaboration (4). By pooling resources, talents, and strategies from a broad range of actors, each of these sectors can more effectively carry out its responsibilities as they affect population health (2). Researchers have advanced similar theories of collaboration to improve the effectiveness of initiatives on related issues such as poverty and community development.

Researchers have conceptualized partnerships for health improvement differently. Three dominant models of partnerships for health improvement have been described (4). In the first, public health agencies are primarily responsible for promoting activities and services that affect the health of the community. Their partnerships with other organizations exist primarily to extend the reach and capacity of governmental public health. In the second, many organizations play some role in promoting public health and so must be involved in health improvement. However, the focus remains primarily on the delivery of public health services. The third model focuses on the system of actors and actions that promote or threaten population health and includes activities in all sectors of community life (eg, education, business) (4). This last model, the most ecologic of the 3, has received increasing attention. However, the evidence to date suggests that these large-scale community health promotion projects have changed population health behaviors and outcomes only moderately (5).

In response to the mixed results of approaches based on the third model, some argue it is necessary to reconceptualize partnerships for health improvement (6). According to this argument, even the broadest partnerships have not shifted from an individual intervention paradigm to a true systems paradigm. Systems thinking focuses on the collective influence of a broad range of actors. It recognizes communities as networks of dynamic, nested relationships among individuals and organizations. These constantly evolving complex adaptive systems comprise diverse agents operating in various subsystems and suprasystems without centralized control (7). Although most partnerships adopt interventions targeting multiple levels within a system, they may fail to recognize the full scope and complexity of the system and miss opportunities to improve population health. Hawe and colleagues (6) argue that

unique problems are associated with scaling up partnerships from the organizational level to the community level. They suggest that these partnerships learn from ecologic-systems perspectives that examine linkages, relationships, feedback loops, and interactions among systems. From this approach, multisector partnerships can be conceptualized as events within systems that either leave a lasting footprint or wash out, depending on how well the dynamic properties of the system are harnessed. The success of a partnership depends on activity settings, the social networks that connect people and settings, and time (6).

Recent work on social networking approaches to collaboration examines the importance of looking at the effect of a particular intervention rather than measuring the changes in a system over time. In network approaches, leaders focus not only on management challenges and opportunities at an organizational level but also on how to mobilize resources more broadly for the greatest social impact (8).

Drawing from these approaches, a fourth conceptualization of multisector partnership seems to emerge. This model focuses not only on the relationships among organizations in the partnership but also on the partnership's relationship to the context of the place it is trying to change. In some ways, this model is a continuation of the focus on neighborhood-based and community initiatives. However, it adds a new emphasis on considering the characteristics of context, including the timing of the intervention and past events, particularly earlier interventions that may have created networks. From this perspective, partnerships work to build capacity over time and consider the impact on the context itself as the primary outcome.

Key Factors in the Effectiveness of Multisector Partnerships

Extensive research has identified the qualities perceived as contributing to strong multisector partnerships in health and other issue areas. This section summarizes some of the lessons learned about the most important dimensions of partnerships.

Partnership resources

Partnership resources include the money, skills and expertise, information, and connections that a partnership

has to draw on (9). Although resources alone do not ensure the success of partnerships, how partnerships are funded and supported does influence their functioning (10). Some common themes are the necessity of sufficient resources, the sustainability of resources, and whether funding supports the partnership's original mission and vision (8,9,11). In addition to sustainable funding, the flexibility of funding is important to long-term success (12). Coalitions may need access to information and support in the form of ongoing technical assistance (10), which enables the partnership to evaluate and change its efforts.

Common vision for partnership

Multisector partnerships bring together groups with disparate interests and roles. One of the most universally recognized needs is a common vision for the partnership's projects, goals, and outcomes (13).

Partnerships without clear goals that rely on broad agendas may become distracted by emerging crises and side issues. Another risk is to become so narrowly focused that the partnership ignores important community and contextual issues. A related concern is ownership of the vision for the project. Researchers emphasize that communities that are being served by the partnership must contribute to the vision for the project, creating a sense of ownership and empowerment (10,14).

Leadership

Effective leadership is one of the most studied characteristics of effective partnerships (10,15-17). Leadership style can vary from collaborative leadership to a more hierarchical model. Whatever the style, however, effective leadership inspires commitment and action, helps the partnership to work toward inclusion, and works to sustain the vision and participation of the partnership's members (10,15).

Research demonstrates the importance of building leadership at many levels. Along with leaders who possess expertise and experience in the issue area, collaborations need sponsors who can provide resources to the enterprise and champions who possess the necessary process-oriented skills to keep the collaboration going. Champions are particularly important because a diverse organizational partnership may lack a clear-cut strategy that can be centrally developed and easily enforced (18).

Organizational structure

The effectiveness of partnerships depends on their organizational structure and capacity. As with leadership, no one form can serve all partnerships equally well. Effective partnerships appear to share several features, however, including clear structure, adequate staffing, sufficient core resources, and transparent decision-making processes (10,13,16).

A core test of organizational structure and process is the ability of a partnership to deal with conflict. In multisector collaborations, conflict is common and emerges from the marriage of different organizational cultures with varied views about planning, strategies, and tactics. Collaborations that have continuous trust-building activities are more likely to manage potential conflict. Conflicts exist not only at an individual level but also at the systemic level. Consequently, collaborations are more likely to succeed when they build in resources and tactics for dealing with power imbalances (18). To achieve a broad consensus of how to proceed, the partnership should develop norms, rules, and processes based on the input of all members of the partnership. The planning must also involve the broader network of affected parties and attend to the stakeholders (18).

Membership

Selection of the right partners is necessary for success. Partnerships aimed at community health improvement should include a broad array of partner organization types (11). Membership diversity refers to members' social identity (ie, racial, ethnic, or cultural identity) and how well they represent the community the partnership serves (16). Building a culturally diverse membership increases the likelihood that the interventions will be culturally appropriate and strengthens the community's investment in the partnership. Attracting broad membership and community investment requires partnerships to demonstrate how their issues relate to the broader concerns of the partners and the community as a whole (13).

There are potential risks, however, in forming new collaborations. Recruitment of members presents a tradeoff between representativeness and effectiveness. Up to a point, expanding representation can increase legitimacy and attract more resources for an initiative. But coalition size and diversity may make it harder to reach decisions

and develop and implement new programs (T. R. Oliver and J. Gerson. Unpublished report to The California Endowment, October 2006).

Although newly constituted partnerships may have the advantage of not being obligated to any particular community group, they may lack credibility and power. Partnerships must therefore strategically align themselves with established groups (12). Bryson et al (18) found that cross-sector collaborations were more likely to succeed when 1 or more linking mechanisms (ie, existing networks, powerful sponsors) were already in place. Thus, building from existing relationships may be more effective than forging completely new ones (18). Research on which members are most valued by partnerships indicates that the most valuable member has a well-connected presence in the community, can devote resources to the collaboration, and actively participates (19).

Forty coalition leaders named commitment to the cause as the main element of coalition success. Additional factors named were commitment to coalition unity, breadth of representation, continuing contribution of resources, and previous history of working relationships (17).

Quality of relationship

In addition to the desired structural characteristics of partnerships, the quality of the relationship distinguishes effective partnerships from ineffective ones. This sense of collaboration or group cohesion is complex and difficult to operationalize. Nonetheless, strong collaborative working relationships are often credited with allowing multisector partnerships to provide integrated service delivery (15,16). Good communication among partners, transparency in decision making, and accessible, jargon-free language better enable partners to participate effectively. Communication and ongoing feedback enable the partnership to grow and evolve. Effective partnerships have been successful in establishing a sense of mutual trust, respect, and commitment (13). Overall, effective coalitions and partnerships bond individuals in addressing a concern together, creating a sense of community and connection (10).

External and contextual factors

The influence of community characteristics on the success of collaborations is a subject of growing interest. Some communities may have more readiness or be more

conducive to the work of the partnership (9,10). Feinberg and colleagues (20) examined the relationship between 3 dimensions of community coalition readiness and the perceived effectiveness of the coalition. In a study that evaluated leadership readiness, community readiness, and strength of community ties, they found that community readiness is positively related to the perceived efficacy of coalitions (20). A community's readiness may be affected by capacity built through prior partnerships, the presence of competition between and within sectors, and the degree to which a community is already saturated with similar partnerships (10).

Communities each come with their own public and organizational policy barriers to partnerships. Financial barriers may include short-term or limited external funding, lack of funding for administration and management, and categorical program requirements. Other barriers may include performance standards or current benefit requirements that discourage key leaders or organizations from participating (9).

Although external factors affect the success of collaborations, the research on community coalitions suggests that the collaboration's response to those factors is more important to the development of the collaboration. Members of community coalitions routinely name political, economic, and community conditions as important in coalition development. However, they identify additional factors as more important, such as choosing a relevant issue, having the right timing, and choosing an appropriate social target (17).

Evidence of the Effectiveness of Partnerships

Despite a common belief that multisector collaboration can improve population health, researchers seldom study the effect of such collaboration on population health outcomes. Evaluating the effect of multisector partnerships on population health outcomes is difficult. Some of the most-cited challenges are the short study period of evaluations, limited use of evidence-based logic models and theories of action to guide interventions, the difficulty of measuring the degree of individual exposure to interventions, and multiple or broad population indicators (21).

Researchers fail to agree on what factors are most

closely linked to improved population health outcomes. Often these factors have been drawn from a broad review of literature from multiple disciplines, each defining efficacy differently (14). Even researchers who agree that a particular quality of a coalition is important may disagree about how to measure that quality (16).

In a review of hundreds of collaborations, Roussos and Fawcett (21) could identify only 34 evaluations of partnerships working locally to address community health that had a study design or logic model to guide their work. Of the 34 partnerships, 10 presented improved population-level outcomes that might be attributed to collaboration activities. The review found stronger support for the ability of collaborations to change behavior and systems. Of the 34 studies of partnerships, 15 included measures of behavior change, 14 of which indicated some shift in behavior. All 34 studies reported some sort of systems change in the form of new programs developed, funds generated, or other measures (21).

Another literature review (16) yielded similar results. The authors searched major databases for studies on partnerships that targeted local geographic areas to improve population-level health outcomes, and defined and measured both coalition effectiveness and coalition-building factors. The review noted that across studies, researchers have defined and operationalized coalition-building factors and effectiveness differently. Studies had different definitions of coalition functioning, often failed to connect coalition-building factors to coalition effectiveness, and yielded mixed results (16). One study concluded that multisector partnerships and interventions continue to be driven primarily by ideology and action rather than sound scientific design and evaluation (22).

Conclusions

Kreuter and Lezin (23) observe that justifications for collaborating to change health status and health systems fall into 2 major categories, conventional wisdom and evidence. Of the 2 justifications, conventional wisdom is vastly more common in the literature. The need for continued research and evaluation of broad-based initiatives to improve population health is clear, given the challenges of studying the influence of multisector partnerships in complex systems. Further research is needed to understand the circumstances in which formal multisector partnerships are

likely to be formed, the extrinsic and intrinsic motivations of leaders and members, and how to increase the commitment of members through incentives and other means. In addition, further research is needed to identify whether and how multisector partnerships affect both the levels of population health and disparities within a population and to clarify what characteristics of partnerships and what contextual conditions are necessary for improved health outcomes. Finally, more research is needed to examine the comparative effectiveness of multisector partnerships and other strategies for improving population health, in particular, when the leadership and resources required to organize and maintain formal partnerships are *not* necessary to improve health outcomes or reduce health disparities.

General lessons are available: first, systems thinking is essential to organizing and sustaining efforts to improve population health, and to assessing their impact. The outcomes of partnership approaches depend on the social, economic, and political context of the community in which partnerships are formed and operate. Only by studying the varying contexts can researchers discern whether any form of partnership is sufficient for population health improvement.

Second, characteristics of partnerships — goals, sponsorship, membership, resources, leadership — do appear to matter, but this has been established primarily through studies based on perceptions of participants rather than objective measures of outcomes. Therefore, more research is needed on multisector partnership outcomes using longitudinal and prospective designs that include measurement of activities, social network development, and types of organizations involved and resources engaged. To aid this area of inquiry, better and more widely adopted measures of structure, process, and outcomes are needed to link partnership formation to community-wide impact. One step toward building a stronger evidence base of what works would be the adoption of common models or frameworks for defining different forms of public health partnerships — for example, the typology offered by Mays (4). Standard models, as well as more standard measures of partnership contexts, characteristics, and strategies, would improve the generalizability and replicability of research and accelerate learning.

Third, multisector partnerships almost certainly offer some value to individuals and communities apart from any

direct and measurable effect on population health. The shared effort and communication that result from a health initiative may highlight problems, shift resources, or raise expectations for participation and performance in other areas of community life. Studies of multisector health partnerships should be alert to such catalytic changes and spillover effects as researchers pursue a clearer view of the connections between partnerships and population health improvement.

Acknowledgments

This work was funded by the Robert Wood Johnson Foundation as part of the Mobilizing Action Toward Community Health project at the University of Wisconsin Population Health Institute.

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SPECIAL TOPIC

Networks as a Type of Social Entrepreneurship to Advance Population Health

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Suggested citation for this article: Wei-Skillern J. Networks as a type of social entrepreneurship to advance population health. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0082.htm. Accessed [date].

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Abstract

A detailed case study from the field of social entrepreneurship is used to illustrate the network approach, which does not require more resources but rather makes better use of existing resources. Leaders in public health can use networks to overcome some of the barriers that inhibit the widespread adoption of a population health approach to community health. Public health leaders who embrace social entrepreneurship may be better able to accomplish their missions by building their networks rather than just their organizations.

Social Entrepreneurship and Networks

Social entrepreneurship has become prominent as an approach to address societal problems. The term is generally conceptualized as innovative activity within or across the nonprofit, government, or business sectors to generate social impact (eg, improvements in public health, environmental conservation, economic development) (1). As traditional approaches to addressing society's ills have failed, social entrepreneurship is seen as a way to leverage resources, enhance effectiveness through innovative partnerships, raise levels of performance and accountability, and ultimately achieve sustainable social impact.

Social entrepreneurship builds on the definition of entrepreneurship as “the pursuit of opportunity beyond the resources that you currently control” (2). Conceptualizations of social entrepreneurship (3) are based on the drive to create social impact rather than personal or shareholder wealth. Social entrepreneurship is often characterized by some of the virtues of commercial entrepreneurship, such as efficiency, dynamism, innovativeness, high performance, and economic sustainability. Examples of such social entrepreneurship include nonprofits operating revenue-generating enterprises (4-6) or pursuing organizational growth (7) to increase the quantity or quality of programs or services. Undoubtedly, many social-sector organizations, following in the footsteps of their commercial counterparts, have achieved substantial impact by attracting more resources, developing their organizational infrastructure, and increasing the scale of their operations. Yet, the process of organizational growth also poses tremendous challenges, particularly in the social sector (those organizations whose primary goal is serving the public interest) where human and financial capital is often scarce. Even organizations that overcome obstacles to growth and achieve appreciable scale seldom achieve substantial social impact on their own.

Some researchers and practitioners have argued that the opportunities and challenges in the social sector require not only the creative use of commercial approaches but also the development of new conceptual frameworks and strategies tailored specifically to generating social impact. A prime example of this conceptualization of social entrepreneurship is a network approach. In a network approach, leaders not only focus on management challenges and opportunities at an organizational or institutional level but also try to mobilize resources more broadly



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within and outside traditional boundaries to generate maximum social impact.

Although social impact can be generated through traditional means by bringing resources into an organization and delivering programs or services directly, organizations can often achieve greater social impact by leveraging the resources and expertise of complementary, or even competing, organizations. By forming networks, leaders can mobilize resources and activities across unit, organizational, and sector boundaries to achieve maximum social impact. I conclude by describing how networks can be used by leaders in public health to overcome some of the barriers to adoption of a population health approach to community health.

A Network Case Study

Organizations that have consistently achieved and sustained substantial social impact despite limited resources have done so by working through networks (8-12). The example of the Guide Dogs for the Blind Association (GDBA) illustrates some of the factors that are important to successful network building (13).

GDBA, a charity based in the United Kingdom, is the world's largest breeder and trainer of guide dogs. In 1997, the chief executive officer, Geraldine Peacock, realized that the public sector that was supposed to deliver services to visually impaired people was not working efficiently or effectively. GDBA was providing guide dogs to just 5,000 clients, despite its 66-year history and considerable organizational scale: an annual budget of approximately 40 million pounds (US \$58.5 million), 27 offices across the United Kingdom, and a staff of approximately 1,200. The organization's own research found that in the United Kingdom approximately 200,000 people needed mobility services, including not only guide dogs but also other services, such as long cane mobility training. At the same time, the organization was losing millions of pounds per year because it had expanded its programs into noncore areas such as operating hotels for the visually impaired.

Peacock sought to improve the organization's effectiveness in several ways. First, she divested GDBA of operations that were not core to GDBA's mission, such as the hotels program. She engaged trusted partners who would have the capacity to take ownership of the divested

operations and invested millions of pounds in these partners to ensure their partners' success in running those programs. Second, to improve services overall, GDBA partnered with local governments, which had responsibility for providing services such as mobility training, independent living skills, and communication skills. GDBA offered to pay for the mobility training that was the responsibility of the government, because the mobility training programs were chronically underfunded and mobility training was GDBA's core expertise. The government could have GDBA provide mobility training directly or could use the funds from GDBA to hire a local nonprofit provider. In the latter case, GDBA also offered to provide technical assistance to support its former "competitors" in providing services to visually impaired people. According to Peacock, it was less important who provided the services than whether they were being provided at a high quality. In exchange for GDBA's resources, the government contractually committed to match 1:1 the funds that GDBA provided for mobility training and use them for independent living and communication skills services. Peacock deliberately pursued a strategy that supported building capacity in the field and facilitating collaborations among providers that had historically been competitive with each other.

Finally, Peacock sought to enhance the efficiency and effectiveness of the charities serving the visually impaired by creating an umbrella organization that would offer a unified voice and a shared advocacy agenda. The individual organizations maintained their own brands and operations, but the umbrella facilitated more frequent communication and ongoing collaborations among organizations in the field.

Within 5 years of creating these partnerships, GDBA more than doubled the number of clients who received mobility training without increasing its own operations. After witnessing the success of GDBA's network approach, in 2002 the UK government established a fund of 125 million pounds (US \$182.5 million) to invest in the types of networks that GDBA and its partners had pioneered.

At GDBA and other organizations using this approach, common factors for effective networks emerge. These networks depend on a willingness among all participants to shift their focus from maximizing organizational- and institutional-level benefits to maximizing social impact. Thus, network participants must be willing to 1) invest substantial resources (financial being just one), 2) share

or relinquish control, and 3) share rewards and recognition with their partners. The network approach also benefits organizations that use it. The network approach enabled GDBA, for example, to change its own culture and reputation from that of an independent, and at times domineering, organization to one that government and other nonprofits consider a trusted partner.

The Need for Social Entrepreneurship in Population Health

Although the term *social entrepreneurship* has emerged recently in the field of public health, the concept itself is nothing new in public health practice. Partnerships are becoming more common between the medical and public health communities to coordinate vaccination, case reporting, and education on such issues as childhood diseases and sexually transmitted diseases, among others. In addition, a joint medical and public health professional association was created (14). The notion that involvement of communities is necessary for developing effective and sustainable public health interventions has become widely accepted (15,16). Research has documented the effectiveness of approaches that draw on local, national, and global knowledge-sharing and support across issues such as reducing cesarean rates, hospital delays and wait times, and hospital admissions for asthma (17,18). Research on patient safety has documented the importance of system-level approaches to improving population health (19).

The emergence of the field of population health, which emphasizes a holistic and system-level understanding of “health outcomes, patterns of health determinants, and policies and interventions that link these two” (20), tempers the rising dominance of the perception that health care is the primary determinant of health outcomes. Many other nonmedical determinants, such as the social and physical environment, individual behavior, and genetics, are factors in population health (20). Just as pay-for-performance might improve the quality of medical care, similar pay-for-population health performance systems should be developed. Financial and nonfinancial incentives are a positive and necessary step to motivate system-level thinking and action toward population health goals. However, achieving the objectives of any pay-for-population health system also requires a fundamental change in the culture and mindset of the leaders and actors in the health fields, both medical and nonmedical. As illustrated in the GDBA

example, leaders must let go of traditional notions of their organizations and agencies as hubs and potential partners as mere spokes. Instead, leaders must view their organizations and their work as nodes among many others in a larger constellation of actors that must coordinate their efforts to achieve a shared vision. To lead their organizations to greater efficiency, effectiveness, and sustainability, they need to creatively mobilize resources beyond their control in the name of improved population health outcomes. The work of any single agency or organization, while important, can contribute in substantial ways to population health improvements only to the extent that it is linked and supported by other system-level efforts.

The sector of population health shares many of the characteristics of other social sectors, which makes it amenable to social entrepreneurship and, specifically, to network approaches:

- Organizations seek to address large, complex issues that cannot be addressed by any single entity.
- Organizations seek to create social impact, not just organizational impact.
- Organizations often have dispersed governance and accountability.
- Organizations create value that is not readily measured.
- Organizations rely heavily on tacit knowledge and expertise as well as trust and relationships to achieve social impact.

Although large-scale health challenges require solutions that no single agency or institution can tackle, virtually all incentive systems in public health preclude such system-level solutions. Funders, governing boards, donors, and organizational and institutional leaders often seek organizational growth and revenue increases rather than impact as primary goals. Board members of various public health agencies are accountable only for their organizations, not how effectively their organization’s work is integrated with the system on which population health outcomes depend. Many donors encourage collaboration among grantees, but they often assume that because they bring the financial resources they can also dictate solutions when in fact the keys to solving the problem are dispersed across individuals and entities throughout the community. Furthermore, donors often restrict funding to specific programs rather than granting discretion to the grantees. Dictating programs and how they should be delivered severely limits

the creativity and flexibility that local experts and leaders need to build network solutions. Given this state of affairs, one would not expect health care and health institution leaders to be focused on anything but their own organization's well-being. Yet, recent research in the field of social entrepreneurship suggests that a network mindset (21) may offer a promising tool to overcome the barriers to achieving population health.

Applying Networks to Overcome Barriers to Pay-for-Population Health

Networked organizations are different from traditional organizations in that they look outward rather than inward. They put their vision and mission first and their organizations second. They govern through trust rather than top-down controls. They cooperate as equal nodes in a broad network of actors rather than strive to become a central hub that dictates the agenda. A shift from the organizational to the networked mindset offers solutions to some of the barriers to pay-for-population health systems identified by public health experts (20):

- 1. No consensus on how to measure population health.** The network approach suggests that it may not be necessary for the field of population health to come to consensus on a single metric at the outset. The goal is to get leaders in the field to focus on population health outcomes, allowing flexibility around what the outcomes might be and the means for achieving them. As self-organizing clusters of networks around shared metrics begin to emerge, the actors themselves may begin to gravitate toward the metrics that have the greatest merit.
- 2. Financial incentives and unintended consequences.** Financial incentives should reward organizations that show an enduring commitment to population health goals through their actions. Trust is fundamental to enabling networks to thrive. If participants fear that they will be exploited by their network partners, the focus reverts to self-interest. Effective network builders seek out peers with similar values to build systemic solutions; ineffective network participants will remain isolated at the margins. Funders can reward the former and limit funding for the latter.
- 3. Coordination across sectors.** A network approach introduces a shift in thinking about coordination not only by breaking down silos through vertical inte-

gration but also by investing heavily to foster the development of lateral relationships among various organizations and sectors. Donors might host meetings, provide venues for health care and public health leaders and providers to discuss specific population health issues, and offer resources to support innovative forms of collaboration. This approach is particularly promising because it does not require cumbersome large-scale acquisitions or mergers. Coordination can start small in multiple arenas and expand as the partners build trust and see the fruits of their partnership. As organizations experience the mutual benefits of collaboration, they may also identify more substantive areas of work. For example, they may mobilize around a holistic approach to disease treatment and management, such as for diabetes, through which patients could benefit substantially from coordinated interventions, such as nutrition, exercise, and medical care. Not all partnerships are destined to flourish, and not all partners are trustworthy, but facilitating peer-to-peer relationship-building and cooperation may catalyze relationships that ultimately contribute to better population health.

- 4. Resistance to reallocation of resources.** Leaders must realize that maximizing their own organizational resources is not a true measure of success; instead, health outcomes should be the measure. More efficiency can be achieved through collaboration, thereby reducing costs and attracting more funding from donors that go out of their way to fund effective network builders rather than organization builders.
- 5. Focus on current issues rather than preventing tomorrow's population health problems.** Any pay-for-population health system must seek to reward leaders and organizations that build networks to deliver system-level solutions rather than investing in their own sustainability. Few leaders seek to drive their organizations out of business, yet in the social sector, that is precisely what the goal should be. Career paths that span the field and sector must be developed to replace career paths tied to specific organizations.

Although no silver bullet can magically answer the population health challenge, a social entrepreneurial approach using networks expands the horizon for innovative solutions. The network approach is particularly powerful because it does not require more resources but instead makes better use of existing resources.

Acknowledgments

I thank the Harvard Business School's Social Enterprise Initiative and the school's Division of Research for its support of earlier research on which this article is based in part, the Center for Nonprofit and Public Leadership at the Haas School of Business, University of California, Berkeley, and the Stanford Graduate School of Business for ongoing support of this research.

This article was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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Improving Population Health: The Business Community Imperative

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Suggested citation for this article: Webber A, Mercure S. Improving population health: the business community imperative. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0086.htm. Accessed [date].

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Abstract

Information on the economic effect of poor population health is needed to engage the business community in population health improvement. In a competitive global market, the United States has high health care costs and poor outcomes (measured by such factors as healthy and productive lives) compared with other countries. US business needs to understand population health and not focus just on the health of employees at the worksite. We describe a long-term approach to population health, including incentives, and identify what is needed to engage business leadership in population health improvement.

The Competitive Challenge

Today, we are spending over \$2 trillion a year on health care — almost 50% more per person than the next most costly nation. And yet, as I think many of you are aware, for all of this spending, more of our citizens are uninsured, the quality of our care is often lower, and we aren't any healthier. In fact, citizens in some countries that spend substantially less than we do are actually living longer than we do.

President Barack Obama, Speech to the American Medical Association, June 15, 2009

The US business community competes in a dynamic global economy. The United States has historically achieved success in the global marketplace by excelling at traditional measures of business performance: innovation, technology application, production engineering, capital deployment, marketing, sales, distribution, and customer service. Increasingly, however, 2 related factors put the US business community at a competitive disadvantage: disease burden such as obesity (1) and increases in costs such as health insurance premiums for employers (2).

Business leaders not yet schooled in all the determinants of health (3) and a US health care system biased toward the treatment of illness often say, "With the growing and added investments I am making in health care for my workers and their dependents, surely my company is producing a healthier and more productive workforce." Sadly, this is not the case. As President Obama stated, the United States spends twice as much per citizen on health care as any other country on earth yet ranks in the lowest tier of advanced countries in health outcomes. In other words, the United States produces more health care for less health (4).

A Commonwealth Fund study illustrates more precisely the competitive disadvantage the United States is facing (5). The study demonstrates that the United States, in comparison with other industrialized countries, ranks lowest in metrics of health care that include quality, access, efficiency, and equity indicators; lowest in metrics of long, healthy, and productive lives; and highest in per capita costs. Other data from the *Dartmouth Atlas* (6) show not only wide variation in health care services but that populations in regions with higher spending levels and more physician visits and hospitalizations do not experience better outcomes or quality of care. Seen through this lens, how well the US business community responds to the related challenges of improving



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health and transforming health care becomes a key driver of market success and of America's future competitiveness and economic security.

This commentary focuses on the role of employers in improving population health. Four issues are addressed: 1) population health from the perspective of employers, 2) incentives for employers to improve population health, 3) opportunities for employers to improve population health, and 4) employers as change agents for improving population health.

Population Health From the Perspective of Employers

Currently used constructs and measures of population health illustrate the multidimensional nature of the determinants of population health outcomes. Many of the determinants of health (7,8) are affected, both positively and negatively, by employers, who contribute substantially to population health by generating industrial production, creating jobs and family income, setting employment policies, and influencing health behaviors through worksite cultures, safety practices, and purchasing health care.

Despite their broad influence on population health outcomes, employers' views of population health are narrowly framed by their self-interests. Simply stated, the population that employers care about is their human capital — active employees — followed by employee dependents, and, for the few remaining employers providing generous benefits, their retirees.

Not as central to employers' definition and understanding of population health is community health or the health of the population where employees and their dependents reside. However, business leaders have incentives and compelling reasons to commit to building cultures of health in the worksite and the community. Employers that wish to maximize their influence on human capital as a competitive asset must develop strategies for workforce and community health.

Incentives for Employers to Improve Population Health

Incentives and rewards are the lifeblood of competitive industries and central to the thinking and culture of busi-

ness leaders. Moral responsibility and doing the right thing are not dominant factors in corporate decision making. Investment decisions are made by building a business case that an investment today will lead to an economic benefit and a competitive edge tomorrow. The challenge is to broaden the scope of self-interest in building the business case.

Sophisticated employers understand the link between maintenance of workforce health, enhanced productivity, and corporate performance. Building a worksite culture of health with executive leadership, making a sustained commitment to developing human capital, and investing in a spectrum of evidence-based worksite health and health care management programs can increase productivity, reduce employer direct (eg, medical claims) and indirect (eg, absenteeism) costs, and improve bottom-line performance (9). A growing number of business leaders now believe that, in a global economy, workforce health is an important competitive asset that affects employer operating costs and shareholder earnings. For leaders in the non-profit sector, improving workforce health and productivity is a key driver in advancing any organization's mission.

Incentives to invest in community health are less direct and salient to business leaders than incentives to invest in workforce health. Nevertheless, a compelling business case can and should be made for business leaders to look beyond the worksite to the communities where their organizations do business and their employees reside. Business leaders must understand that an employer can do everything right to influence the health and productivity of its workforce at the worksite, but if that same workforce lives in unhealthy communities, employer investments can be seriously compromised.

Influences on community health and, by extension, workforce health and productivity, include unsafe communities; the presence of a cheap and convenient but a nutritionally unsound food supply; the absence of health education in school curricula and adequate physical education programs; land use and neighborhood design that discourage physical activity and create dependency on car transportation; a health care system with a weak prevention and primary care infrastructure that is oriented toward treatment of acute illness; and poor air and water quality.

Using this broader perspective, the business community's view of population health can radically shift, and strong incentives emerge for employers to invest in com-

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munity health intervention strategies. What also emerges is an understanding that individual employers do not have the needed leverage on their own to influence community health and health care. Instead, employers must work together collectively and with other community stakeholders on population health strategies that can make a difference. Such an understanding has led during the past several decades to the establishment of business and health coalitions dedicated to improving health and transforming health care, community by community.

The incentives and the business case for employers investing in building healthy communities include the following:

- Improve the health status, and therefore the productivity, of an employer's current and future workforce.
- Control direct (health care) and indirect (absenteeism, disability, presenteeism) costs to the employer.
- Create both the image and the reality of a healthy community that may help recruitment and retention of workforce talent in tight labor markets.
- Increase the buying power and consumption level for business products, in particular nonmedical goods and services, by improving the health and wealth of a community.
- Strengthen an employer's brand and recognition in the community.
- Generate, for individual business leaders, positive feelings of civic pride and responsibility and of being a constructive member of the community.
- Channel corporate philanthropy in a direction that will improve community relations, goodwill, or branding with the potential for a positive return for the business enterprise itself.
- Help create public and private partnerships and a multistakeholder community leadership team that can become the foundation for collaboration, cooperation, and community-based problem solving for many other issues affecting the business community, such as economic development and education.

Opportunities for Employers to Improve Population Health

Whereas current employer efforts focus on building worksite health promotion initiatives, community-based health improvement strategies are emerging that enjoy

Box. National Business Coalition on Health, Sample of Member Coalitions With Initiatives to Improve Community Population Health	
Coalition	Coalition-Led Initiative for Community Population Health
Buyers Health Care Action Group Minneapolis, Minnesota www.bhcg.com	Collaborative initiative with public and private employers to measure and improve health with Healthiest Twin Cities including diagnosis and treatment for chronic conditions and healthier lifestyles
Employers Health Coalition Arkansas Fort Smith, Arkansas www.ehcark.org	Cooperative effort with public health for fluoridation of water to promote oral health
Heartland Healthcare Coalition Morton, Illinois www.hhco.org	Community public campaign to address inappropriate use of antibiotics with employer action component and outreach to primary care physicians
Louisiana Business Group on Health Baton Rouge, Louisiana www.lbgh.org	Medical home initiative including Medicare and Medicaid to address integrated health care with patient engagement and prevention with emphasis on primary care
Memphis Business Group on Health Memphis, Tennessee www.memphisbusiness-group.org	Founding member of Healthy Memphis Common Table, which includes consumers, providers, government, and other stakeholders, to address treatment and prevention of obesity and other chronic conditions for a healthier community
Mid-America Coalition on Health Care Kansas City, Missouri www.machc.org	Three-part program to address depression with public education, practitioner engagement for diagnosis and treatment, and worksite initiatives; now leading a Healthier Heartland initiative with multiple stakeholders
Savannah Business Group on Health Savannah, Georgia www.savannahbusinessgroup.com	Leader in an initiative with city and other stakeholders targeting nutrition, exercise, and obesity with a special focus on schools

the active participation from and leadership of the business community. Many of these initiatives have emerged from employer-based health coalitions that surfaced during the past 3 decades principally to address rising health care costs through *value-based purchasing* (10). Coalitions have learned that community-based organizations collectively representing employers (and their aggregate purchasing power) can provide more leverage on the local

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health care delivery system than any single company. Now coalitions are applying that same philosophy to influence strategies for broader community health improvement.

Distinct opportunity areas for improving community health quickly surface when employer-led coalitions and members of the National Business Coalition on Health (NBCH) work in partnership with public health officials and other community stakeholders (Box). Many of these partnerships focus on the more clinical aspects of health (eg, cardiovascular health, diabetes, asthma, and depression) but are quickly moving to a more upstream approach focused on primary prevention and better support for healthy lifestyles.

A cross-cutting example is from the Florida Health Care Coalition (FHCC) (11). FHCC, a member of NBCH, partnered with the American Lung Association of Central Florida to bring to the local schools Open Airways for Schools, a school-based asthma risk assessment and health education program for children with asthma in grades 3 through 5 (ages 8-11). FHCC worked with 2 school district members to secure funding for Open Airways instructors to visit the schools and provide asthma education for school officials as well as children. This type of population outreach to dependents of employees — and the broader school community — benefits employers by reducing children's emergency department visits and the associated work time lost by parents. Business-led health coalitions demonstrate creativity and distinctive approaches to improving the health of the population.

Employers as Change Agents for Improving Population Health

Examples of population health improvement — from workforce to community health improvement — demonstrate that models exist. But what is needed to expand this work, particularly at the community level, and with employers in a leading role? We recommend four distinct needs: 1) evidence-based interventions, 2) performance incentives, 3) metrics, and 4) business leadership.

Evidence-based interventions

As business leaders know, success often depends on a good business plan and disciplined execution. As employers become more convinced that they should invest

in improving workforce and community health, they will then want to identify the evidence-based intervention strategies that work. Building the evidence base and the lessons learned from a long history of population health strategies and organizing such information so it is easily accessible to community leaders is a priority (12,13).

Performance incentives

In workforce health improvement initiatives, employers are aggressively implementing incentives to motivate and help move employees and their dependents toward better health. Provider pay-for-performance strategies have become a central and universally recognized element of health care reform legislation and corresponding value-based purchasing initiatives in the private sector. Performance incentives are needed as a catalyst and motivator for community health improvement. With rare exceptions, not enough attention has been paid to strategies and mechanisms that could reward population health improvement (7). Innovative performance incentives should be rapidly explored and tested. Approaches might include making performance-based payments to integrated *accountable care organizations* that can manage population risk or tying the allocation of federal and state public health dollars to communities improving population health status.

Metrics

Meaningful metrics are an essential ingredient of employer engagement in population health. The field of worksite health has increasingly generated a set of metrics that tie improved workforce health status and reduced illness burden to quantifiable business performance. Similar metrics for community health indicators relevant to business are more elusive.

Typical population health measures relate to length of life, self-reported health status, access to care, disease prevalence, individual health behaviors, socioeconomic factors, and the physical environment. Are these considered meaningful metrics to a business leader? And what is the benefit to business of an improved population health score? Any metric embraced by the employer community needs to speak the language of business. In particular, understanding the revenue benefits of a healthier community is essential, whether the effect comes from reductions in direct health expenditures, improvements in workforce productivity, or customer buying behaviors.

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Leadership

Business leaders go to work each day with this question in mind: “How can I make my company’s products and services more competitive in a global economy?” Business leaders do not often think about their company’s role as a primary contributor and change agent for improving health and health care. Yet, as key stakeholders with a substantial influence on health and health care, they must — or risk continuation of the status quo. Deteriorating workforce and community health and an expensive and broken health care system affect the bottom line and warrant the immediate attention of business leaders (13). The business community, in its role as employer, health care purchaser, and respected community leader, is in a unique and powerful position to be a change agent. Who else has both the motivation and status in the community to play this key leadership role?

Conclusion

Poor health and rising health care costs in America are problems in search of employer leadership and solutions. Although many businesses still treat health as an operating cost to be managed, an increasing number of employers — large and small — have begun investing in human capital and building cultures of health at the worksite. There has been less employer attention, leadership, and investment in improving the health of communities and understanding the influence and impact of population health status on business performance. Nevertheless, the work of business and health coalitions indicates that strategies for community health improvement are building momentum and that employers play a lead role. These efforts would be buttressed by more inspired leadership from individual corporate leaders, a stronger evidence base for community health intervention strategies, the establishment of performance incentives for population health, and metrics that speak the language of business.

Acknowledgments

This work was funded by the Robert Wood Johnson Foundation as part of the Mobilizing Action Toward Community Health (MATCH) project.

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Designing Vermont's Pay-for-Population Health System

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Suggested citation for this article: Hester J Jr. Designing Vermont's pay-for-population health system. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0072.htm. Accessed [date].

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Abstract

Vermont is developing a health care system that could offer a unique opportunity to test a new model for improving population health. Four lines of development converged for the system: 1) a published challenge to create a pay-for-population health system, 2) comprehensive state health reform legislation, 3) the Institute for Healthcare Improvement Triple Aim project, and 4) the concept of the accountable care organization (ACO). In phase 1 of pilot testing, 3 communities serving 10% of the population are using the system, which is based on the *enhanced medical home* model. Planning is under way for phase 2 of the pilot, ACOs that use incentives based on the Triple Aim goals. Vermont has created a conceptual framework for a community health system and identified some of the practical issues involved in implementing this framework.

This article summarizes the design and implementation of the enhanced medical home pilots and the results of a feasibility study for the ACO pilots. It describes how one state is using a systematic approach to health care reform to overcome some of the implementation barriers to a pay-for-population health system. Vermont will continue to provide a statewide laboratory for a pay-for-population health system.

Introduction

Since 2006, 4 lines of development have converged in Vermont's health care reform program, creating a unique opportunity to test a new model for improving population health. First, more than a decade ago, Kindig (1) issued a challenge to improve the outcomes of an American health care system that spends twice as much per capita for health care services as other developed countries, while achieving third-world rates of illness and death. Recently, he renewed the challenge, calling for the development of a "pay-for-population health performance system that goes beyond medical care to include financial incentives for the equally essential nonmedical care determinants of population health" (2).

Second, in 2006 Vermont enacted legislation creating one of the nation's most ambitious health care reform programs (3). Building on foundations laid in the previous 5 years, the state attempted to achieve a sustainable reduction in the number of uninsured residents, accelerate the implementation of health information technology, and transform the prevention and treatment of chronic illness through a program called Blueprint for Health. Treatment of chronic illness accounts for more than 65% of all health care expenses in Vermont, but current practices offer major opportunities for improving performance. Blueprint for Health is based on the Chronic Care Model (4) and is a true public-private partnership supported by a broad base of stakeholders (5). Having only 600,000 residents, Vermont proved to be an ideal laboratory for testing meaningful delivery system reform as a major component of its broader health care reform effort to improve coverage and health information technology. Its small-scale, noncompeting delivery system and history of collaboration between stakeholders provided a supportive, nurturing environment for the proposed changes. Every year



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since the initial health reform legislation passed in 2006, Vermont has added legislation to strengthen and broaden health reform, including mandating a model called the *enhanced medical home* and coordinating strategies to prevent chronic illness. The legislature and its Health Care Reform Commission have led this process, but the implementation of delivery system reform has required sustained shared leadership by both the legislative and executive branches and by private-sector stakeholders.

Third, in 2007 the Institute for Healthcare Improvement began its Triple Aim project to drive large-scale system change by 1) controlling total per capita medical costs, 2) improving the population's health, and 3) improving the care experience of health care consumers (6). The institute created a learning collaborative that brought together an international collection of health care organizations implementing the Triple Aim project. The Vermont Blueprint for Health accepted the invitation to join the initial learning collaborative and continues to participate.

Finally, Vermont adopted the model of the accountable care organization (ACO) suggested by Fisher et al (7) based on their research documenting widespread, large variations in health care use without improvement in outcomes. The ACO model is built around creating a new set of financial incentives for a community provider network of physicians, local hospitals, and other caregivers for a defined population. The financial incentives are based on a pool of shared savings that is distributed when specific quality criteria are achieved.

This article describes Vermont's statewide effort, which weaves together these 4 lines of development and offers the prospect of creating a prototype for Kindig's pay-for-population health system in similarly rural areas. As part of its broader health care reform agenda, Vermont is attempting to build a statewide network of community health systems, which would provide both the infrastructure and financial incentives required to improve population health. The community health system involves multiple levels of reform to create the integration needed for effective population health incentives. The first, most basic, level is the enhanced medical home, which gives primary care practices the ability to better coordinate care with other providers and support behavior changes in their patients. The second level is the ACO, composed of the local hospital, specialists, and other key providers who work with the medical home practices. The Vermont

community health model incorporates a prevention and population health incentive.

By the end of 2009, phase 1 of system reform was implemented in 3 pilot communities serving 10% of the state's population. Planning is under way for phase 2 pilot programs that combine the ACO concept with an incentive model built on the Triple Aim goals. Legislation enacted in May 2010 expands the enhanced medical home program from a pilot to a statewide initiative and commits state support to phase 2: 3 ACO pilots that use incentives based on the Triple Aim goals. Several characteristics make Vermont a unique statewide laboratory for implementing these reforms. It has a small population, a delivery system with no directly competing hospitals, a simple payer system with only 3 major commercial payers, and a long tradition of collaboration between major stakeholders. Health care reform has enjoyed long-term bipartisan support from both a Republican governor and a Democratic-majority state legislature. These qualities make it unlikely that other states will implement community health systems in exactly the same way that Vermont has, but the conceptual framework developed in Vermont can be generalized to other settings, particularly those with more rural delivery systems. This article will first present the conceptual framework of the proposed network of community health systems, focusing on the different types of integrator roles necessary for success. Then, it will describe the design of the enhanced medical home pilots and the results of the feasibility study for the ACO pilots.

A Conceptual Framework for a Community Health System

The Vermont experience has revealed the necessity of integration at 3 geographic levels.

- **Enhanced medical home.** The National Committee for Quality Assurance (NCQA) defines the *patient-centered medical home* as a health care setting that facilitates partnerships between patients and their physicians through the use of registries, information technology, and health information exchange. This is the foundation level of integrating care to meet individual patient needs. The medical home is particularly challenging for small practices that must coordinate care across multiple settings and support patients through long-term behavioral changes. Because most Vermont primary

care practices are small (fewer than 5 physicians), the Blueprint for Health uses an enhanced medical home model, which provides more support to small practices.

- **Community health system.** The ACO is 1 example of a community health system, what Fisher called the “neighborhood for the medical home” (8). The broader definitions of an ACO require only primary care physicians, but for Vermont, this geographic level must consist of at least a local health care provider network composed of a community hospital, its medical staff of primary care and specialist physicians, and other caregivers working within a geographic area that would typically be defined by the service area of the hospital. The community health system level needs to expand to include a broader array of public health and community resources for maintaining the health of a population. Large urban areas could have overlapping community health systems in the same region, which complicates their development. Fortunately, Vermont’s rural quality means none of its 13 hospital service areas overlap.
- **Region or state.** The medical home and community health system levels depend on the creation of supporting infrastructure at a larger regional level. Some examples are health information technology support, such as regional health information exchange (secure, appropriate exchange of digital health information among providers and with patients); payment reforms; and technical support services and training programs to develop process improvement capacity and disseminate best practices. In Vermont, this supporting infrastructure has been implemented at the state level, but larger states may need to use regional structures.

The 3 geographic levels are interdependent, interacting through the following 5 categories of functional capacity that create the required integration.

- Service integration is necessary across levels and settings of care. Examples include patient-centered integrated care models at the patient level and integrated health care, public health, and social services that support population health at the community level.
- Financial integration refers to unified payments and incentives across multiple payers at the state level and local management of integrated budgets at the community level. Vermont used legislative mandates to require Medicaid and major commercial payers to participate in a common set of payment reforms to support delivery system transformation. The state could not mandate

Medicare participation, but it used state funds to pay for Medicare’s share of payment reforms so it could test all payer models in its pilots.

- Governance provides leadership and establishes accountability at the community level under a state-regulated framework.
- Process improvement refers to changes in clinical and administrative processes to improve performance at both the patient-centered medical home and community health system levels. This capability lies at the heart of a high-performing health system and requires engagement at all 3 geographic levels.
- Information tools include both information technology and reports to support care and to assess performance. Successful implementation of effective information tools requires mutually supportive efforts at all 3 geographic levels.

Vermont’s reform plan consists of 2 phases, the first at the medical home level and the second at the community health system level. These reforms include changes in financial incentives to transform the delivery system; they have been challenging to design in a multipayer environment. Although payment reform is necessary, it is not a sufficient requirement for building a community health system. Too often, policy makers have assumed that simply changing the financial system will drive other necessary changes. Vermont’s experience shows that the substantial structural changes needed require building new capabilities in all 5 functional categories.

To concentrate resources and coordinate efforts, Vermont used pilot communities. This approach had several benefits. First, because the changes were pilots and not systemwide, they were less threatening and easier to adopt. For example, it would have been impossible to implement all payment reforms statewide. Second, the competition to become a pilot community galvanized local leadership and created a more receptive climate for change. Third, scarce state resources could be focused in a more concentrated way, which prevented their premature dilution. Finally, the pilot design incorporated formative evaluations, which allowed the state to learn while implementing and recognize that these efforts are a work in progress. The corollary to the use of pilots is that scaling them statewide will require federal support through national health reform. Vermont can begin the process of building a community health system but cannot finish the task with state resources alone.

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Phase 1: The Enhanced Medical Home

The enhanced medical home pilots involve primary care practices in 3 communities (9). These pilots are designed to strengthen the functional capacity of primary care practices to coordinate care across settings and to support behavior changes in their patients while providing the infrastructure to enable them to serve as a medical home. The objective of the pilots is to reduce the prevalence of chronic illness and its complications and to improve compliance with national prevention and treatment guidelines. The pilots have 5 components.

- **Financial reform.** All major payers — the 3 major commercial insurers, Medicaid, and Medicare — must reform their payment systems. (To begin the program in a timely way, the state is paying the full incremental costs for Medicare patients, with the objective of obtaining federal support in 2010.) The payment reform features 2 elements — a monthly per capita payment directly to each practice and the funding of a local community health team as a shared resource for multiple practices. The per capita payment is based on a semiannual assessment of each practice by outside evaluators using the NCQA Patient Centered Medical Home assessment tool (10). Each payer makes a monthly payment to the practice based on the score and the payer's panel size. For a physician with a panel of 2,000 patients, the maximum payment would be approximately \$60,000 per year in addition to the usual fee-for-service payments.
- **Community health teams.** These are multidisciplinary teams that provide support and expertise to enhanced medical home practices through direct services, care coordination, population management of the patient panel (based on segmentation according to need), and quality improvement activities. Because community health teams are designed to meet the needs of their specific communities, the exact mix of resources varies. They typically include nurse care coordinators, behavioral health professionals, community health workers, and a prevention specialist from the district office of the Vermont Department of Health (a total of 5 full-time equivalent staff for a patient population of 20,000). Involving the prevention specialist in the community health team ensures that prevention programs are developed collaboratively by public health and health care delivery specialists, while maximizing program impact.
- **Health information technology.** A medical home is unlikely to function effectively without robust health

information technology tools to identify patients with chronic illnesses, track their needs, and coordinate their care. The Blueprint for Health defined a core set of guideline-based data elements that are common across all sites, and each site enters those data into a Web-based clinical tracking system called the DocSite Registry (DocSite, LLC, Raleigh, North Carolina) that is used by all practices in pilot communities. DocSite captures data on all patients who are active with the practice. It can produce both visit planners to structure the activities for each patient visit and population-based reports at all 3 geographic levels. Participating practices have updated their electronic medical records to provide the core data elements to DocSite through statewide health information exchange. Practices have found DocSite essential for producing the population-based reports necessary to track patients and coordinate care.

- **Community activation and prevention.** Three tasks of the community health team are to complete a community risk profile, prioritize prevention interventions, and implement a local prevention plan in coordination with the delivery system. In developing the community risk profile, the community health team's prevention specialist is supported by state data sources, including vital statistics, hospital discharge data, census data, Behavioral Risk Factor Surveillance System data, and surveys of tobacco use prevalence. The pilot communities are merging elements from these databases to create multidimensional data sets capable of providing rich profiles on the health of the population. For example, the St. Johnsbury community health team has been collaborating with staff from the Dartmouth Population Health Research Center and the Triple Aim project to develop its population health measures. The team has created a local version of the drivers-of-health model developed by the University of Wisconsin that includes nonmedical determinants of health (11).
- **Evaluation.** The pilot programs will be comprehensively evaluated after 20 months using data sets that include the NCQA Patient-Centered Medical Home scores, clinical process measures, health status measures, cost and utilization measures from a multipayer claims database, and population health indicators. The patients in the pilot practices will be compared with a matched sample of patients outside of the pilot practices. The data collection for the evaluation has been built into the transaction support for the day-to-day operation of the pilots and is designed to have minimal additional impact.

Phase 2: The Accountable Care Organization

If the phase 1 pilots achieve results similar to those of other closed-system settings such as the Geisinger Health System (12), they will be able to meet the first of the Triple Aim goals, per capita cost savings, by reducing unnecessary hospital admissions and emergency department visits for treatment of chronic disease. To meet the other 2 Triple Aim goals of improving population health and experience of care, the local community health system must be able to share in those savings and reinvest them locally. The community activation and prevention plan created by the pilot community health teams will guide investments in each community, including priorities for key nonmedical determinants of health. However, in the absence of a second phase of reform, the financial benefits of the enhanced medical home simply flow downstream to the payers. The primary care practices have received an enhanced payment, but otherwise the community has no additional resources available to improve the health of its population.

Vermont's ACO model incorporates the Triple Aim incentives to address this issue. The model creates a shared savings incentive pool based on projected medical expenses, which is distributed on the basis of agreed-on quality measures and population health targets. As the next stage of health system reform to build a sustainable community health system, ACO pilots will be implemented. The Health Care Reform Commission has conducted a feasibility study for implementing a community-level incentive system based on ACOs (13). At the same time, the Dartmouth Institute for Health Policy and Clinical Practice and the Engleberg Center for Health Care Reform at Brookings jointly developed a national learning collaborative to implement several ACO pilots nationwide. Staff from both organizations participated in the Vermont feasibility study and contributed their research findings. After finding encouraging results from this study, legislation was passed directing the Health Care Reform Commission to collaborate with the executive branch of the state government and interested provider networks to develop a Vermont application for the ACO national learning collaborative (14).

The ACO feasibility study created a working design for the pilots, building on the medical home as the essential first step (15). The Health Care Reform Commission

created a broad-based work group that identified potential obstacles to building the community level of integration. The group focused on 3 categories.

- **The scope and scale of the pilot.** The scope of covered benefits included in the shared savings budget should be broad, encompassing not only physician and hospital care but also prescription drugs and behavioral health services. To have statistically meaningful medical expense budgets and savings, the minimum population for an ACO is 15,000 commercial members, 10,000 Medicaid members, or 5,000 Medicare members.
- **Functional responsibilities of an ACO and criteria for a community provider network to qualify.** To succeed as a system integrator, an ACO must possess the 5 functional capacities (financial reform, community health teams, health information technology, community activation and prevention, and evaluation). The pilots need to start with a local provider organization such as a physician-hospital organization with experience and a proven track record in most of these skills.
- **Financial model and the design of Triple Aim incentive measures.** The work group concluded that reasonable starting points for meaningful measures of all 3 Triple Aim goals (controlling total per capita medical costs, improving population health, and improving the care experience) were available. They explored in detail key issues in designing the financial model and setting total per capita cost targets. These efforts yielded a set of population measures that could be implemented in approximately 2 years, with the understanding that the measures would likely change rapidly after implementation.

Qualified ACO pilot sites were identified, and the Vermont ACO pilots are being developed. The state regulatory agency for insurance is facilitating conversations with commercial insurers regarding a shared savings pool. Vermont's state Medicaid agency is also developing a plan to participate in the ACOs. The Blueprint for Health program is contributing to the design of the ACO model to ensure effective coordination between the medical home practices and ACOs.

Conclusions

Vermont has not yet created a true pay-for-population health system, but the state has found no obstacles

that cannot be overcome. A substantial missing piece, federal participation, is not assured, but national health care reform legislation explicitly authorizes and funds Medicare participation in ACO pilots. Vermont provides a statewide laboratory for assembling a bench model that will allow the state to test design issues that still need to be explored. Building a replicable, functioning pay-for-population health system should be just a matter of time.

Acknowledgments

This manuscript was developed as part of the Mobilizing Action Toward Community Health (MATCH) project funded by the Robert Wood Johnson Foundation.

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The Governance of Standard-Setting to Improve Health

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Suggested citation for this article: Fox DM. The governance of standard-setting to improve health. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0027.htm. Accessed [date].

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Abstract

This article describes recent events in the governance of standard-setting for 2 areas of US health policy — states' decisions about which prescription drugs to cover under Medicaid and other public programs and making health an aspect of foreign policy — and whether these events offer lessons for policy making. In prescription drug coverage, methodologic advances in research that evaluates health services and the politics of restraining the rate of growth in health expenditures enabled policy makers in most states to establish new public processes for assessing and applying evidence about the effectiveness of competing drugs. Their counterparts in foreign policy, in contrast, made few changes in existing processes for choosing which interventions to support. The history of governance in each area of policy making for health explains the selection of standards to evaluate evidence about interventions and whether and how to use this evidence to guide policy.

Introduction

Government leaders at every level choose among alternative policies mainly as a result of governance. Researchers in the policy sciences (eg, history, politics, economics, law) describe governance as encompassing the complex relationships among people and organizations that influence the making and implementing of policy. Understanding

governance requires analysis of the authority and accountability embodied in constitutions, laws, and regulations; the politics of professional, commercial, and advocacy groups; and the shaping of public opinion. Moreover, ideas and beliefs — some contested, others consensual — influence the governance of each area of policy. In sum, governance is the source of the “power to make, the willingness to obey, and the decisions to contest rules and commands” (1).

This article describes, compares, and seeks lessons from the effects on standard-setting of recent changes in the governance of health care policy in the states and of health as an aspect of American foreign policy. During the past decade, almost all of the states established public processes to set standards for evaluating research findings on the effectiveness of pharmaceutical drugs, for adjudicating competing claims about the strength of the evidence for these findings, and for advising about or, in some jurisdictions, recommending policy. In contrast, the events that raised the priority accorded to health as an aspect of foreign policy did not establish new processes that set standards for how the best available evidence would inform policy. As a result, the conventional governance of foreign policy set standards for which determinants of health to address and with what interventions.

History of the Governance of Population Health

Governance and the delegation of authority

Until recently, the governance of most countries' jurisdictions resulted in the authority for setting standards for health policy being split among different influential groups. Public officials set standards for investigating, measuring, and, if possible, acting to reduce the incidence



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and prevalence of disease and improve the safety of patients in clinical facilities. In each country, governance determined the influence of the best available research and lobbying by commercial, professional, and reformist interest groups on these standards.

Governance in most countries resulted in authority for science being delegated to communities of researchers. Researchers usually dominated the prioritization of subjects for investigation and set standards for methodology and evidence. They governed science through professional associations, national academies and colleges, universities, foundations, and government funding agencies.

Governance also resulted in authority being delegated to the health professions. For centuries, physicians have had legal authority to license, certify, credential, and discipline their colleagues. As a result of this authority, they acquired substantial autonomy beyond what had been legally granted to them to set and enforce standards for care. Physicians tenaciously protected this autonomy when, during the 20th century, governments delegated more limited authority to other health professions to license and discipline their members.

However, governance could not divide authority to make and implement policy to address determinants of health that involved physical infrastructure, personal behavior, and socioeconomic conditions. For example, since the 19th century, coalitions in the United States and other countries supported the allocation of considerable tax revenue for sewerage and the chlorination and filtration of water. By the early 20th century, investment in technologies to produce clean water was “responsible for nearly half the total mortality reduction, three quarters of the infant mortality reduction, and nearly two thirds of the child mortality reduction [in] major American cities” (2).

Innovations in governance

Other innovations in public health policy occurred as a result of governance that involved public agencies, the medical profession, and leaders of business, philanthropy, and labor. For example, international collaboration among researchers and public officials to define diseases in order to report and quantify cases began in the 1850s. By the end of that decade, William Farr, a British health official, had devised a “model healthy population to serve as a standard” for calculating excess mortality among health

districts (3). By the 1980s this concept, elaborated, had become the basis of the *European Community Atlas of “Avoidable Death”* (4).

By allocating resources to address other determinants of population health, governance facilitated the implementation of health care policy. Beginning in the 1850s, for instance, William Farr collaborated with Florence Nightingale in achieving policy to measure excess deaths in public and charitable hospitals. Then they acquired resources to evaluate interventions to reduce excess mortality by intervening in both the care of patients and the management of hospital environments (5). Efforts continue to persuade policy makers to link interventions with individuals and with populations. For example, a recent US study of avoidable deaths found that “health improvement requires investment in . . . health care, behavioral change, and socioeconomic factors” (6).

Addressing multiple determinants of health in governance

Governance also has been mobilized to address multiple determinants of health. One of the earliest examples of this mobilization occurred in New York City in the 1890s when public health officials proposed mandatory reporting of tuberculosis, which the medical profession strongly opposed. Then the city’s political machine, Tammany Hall, along with leaders of business and philanthropy who usually opposed Tammany, endorsed mandatory reporting (7). Another example of the mobilization of governance to address multiple determinants of health occurred in many low- and middle-income countries from the 1920s through the 1960s. Public officials in these countries, often collaborating with leaders in business, labor, religion, and philanthropy, prioritized investment in raising standards for education and public health rather than for health care (8).

Governance in industrial countries frequently results in the prioritization of determinants of health other than care during crises. Until the mid-19th century, for instance, hunger and its effects were not problems of governance. Prevailing belief ascribed hunger to individual misbehavior or inexorable natural forces. Governance then redefined hunger as a problem caused by economic, social, and political circumstances. By the 1920s, scientific advances distinguished starvation from malnutrition, and policy emerged to address both conditions. During World War II, a British official described the effects of public, civic, and

private activities to prevent starvation and malnutrition. He reported that the “people of this country are actually better fed today from the point of view of health than they were before the war” (9).

In each of the examples above, participants in governance had incentives to address determinants of population health. Healthier voters enhanced Tammany’s political capital and were more productive employees. Policy makers and their allies in low- and middle-income countries built schools and educated their citizens about managing health risks, in large part because they had fewer resources than their counterparts in industrial countries. The governance of wartime Britain strongly endorsed food policy that maintained a productive workforce and contained class conflict.

Precedents also exist for standards that address multiple determinants of health in the governance of foreign policy. During the 1930s the League of Nations Health Organization promoted science-based standards for nutritional policy, usually collaborating with external scientific, professional, and philanthropic organizations. In the 1950s, leaders of philanthropic foundations and public officials in the United States collaborated to expand the scope of foreign policy to include aid for family planning in low-income countries.

The Conventional Politics of Setting Standards for Health

In each of these examples, research findings on population health informed governance through conventional political processes. Researchers, physicians and other health professionals, advocates for patients, and lobbyists for commercial interest groups published studies and polemics, informed journalists, testified to legislative committees, visited policy makers, and contributed to their campaigns. Officials of national and subnational governments, multinational public organizations, philanthropies, and advocacy groups issued reports and promoted policies to set and raise standards for health.

Unanticipated consequences of these conventional mechanisms of governance impeded making policy to improve population health. Elected officials have had grounds for skepticism about scientific advice given to them by patients’ advocates, workers, members of racial and eth-

nic minority groups, and even charitable organizations, as well as from lobbyists for commercial and professional organizations. Policy makers have, for instance, often distrusted advice from career scientists within government because these civil servants have frequently collaborated with (and subsequently became employees of) advocacy and industrial organizations that interpreted scientific evidence in ways that promoted their self-interest (10).

Changes in Governance

Advances in research and evaluation methods

Despite interest-group lobbying and the skepticism of policy makers, science that met international standards of excellence has frequently been effective in the governance of population health policy. Examples include regulating lead in gasoline and paint, asbestos in building materials, and vinyl chloride as an industrial chemical (11) and limiting exposure to secondhand tobacco smoke in public places and workplaces. In each of these instances, findings from research that was independent of commercial or ideological influence helped government officials persuade colleagues and constituents to support new regulations, even when these policies adversely affected the earnings of corporations and individuals and restricted personal liberty.

Advances in methods for evaluating the effectiveness of health services have influenced governance around the world since the early 1990s. These methods enabled policy makers to challenge assertions about what services to pay for that were based mainly on claims of authority by medical professionals and sometimes on questionable evidence promoted by commercial and advocacy groups. The most prominent example of this influence of research on governance is the methodology of research synthesis and its use to conduct systematic reviews of the effectiveness of prescription drugs, medical devices, care processes, and public health interventions. Authors of systematic reviews who accept international standards exclude the weakest and most biased primary studies and conduct meta-analyses to minimize bias in studies they select for synthesis. The number of systematic reviews published each year in the international literature recently increased from 87 in 1988 to an average of 2,500 in 2005 (12).

Methodologic advances that have increasing influence on governance also occurred in other disciplines in recent

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decades. New methods for measuring and improving the quality of health care, work that was subsequently labeled quality science, evolved from the study of industrial processes in the general economy and from general and clinical epidemiology. Advances in the methods of economics increased the persuasiveness of cost-effectiveness analysis and created new approaches to studying social well-being and analyzing different forms of organizational governance. Similarly, advances in the methods of political science, sociology, and historical epidemiology generated findings that interest some key participants in governance; for example, quantifying the relationship between changes in health care infrastructure and health status, educational attainment, and even the stability of regimes in low-income countries.

The new governance of evidence-informed standards

Recent innovations in the governance of health care in most industrial countries are assisting policy makers to counter pressure from interest and advocacy groups in new ways. Policy makers have established organizations — sometimes called agencies, commissions, committees, councils, or institutes, but which will be called *review organizations* hereafter — that commission, conduct, and report on independent research that evaluates interventions. These organizations usually recommend policy or issue guidance that has the force of law. The first review organizations assessed new interventions, especially those involving drugs and devices, but their scope is steadily expanding. Review organizations are led by experts in health research, policy, and clinical practice or appoint such experts to advisory groups (13).

Staff of these organizations often share experience across national and subjurisdictional boundaries. As a result of these exchanges, most of the organizations are applying internationally accepted standards for methods to evaluate drugs, devices, and care processes. Research from one country often supports a report under attack in another.

Review organizations dealing with the governance of health care have antagonists. Manufacturers of drugs and devices, the research and advocacy groups they finance, and some associations of medical specialists frequently challenge public and quasi-public organizations that evaluate health services. These critics often deplore decisions that limit coverage to the most effective interventions.

Many insist that analysis of cost-effectiveness masks decisions to ration care.

The frequency and sophistication of these challenges has increased since the 1990s because of the rapid increase in the number of public, quasi-public, and nonprofit organizations that use evidence-based health research to inform their recommendations. This growing use of evidence-based health research followed the advances in methodology summarized above. These advances influenced governance because they coincided with the dismay of many policy makers and employers about increasing expenditures for health care. The first project to use systematic reviews to evaluate an entire area of health services published its results in 1989 (14). The Cochrane Collaboration, organized in 1993, has established an international process for improving the standards and methods of systematic reviews. It also created, enlarged, and sustained an international community of reviewers.

The standards set by most of the review organizations threaten manufacturers and their allies in the supply chain, as well as many researchers, because they address sources of systematic bias in conducting and reporting research. For example, the review organizations' standards for disclosing and avoiding conflict of interest are often higher than those of most universities and funders of primary studies. Many review organizations also require that evidence submitted to them by industry be made publicly available.

Despite considerable opposition, evidence is accumulating that policy created on the basis of the work of organizations that conduct and assess systematic reviews of prescription drugs and other interventions is improving the quality of care and containing growth in spending. The application of science-based regulatory standards shifts market share, often drastically, to the most effective interventions.

Some public review organizations in the United States and other countries also evaluate interventions to prevent disease and address determinants of health other than care. The United States Preventive Services Task Force systematically reviews evidence of effectiveness and issues recommendations. The Guide to Community Preventive Services of the Centers for Disease Control and Prevention commissions systematic reviews of interventions to improve population health but does not recommend policy.

The National Institute for Health and Clinical Excellence (NICE) in the United Kingdom has published public health “guidance” based on evidence reviews for interventions that have recently included behavior change, community engagement, social and emotional well-being in primary education, and promoting physical activity. Policy makers have recently asked a few review organizations to recommend the reallocation of resources from ineffective services to address determinants of health other than care. Such public discussion has occurred — and generated controversy in governance — in Australia, England, France, and Spain (15).

The changes in governance that have raised evidentiary standards for policy for health care and population health are a result of the gradual redistribution of power. Redistribution is occurring because of growing agreement on 2 points among many leaders of government, business, the health professions, and the media: 1) that the rate at which spending for health care has been increasing is unsustainable and 2) that much care is ineffective, unnecessary, or harmful. This agreement is reflected in changes in governance that are mitigating political barriers to higher evidentiary standards for the coverage of health services (eg, the sections on comparative effectiveness research in Patient Protection and Affordable Care Act of 2010 in the United States) (16,17). These barriers are, however, still daunting.

Standards for Health in the Governance of Foreign Affairs

Improving health has become a funded rather than symbolic goal of foreign and national security policy since the late 1990s. The US Central Intelligence Agency reported in 1998 that high infant mortality was a significant predictor of the failure of states. During the second Clinton Administration, the National Security Council for the first time assigned a staff member to address issues in global health. In 2001, a new secretary of state, Colin Powell, appointed the first assistant secretary of state for health. Ambassadors rather than aid officials in Washington and low-income countries administered the President’s Emergency Program for AIDS Relief (PEPFAR) enacted in 2003. A committee of the Institute of Medicine recommended that the incoming Obama administration “highlight health as a pillar of US foreign policy.” The United States and other donor countries

increased spending for health by more than 600% during the past 2 decades (18-20).

The salience of health as an aspect of foreign affairs increased without changes in governance as substantial as those that have occurred in decision making for health care. Policy makers for health in foreign affairs and their allies outside government have often refused or been reluctant to apply findings from research on the effectiveness of interventions. Some opposition to applying the findings of independent research is ideological (eg, advocates of abstinence-only programs to prevent HIV infection) or commercial (eg, resistance from pharmaceutical companies to purchasing generic drugs with PEPFAR funds).

Many experts on international health and their allies in government have also resisted applying the best available findings from research. Following are some examples from my experience. A Washington-based nongovernmental organization (NGO) appointed an internationally prominent systematic reviewer as its director of research and then denied him access to its grant funds from the Bill and Melinda Gates Foundation. Leaders of health-related NGOs from many countries opposed a recommendation by a work group of the Council on Foreign Relations that PEPFAR take account of findings from systematic reviews (21). The first administrator of PEPFAR in the US Department of State and the program’s chief physician met with the authors of the recommendation but declined to accept it. As a participant in these events, I speculated that this resistance to the best evidence was about protecting territory: for NGO leaders, access to and approval by funders in government and foundations; for PEPFAR officials, to avoid collaborating with and perhaps funding federal agencies that sponsor research that evaluates interventions to improve health.

The World Health Organization (WHO) endorses systematic reviews but has been ambivalent about using them to set standards for policy. WHO’s Model Lists of Essential Medicines and its program on maternal and child health rely on reviews published by the Cochrane Collaboration. However, WHO continues to recommend Directly Observed Therapy/Short Course (DOTS) for treating tuberculosis despite trials and systematic reviews that find it is not the most effective intervention (22).

Several countries and private organizations are, however, applying standards in global health similar to those

that are becoming conventional in the governance of domestic policy for health care. The chief medical officer of the Department of Health in the United Kingdom, for example, leads a “government-wide global strategy” for health that includes using the research and standard-setting expertise of the National Health Service, the Health Protection Agency, and NICE (23,24). Similarly, leading foundations and multinational organizations in global health evince increased interest in evidence from independent research. The governance of health as an aspect of foreign affairs may be changing.

Conclusion

The use of evidence from research to set standards and inform policy has had a different history in health care, especially in making decisions about coverage, than in health as an aspect of foreign policy. In health care, findings from research in laboratory, clinical, and community settings have been prominent in governance of the allocation of resources and of accountability for more than a century.

In the governance of foreign policy, in contrast, findings from formal research have almost always been subordinate to ideology, commercial interests, and threats to international and homeland security. Participants in governance often have substantial reasons to subsidize and placate leaders of countries that have dysfunctional health systems. Policy makers for health care, unlike their counterparts in foreign policy, work in the context of high public expectations that interventions will have measurable benefits for people and populations.

Proponents of science-based standards in the governance of both health care and health as a factor in foreign policy have experienced less resistance to establishing such standards for health services than for socioeconomic and behavioral determinants of health. Evidence has accumulated about the effects on health status of alternative policies for income maintenance, education, social services, and the environment. But improving health is hardly ever the highest priority of leading participants in the governance of these areas of policy, at home or in other countries. Calculations of potential net improvement in population health status over time are likely to remain secondary to immediate economic and political concerns.

However, recent research on the economics of governance

suggests that it is possible and desirable to make policy that addresses broad determinants of health and to do so for both domestic and foreign policy. In his presidential address to the American Economic Association in 2009, Avinash Dixit described the benefits of governance that promotes well-being in a country or region. Such governance “enabl[es] the growth of income and globaliz[es] the enlargement and stability of the middle class.” These benefits justify higher standards for population health to inform “collective action” in the “provision of public goods and the control of public ‘bads’” (25). Other economists argue that effective incentives for such collective goods exist “outside the standard private goods model” (26).

Moreover, evidence exists that policy has improved population health indirectly, thus avoiding some resistance to making changes in governance to set higher standards for interventions. For example, strong evidence exists that population health in industrial countries improved since the early 19th century, mainly as a result of increased public spending for health, housing, and social services combined with taxes that encouraged capital investment and, by taxing consumption, discouraged behavior linked to poor health and premature death (27).

The history of governance in each of the areas of policy discussed in this article offers lessons for improving population health. The lesson from the governance of health care is that governance can be politically feasible for policy makers to establish science-based standards for policy and create organizations to conduct and assess research effectively. The lesson from the governance of foreign policy is that it can contribute to improving health even when it rejects standards on the basis of the best available evidence. The broadest lesson from the analysis in this article is that governance, in all its complexity, is the principal determinant of policy.

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ESSAY

Observations and Recommendations From the Mobilizing Action Toward Community Health (MATCH) Expert Meeting

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Suggested citation for this article: Kindig DA, Booske BC, Siemering KQ, Henry BL, Remington PL. Observations and recommendations From the Mobilizing Action Toward Community Health (MATCH) Expert Meeting. *Prev Chronic Dis* 2010;7(6). http://www.cdc.gov/pcd/issues/2010/nov/10_0132.htm. Accessed [date].

Introduction

In October 2009, authors, staff, and guest experts from the Mobilizing Action Toward Community Health (MATCH) project and the Robert Wood Johnson Foundation, the project's funder, met in Madison, Wisconsin to discuss metrics, incentives, and partnerships for population health improvement. Their essays were published in this and the previous 2 issues of *Preventing Chronic Disease* (www.cdc.gov/pcd/issues/2010/jul/toc.htm and www.cdc.gov/pcd/issues/2010/sep/toc.htm). The plenary and small-group discussions were provocative and wide ranging. The purpose of this commentary is to 1) summarize key themes from the essays and meeting discussion and 2) present recommendations for future practice and research regarding metrics, incentives, and partnerships to improve population health.

Discussion Themes

Metrics

Bilheimer and Pestronk presented commentaries on the metrics essays (1,2). Meeting participants identified challenges related to population health metrics. They

recognized that the usefulness, reliability, and validity of metrics are often compromised by limitations in available data. Examples of these complicating factors include sparsely populated geographic areas, challenges with survey methods (such as random-digit dialing in a cell phone era), and the choice of unit of analysis.

Geopolitical areas such as counties or states are often used because they are the focus of much of the available data, but these areas do not necessarily reflect population health *market areas* where programs and policies are implemented to improve health outcomes. Data intricacies add complexity to analyses — as is illustrated by the fact that different health determinants operate in different geographic areas (eg, school nutrition policies are local, air quality policies are regional, and Medicare policies are national).

Participants agreed that the population health field needs revised metrics to address various goals.

- **Population-based metrics to monitor changes in population health.** Most measures of population health (eg, those used in the *County Health Rankings*) are used to measure differences between geographic areas and often combine several years of data to increase the precision of the estimates (3). More precise metrics are needed to monitor trends over time and show changes over short time frames in response to local-level changes in programs and policies.
- **Standard measures of health disparities within communities.** Most measures of population health can demonstrate disparities *between* geographic areas (eg, the *County Health Rankings*), but more attention needs



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to be focused on disparities *within* communities by using different disparity domains such as race/ethnicity and socioeconomic factors.

- **Metrics that can be easily understood by the public and policy makers.** Many metrics that reflect the health of a population (eg, age-adjusted death rates) are difficult to communicate to the public or to policy makers. Approaches such as dashboards (which use graphics resembling gauges and dial-type indicators) or rankings can improve communication and awareness or generate action among targeted and broad audiences.

One participant suggested that, “A good measure makes you feel responsible for taking action.” Another noted that measurement is an assertion of responsibility; population health should be measured at appropriate levels so that disparities are not masked and should include a wide set of measures so that governments and other relevant entities (eg, business, education, transportation) can take responsibility. Participants also preferred an interpretable logic model so that audiences understand the choice of metrics: Why is each measure important and what can be done about it? What are the pathways, how can they be influenced, and at which levels?

Incentives

McGinnis and Lewis provided commentaries on the essays that examined the use of incentives to improve population health (4,5). Meeting participants discussed the process of creating incentives to improve population health, and how incentives should link to measures of desired outcomes. Although much of the discussion focused on financial incentives, participants also addressed nonfinancial incentives such as political gain or professional recognition. For example, it was noted that California’s quality improvement in health care was largely driven by public reporting and information sharing. The desire to achieve such recognition on published lists may fuel innovative and sustained change.

As a result of current private and public fiscal instabilities, perhaps financial incentives should be directed toward identifying new resources or redirecting existing ones. Would resources be one-time grants from government and foundations, or would they be built into formulas like the community benefit tax rules to ensure the long-term investments that would be needed?

Participants noted that incentives must be linked to individual or organizational self-interests to affect change. Unfortunately, no consensus exists on which specific incentives best motivate individuals, organizations, and sectors and how factors such as values, ideology, and beliefs affect the power of incentives at all levels. We need to better understand how incentives have been used both successfully and unsuccessfully in education, welfare, and other social systems. Although government entities generally adopt a directive (ie, top-down) approach to incentives, incentives can also be effectively initiated from the bottom up, in which individuals and investors decide how and where to direct their resources.

Partnerships

Shortell and Bailey provided commentaries on the population health partnership essays (6,7). Participants observed that partnerships are anything but one-size-fits-all; they may be characterized across a spectrum of collaboration ranging from cooperation to integration. Participants raised various issues on the partnership theme.

- **Identifying best practices in community partnerships.** Given the wide variability in partnership structure and function, participants wanted to know if best-practice processes can be identified that apply across the board (such as with respect to capacity building and strategic planning). For example, do partnerships require a minimum level of formality to effectively share power and drive action? What factors cause partnerships to have a more formal structure and function?
- **Sustaining partnerships.** Participants wanted to know more about how partnerships earn credibility and legitimacy over time and how community institutions can prevent or resolve conflict that could hinder strong cross-sectoral collaborations. For example, how are costs and benefits evaluated from the perspective of prospective partners (transaction costs of formation vs potential for synergy once established)?
- **Balancing competing priorities.** Participants asked how partnerships could balance core competence (what they accomplish in an absolute sense based on available expertise, skills, and resources) with comparative advantage (what they can accomplish in a relative sense based on what they do better than others). In addition, they wanted to know the degree to which having a population health agenda shared (overtly or

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not) by sectors outside health, what might motivate nonhealth sectors to come to the table, and whether a multisectoral investment logic model could be developed for all partners.

Participants noted that there is no substitute for effective leadership throughout all phases of partnership. Without questioning the potential of partnerships, they challenged the notion that partnerships are necessary for improved population health. Participants did not doubt that multiple sectors should be engaged in efforts to address the multiple determinants of health, but several questioned whether improvement actually requires cross-sector work. In other words, is it possible to effect substantial change through focused intrasector activity? One possible response is that the nature of the task at hand often determines the level of cross-sectoral coordination required: solving bigger problems is likely to require more interdependence, particularly the sharing of resources.

Recommendations for Practitioners

In breakout groups, participants identified 3 opportunities for future work among practitioners: increasing investments in multiple determinants of population health, establishing service bureaus to provide technical assistance, and establishing an award for population health improvement.

Increase investments in the multiple determinants of population health

Discussion regarding investments centered on aligning resources and incentives to drive investment in programs and policies that will improve health outcomes and reduce disparities. Suggestions included developing investment pools similar to those being tried by the California Endowment. The California Endowment is using funds for intervention via multisectoral partnerships or enhancing naturally occurring multisectoral initiatives. Such interventions should require investments in the multiple determinants of health, including income and educational policies and the built environment. To increase the likelihood of success, meeting participants recommended focusing investments in places where some partnership activity already exists and where infrastructure is in place.

This recommendation has several challenges. For example, how should investments be balanced between communities with the need and those with the highest likelihood of success? Also, who will provide the necessary resources? Although government, foundations, and business and community investments are reasonable sources, discussion also focused on other sources that might be more dependable and permanent, such as savings captured from waste on unnecessary health care. Some discussion focused on the policy proposals for accountable care organizations (ACOs) in Medicare, which could generate savings for high-quality and low-cost care. Instead of only sharing savings with providers and payers, a portion could be used as a community health dividend. The Vermont Blueprint for Health (8) has used such an approach, and leaders in Minnesota have called for nesting ACOs in accountable health communities. Participants also suggested that the community benefit definition used by the Internal Revenue Service be expanded to include the value of hospital investment in local population health improvement that goes beyond charity care. The 2010 Patient Protection and Affordable Care Law (Pub L No. 111-148) represents a step in the right direction by requiring nonprofit hospitals to conduct a needs assessment in consultation with the communities they serve at least every 3 years.

Establish technical assistance service bureaus

Many participants noted the lack of community capacity and expertise for population health improvement activities such as using metrics to leverage investment and create effective partnerships. Local or virtual technical assistance could be provided to use data for health improvement, identify evidence-based policies and programs, create processes to identify and implement local interventions, set cost-effective priorities, and help community partners recognize the need for cross-sector collaboration for health improvement. For example, public and private funders could be more prescriptive in providing a menu of evidence-based programs and interventions.

Establish a population health improvement award

The idea of a Baldrige-like (9) annual prize for communities excelling in improving population health through creative use of incentives, metrics, and partnerships was proposed. Participants noted that recognition of improvement should take account of change over time and achievement or accomplishment at a point in time.

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Recommendations for Researchers

Participants identified some major research needs and opportunities that could move understanding and action forward in the population health field. They included examining causal relationships between determinants of health, increasing understanding of population health incentives, and increasing understanding of population health partnerships.

Examine causal relationships between determinants of health

Participants recommended that funders should support research to examine the cost-effectiveness of addressing different determinant categories and also specific programs and policies. This research should also address secondary health effects of nonhealth policies, for example by expanding the scope of comparative effectiveness research to include determinants of health beyond health care. In addition, research should be conducted to improve metrics that can monitor changes in population health and to propose ways to balance incentives for population health improvement. Researchers should also develop more robust disparity measures for health outcomes and health determinants.

Increase understanding of population health incentives

Researchers should develop an expanded multisector population health model so that leaders understand their roles, responsibilities, and most cost-effective actions for population health improvement within and outside of their own sectors. Research on these investments should also determine what cross-sectoral financial and policy investment at the community level has been successful in improving health. The information can then be used to develop local (ie, substate) data sets for understanding these relationships.

Researchers should also determine the advantages and disadvantages of applying incentives at different levels of aggregation (ie, individual vs community vs organization), the advantages and disadvantages of using bundled or unbundled metrics for applying incentives, and how to avoid poor performers receiving penalties when they need resources to improve. Finally, research should examine the scope of potential nonmonetary and monetary incentives for population health in the United States and abroad.

Increase understanding of population health partnerships

Research should be conducted to better understand public- and private-sector leaders' attitudes toward population health improvement and tradeoffs. Where do population health improvement and disparity reduction (in general) fall on their priority list? Who (outside of the health community) is paying attention?

Research on partnerships should also identify the characteristics of effective partnerships. How can they be developed, expanded, and sustained? Are partnerships necessary for population health improvement, or can sectors operate effectively alone? Which organizations are candidates to be integrators across the population health model?

Conclusion

The 2009 MATCH expert meeting generated thoughtful and stimulating discussion around the essays presented in this and the previous 2 issues of *Preventing Chronic Disease*. Far more questions were asked at the meeting than answered. Through facilitated dialogue, participants offered wide-ranging ideas and insights in the areas of metrics, incentives, and partnerships. The meeting provided little time or space for many details; the format necessitated input in rather broad brushstrokes toward the goal of building consensus for practice and research priorities. As the essays and commentaries in this series attest, improving population health will require effort on many fronts; no single track to success exists. Whereas the challenges are substantial, the ideas shared here should be reflected on, refined, expanded, and hopefully pursued through empirical and applied efforts to improve population health.

Acknowledgments

The October 2009 meeting was supported by the MATCH project with a grant from the Robert Wood Johnson Foundation to the University of Wisconsin Population Health Institute. We appreciate the assistance of Jessica Athens, Jenny Buechner, Erika Cheng, and Joan Fischer.

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