



ALTARUM INSTITUTE DISTINGUISHED SCHOLARS SEMINAR

**INNOVATION, HEALTH, AND EQUITY:
TAKING A SYSTEMS APPROACH TO HEALTH AND
ECONOMIC VITALITY**

Health Care Reform is Not Enough

Stanley Chin,
Research Director, Altarum Institute

David A. Kindig, MD, PhD,
Altarum Institute Distinguished Scholar

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Abstract.

Health *care* is estimated to contribute no more than 50% toward broad health outcomes. The rest comes from non-medical determinants, including the social environment, the physical environment, and individual behaviors that produce – or diminish – health. Wide variation in both health care and non-medical determinants cause considerable variation in overall health outcomes, disease burden, and therefore the overall cost burden of the U.S. health care system.

What Altarum Institute calls “A Culture of Health” describes the complex web of “upstream factors” that shape the health of individuals and of the population. What non-medical levers are available in education, social marketing, and other areas that might provide an equal, if not greater, impact on system costs and the improved health status we all desire?

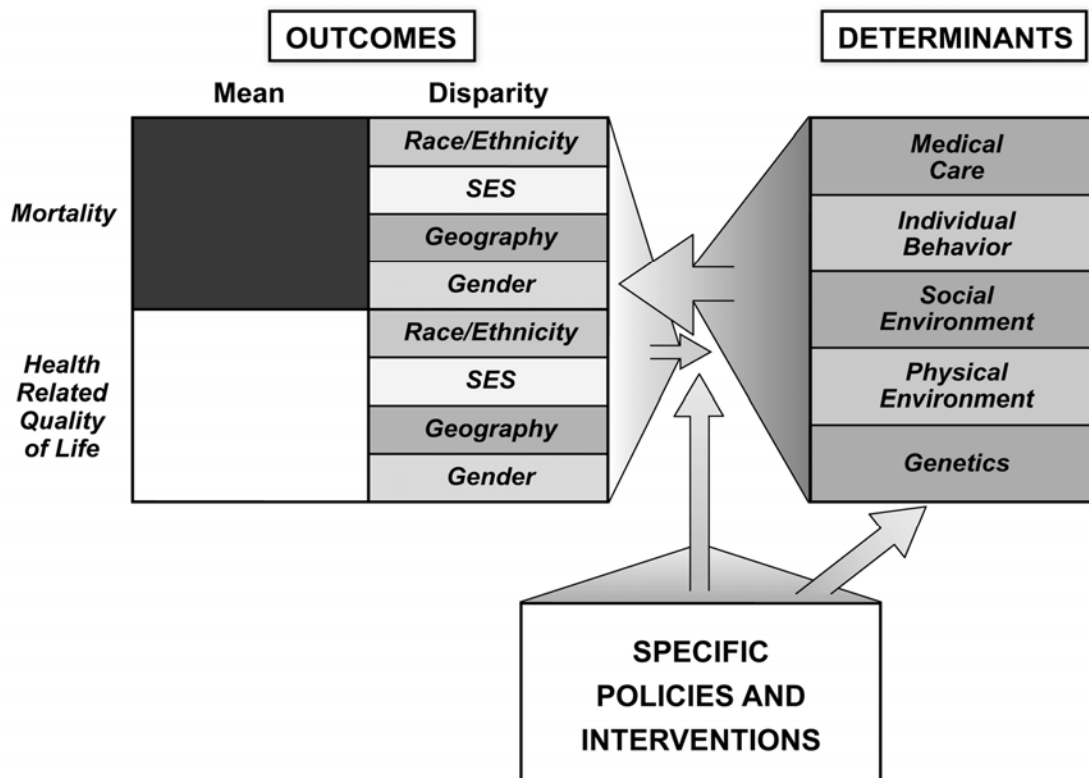
This paper and presentation will explore a program of research that seeks to better understand how these “upstream” determinants work and how and where policy interventions can best be used to enable better health and reduce costs over time.

1. Beyond Value from Medical Care

The “inconvenient truth” about improving health outcomes is that such outcomes are the product of multiple determinants of health, of which medical care is only one, and perhaps not the most important. While it is critically important for everyone to have access to an efficient health care system as the initial paper argues, policymakers are fooling themselves if they think that even the most cost effective system of universal coverage will make us the healthiest country in the world in terms of life expectancy, infant mortality, or optimum health related quality of life.

Over the past 20 years, a clear understanding that the concept of such population health outcomes being produced by multiple determinants of health has grown, but policy application has not necessarily followed suit. . Based on the seminal work of Evans and Stoddart¹, Kindig recently offered the framework below for considering population health outcomes and investments².

Figure 1: Model of Population Health



2. What Are Population Health Outcomes?

The left side of Figure 1 represents a way of conceptualizing broad population health outcomes. Previous health improvement frameworks have focused both on increasing the overall population mean, as well as reducing and eliminating disparities within the population. Within disparities, there are multiple domains that could be policy targets such as race or ethnicity, socioeconomic status, gender, and geographic location. In addition, researchers generally accept that such outcomes should include both length of life (mortality) and the quality of those life years (health related quality of life). While it is possible to combine the mortality and health related quality of life quadrants into a single summary measure such as quality-adjusted life years (QALYs), considering them separately, along with disparities, is important because different patterns of determinants will probably produce different changes in each of them. In this figure each quadrant has been arbitrarily sized equally, and similarly the domain bars within the disparity quadrants are depicted as equal. It is probably not the case that each quadrant or domain should receive equal weight; this is not an empiric issue but rather one of social valuation for different Nations, States, or other population groups to decide. The point of presenting them this way is to encourage such consideration as a component of goal setting, which has been done occasionally. For example, the World Health Report 2000 weighted the mean and disparity equally based on a survey of about 1,000 respondents³, Similarly in a State Health Report Card recently produced for the State of Wisconsin⁴, equal weighting was primarily used although the method used for summarizing disparities across domains caused slight variation from equality.

3. How Are Population Health Outcomes Produced?

The right hand part of Figure 1 represents the determinants of the left side population health outcomes, which have been divided into five determinant categories. Medical care includes, for example, prevention, treatment, and disease management. Examples of individual behaviors include smoking, exercise, and eating habits. The social environment includes socioeconomic factors, most often measured by income, education, and occupation, while the physical environment consists of, for example, air and water quality as well as the built environment. Genetics refers to inherited characteristics that determine health outcomes, most of which are unmodifiable at this time although genomics holds some promise for future intervention.

Although these determinant categories are listed independently, they have substantial and complex interactions with each other over the life course. Figure 1 also contains a small arrow going from outcomes to the determinant categories. This is to show that some outcomes also have a “reverse causality” impact on determinants; for example, while social determinants like income have an impact on outcomes, the outcome of being unhealthy also can have a negative impact on income.

4. What is the Contribution of Each Determinant to Health Outcomes?

Figure 1 displays each of these five determinant categories as making equal contributions to outcomes. While this is ultimately an empiric question rather than one of social valuation, it is unlikely that the equality depicted is correct. Unfortunately, research has not yet provided adequate guidance to policymakers regarding specific investment choices across these categories to improve population health. This lack of cross-sectoral economic evidence stems from complicated issues of interactions among determinants, the latency over time of their effects, and the absence of robust longitudinal data sets; Greg Stoddart called understanding the balance of determinants the “fantasy equation”⁵, reflecting the difficulty of such analysis. In addition, the outcome chosen is of great importance since different outcomes will be derived from different patterns of determinants.

In spite of these challenges, researchers have estimated the relative contributions of the multiple determinants of health to health outcomes broadly defined. Public health advocates have often based policy advocacy on early estimates from the Centers for Disease Control and Prevention, which indicated that about 40% of deaths are caused by behavioral factors and then 30% to genetics, 15% to social circumstances, 10% to medical care, and 5% to physical environmental exposures⁶. The widely recognized America’s Health Rankings has four determinant categories with weights assigned as follows by an expert panel in 1991: personal behaviors 36%; community environment 25%; public and health policies 18%; and clinical care 21%⁷. Some investigators have examined single determinants; for example, Cutler has recently assigned a 50% weight to medical care, while also carrying out sensitivity analysis from 25% to 75%⁸. In contrast, Wolff and colleagues have estimated that correcting disparities in education-associated mortality rates would have averted eight times more deaths than those attributable to medical advances between 1996 and 2002⁹. Looking at two determinant categories, using longitudinal data from the Americans’ Changing Lives survey, Lantz and colleagues found that four common health risk behaviors (smoking, physical activity, alcohol consumption, and body mass index) had only modest impacts in predicting

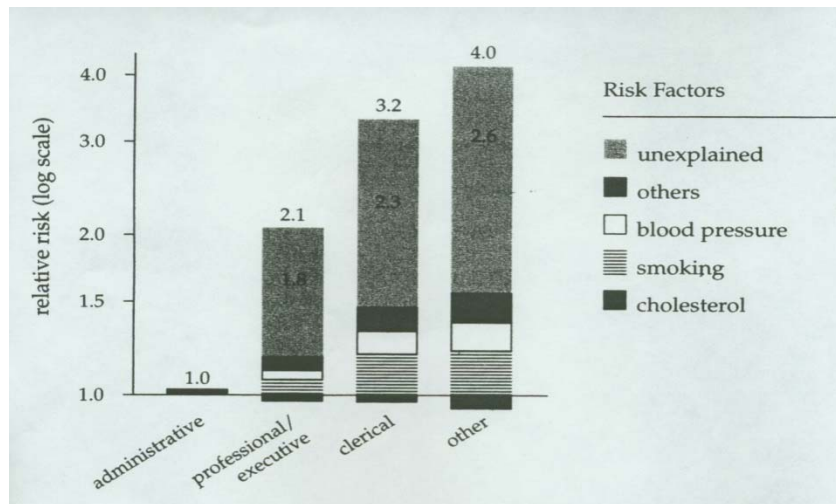
functional status and self-rated health in low-income populations after controlling for socioeconomic factors; they concluded that, “Risk behaviors are not the dominating mediating mechanism for socioeconomic health differences”¹⁰. In addition, a recent examination of 22 European countries found that the variations in health inequalities could be attributed to variations in smoking, alcohol consumption, and access to care, but that the patterns of determinants of inequality differed by gender, country, and the outcome measured¹¹.

5. The Social Determinants are the Next Frontier.

Different categories of determinants have figured more prominently over time. The role of medical care has always been easy for the public and policymakers to understand and has grown in importance and investment over the last 60 years with the growth of new technology and the expansion of specialty care. Around 1970, with the publication of the LaLonde Report in Canada and the first U.S. Surgeons General’s Report on Smoking, the role of individual behavior on health began to be appreciated, with more current emphasis on lack of physical activity and poor nutrition as contributors to obesity and chronic disease. Physical environmental determinants like air and water quality also have been generally understood to affect health. One of the reasons for such general appreciation and understanding of these determinants by the public and policymakers is that the mechanisms by which they biologically affect health and disease (antibiotics, cigarette smoke, air pollution) are relatively easy to understand.

Over the last 25 years researchers have seen the re-emergence of an understanding that the social determinants of health such as income, education, occupation, and social cohesion are equal contributors to health outcomes. A new academic field of social epidemiology has developed in this period¹². It is beyond the scope of this paper to summarize this body of work, but one of its major findings has been the social gradient in health, in which it is not only the extremes of high and low levels of education and income that have health outcome effects but at most gradations in between. One of the most important investigators in this field, Michael Marmot, a British social epidemiologist, clearly expressed this concept, as illustrated in Figure 2, which is based on one of his studies using the British civil servant Whitehall data¹³.

Figure 2: Whitehall Relative Risk of Coronary Heart Disease Death



Source: Marmot (1987)

The four administrative job categories reflect different education and income profiles among British civil servants. It can be seen that there is increased mortality from Coronary Heart Disease at each of the four occupational levels (the “social gradient”). In addition, it can be seen that the contributions to this mortality from common risk factors such as blood pressure, smoking, and cholesterol increase with lower occupational grade. But the amount of mortality not explained by these risk factors, in a British system where all have access to medical care, is quite remarkable. Much active research is currently investigating the reasons for the unexplained variance, with strong indications that neuroendocrine and immunologic “stress” pathways are involved.

While this example features occupational category as a marker of social class and socioeconomic statuses, such relationships also have been shown for income, education, and other components of the social determinants of health. While examining the effects of these separate social factors is challenging for researchers, the evidence is convincing, that, for example, the level of education is probably as important as medical care and other factors in improving health. A large body of evidence supports this claim, including the fact that people in Nations, States, and counties with higher education rates have better health outcomes in many categories.

For example, in 2005, the age-adjusted mortality rate for adults with some education beyond high school was 206 per 100,000. However, it was twice as great for those with only a high school education, and three times as great for those with less than high school education¹⁴. People with more education also have fewer disabilities and better physical functioning. One study estimates that eight times more lives would be saved by correcting educational disparities than those saved by medical advances in the same period¹⁵. One of the most precise studies, which controlled for many other possible explanations, showed a 1 to 3% reduction in mortality rates for each year of additional schooling¹⁶.

How could such factors like occupation or education have an impact on biological processes that produce death or disability? It is generally understood how immunizations, not being

exposed to cigarette smoke, and exercise get “under the skin” to exert their biologic impact, but this is less clear for the social determinants such as income and education. There are probably two main pathways. The first operates directly, through better knowledge about the importance of medical care as well as prevention. This includes the possibility that more education and higher socioeconomic status enhances the ability to make difficult short-term decisions that affect health later in life—to stop smoking, eat better, and routinely exercise, for example. Recently the field of health literacy has been rapidly developing, with the Institute of Medicine claiming that “Ninety million American adults lack the needed literacy skills to effectively use the U.S. health care system”¹⁷. The costs to the health care system of such low health literacy have been estimated to be greater than \$100 billion per year. A second pathway is more indirect, as people with more education have better occupations and higher incomes, which in turn result in better access to health care and, equally important, often less stress in many aspects of life. As indicated above, an entire new research field is under active development to understand the impact of such stress on the endocrine and immune systems which can biologically impact disease and mortality¹⁸

One of the most relevant areas of research lies in the relationships between the social factors and individual behavior choices. As the Lantz et al paper cited earlier indicates¹⁹, a considerable component of behavior change undoubtedly lies in the social context underlying such behavior change. Health behaviors such as smoking and nutrition are often framed from an individual choice perspective, but the ability to make such choices is often governed by the social circumstances individuals find themselves in. It is very important that the causal pathways linking socioeconomic status and behaviors be fully elucidated so that proper policy choices can be made. For example, one of the consequences of the education gradient in health and health behaviors is that, since 1981, overall health disparities rose: “Virtually all gains in life expectancy occurred among highly educated groups.”²⁰

6. There is Great Variation in Health Determinants Across States.

Even without knowing the exact balance of investment in the multiple determinants that will produce optimal outcomes, natural experiments abound across communities, States, and Nations. Table 1 shows data for three States from America’s Health Rankings in 2007²¹.

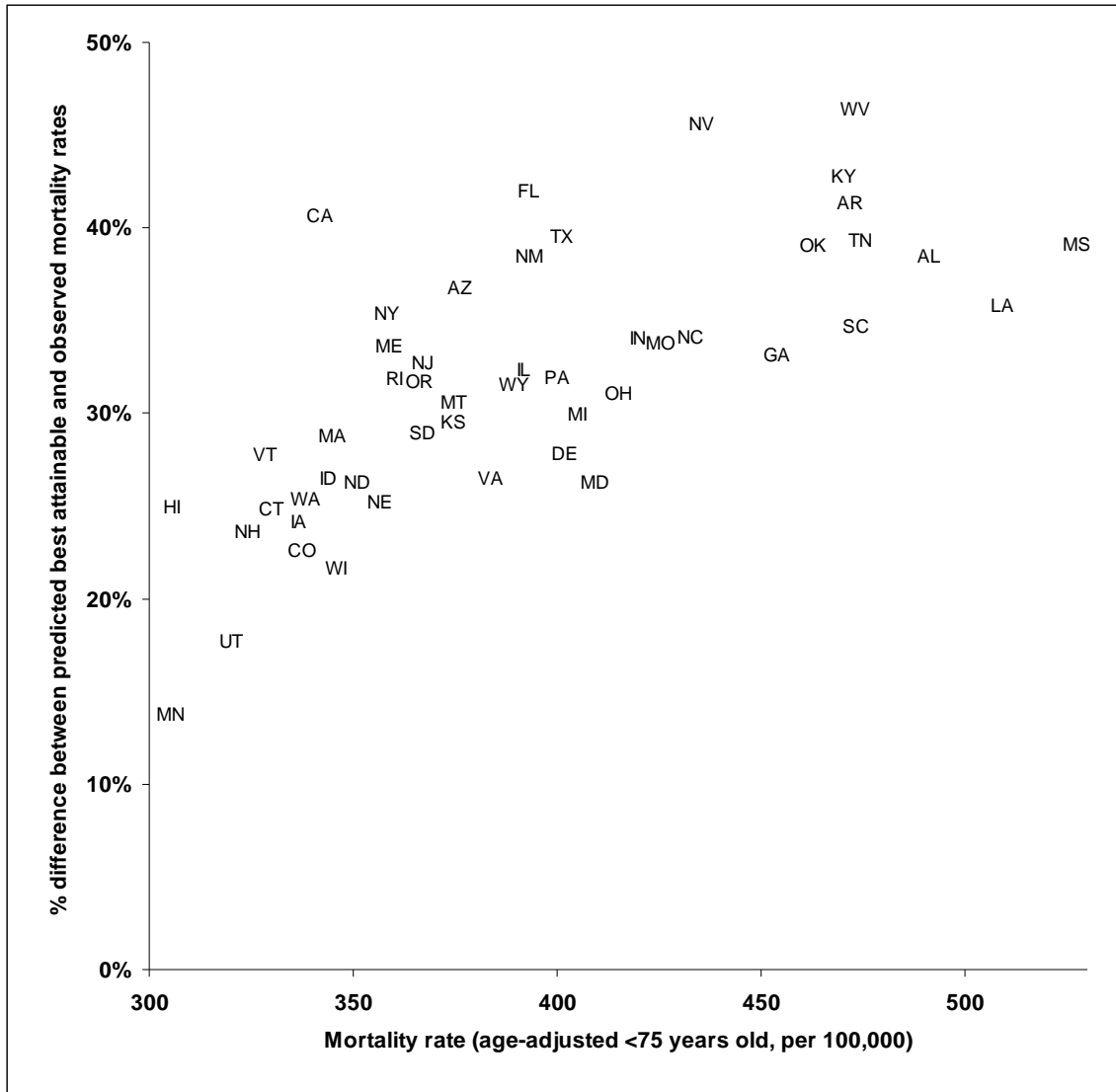
Table 1. Health Outcomes and Determinants Rankings for Three States in 2007

Overall Health	Wisconsin #12	Minnesota #2	N. Dakota #8
Smoking	28	15	22
Obesity	34	21	27
High School Graduation	4	7	2
Uninsured	2	4	18
Prenatal Care	24	27	39
Immunization	2	7	10

All three States rank fairly high on overall health with Minnesota being #2, North Dakota #8, and Wisconsin #12. cursory examination shows that even a high ranking State like Minnesota, while ranking high on determinants like uninsured rate and high school graduation, has much opportunity for improvement on determinants like smoking and obesity rates.

Given such variation, it is certain that no State has yet achieved the best health determinates that it could. To estimate the feasible range of mortality improvement that might be possible for any State, if it could achieve for each determinant what any State has already achieved, the following analysis was undertaken²². Using secondary county-level data on modifiable and non-modifiable health determinants from 1994-2003, regression analysis was used to predict State age-adjusted under-age 75 mortality rates in 2000, estimating each State's "ideal" predicted mortality if that State had the best observed level among all States of every modifiable determinants. Figure 3 shows the results of this analysis.

Figure 3: Predicted vs. Baseline State Mortality Rates



There was considerable variation in predicted improvement across the States. The State with the lowest baseline mortality, Minnesota, was predicted to improve by 14% to a mortality rate of 263 per 100,000 if Minnesota had the most favorable profile of modifiable health determinants. However, West Virginia, with a much higher baseline, would be predicted to improve the most by 46% to 254 per 100,000. Individual States varied in the pattern of

specific modifiable variables associated with their predicted improvement. Among the modifiable variables, the percentage of the population uninsured has the largest impact on the predicted mortality rate with a 1% increase in uninsurance being associated with a 7.9 per 100,000 increase in mortality rate. Three socioeconomic variables (high school graduation, college graduation, median family income) are all associated with lower mortality rates, while the percentage living alone and percentage unemployed are associated with higher death rates per 100,000 population. In the behavior category, both higher smoking and inactivity rates were associated with higher mortality rates.

The relative amount of improvement in mortality rate that might be realized by a State improving a *specific* modifiable factor from a State's current level to that of the best value attained among all States also was explored: the research found that there is considerable variation across the States in the relative contribution from each modifiable determinant.

For example, Utah has most of its reduction predicted to be from reducing the uninsured rate but nothing from smoking rates (since it already has the lowest smoking rate among all States). West Virginia has a relatively low percentage predicted from the reducing the uninsured but greater reduction associated with increased education rates.

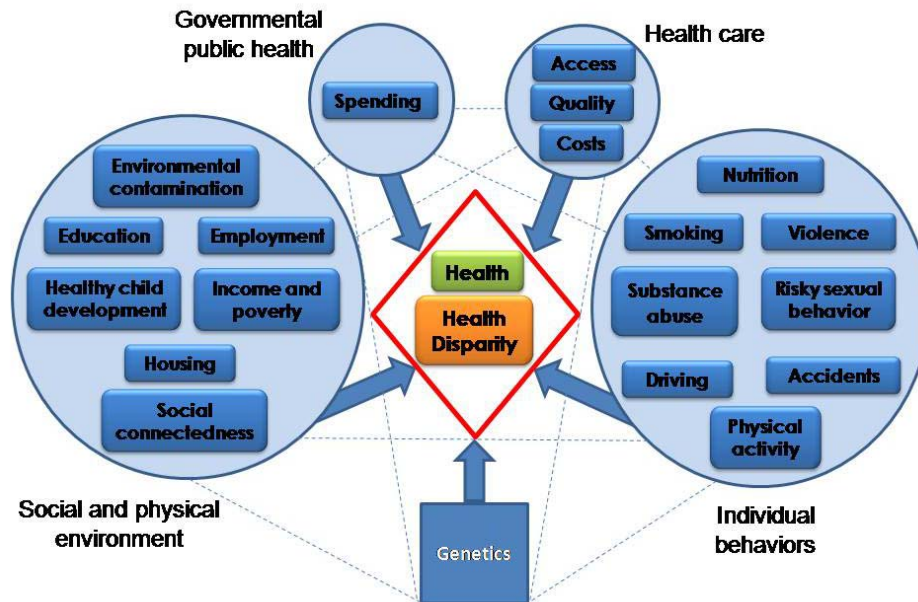
While the limitations of ecological cross-sectional data limit the degree of causal interpretation which can be made, and therefore falls short of providing specific guidance on cross-sectoral policies, the results certainly support the contention that health improvement requires investment in all three major investment categories of health care, behavioral change, and socioeconomic factors.

While most population health scholars understand this, many in policy positions do not, especially as it relates to the socioeconomic determinants. It is not a fantasy to understand that major improvement in health outcomes can be made by combinations of interventions in multiple sectors that have already been achieved in other jurisdictions. As such relationships described here gain better causal certainty, they should provide substantial guidance to policy makers in the public and private sectors as they attempt the most cost-effective improvement for the people for whom they have responsibility.

7. What Works for Population Health Improvement?

It is one thing to dissect underlying causal relationships between the multiple determinants of health and population health outcomes; it is another to determine a “balanced investment portfolio” of programs and policies that are effective and cost-effective for health outcome improvement. Many in the research and policy community are engaged in the search for such evidence, with major examples being the Community Guide for Preventive Services²³ and the Cochrane Collaboration reviews²⁴. Seldom has the evidence from the multiple determinants of population health been brought together in a way that is easily understood by policy makers. As part of project called “Making Wisconsin the Healthiest State,” a scan of the evidence of effectiveness of more than 360 specific policies and programs addressing the multiple drivers of health in 20 categories as shown in the model below was carried out.



































Figure 4: A Model of Categories of Evidence for Population Health Improvement



For each of the 20 determinant categories, each program and policy was evaluated on the following parameters: description and intended beneficial outcomes, level of implementation in Wisconsin and other States, strength of evidence of policy and program effectiveness, potential population reach (i.e., the number of Wisconsin residents potentially affected), and category of decisionmaker(s) who could enact the policy or program.

Figure 5 below displays one summary page for evidence on one category, physical activity and nutrition (the entire list of programs and policies is available on a Web-based database: Healthiest State Programs and Policies ([www. pophealth.wisc.edu/UWPHI/](http://www.pophealth.wisc.edu/UWPHI/))).

Figure 5: Summary of Evidence for Physical Activity and Nutrition

Physical Activity and Nutrition		POTENTIAL DECISION MAKERS					
PROGRAM (\$) OR POLICY	Strength of Evidence	Potential Population Reach	Government	Education	Health care	Business	Community Organizations
Increase access to healthy food options							
Allocate funding to expand WIC and Senior Farmers' Market Nutrition Programs	3						
Make water available; promote consumption	3						
Allocate funding to use electronic methods of payment at farmers' markets	2						
Modify vending machine options to increase healthy beverage choices	2						
Increase availability of fruits & vegetables, nutritious options	2						
Ensure on-site cafeterias follow healthy cooking practices	2						
Offer healthy foods at meetings, conferences, and catered events	2						
Farm-to-school programs	2						
Prohibit the sale of (non-nutritious) food for school fund-raising activities	2						
Tax credits for locating farmers' markets/ farm stands in lower-income neighborhoods	2						

While the review was undertaken for a single State, the evidence reviewed is global in scope and therefore should be of use to anyone considering cross-sectoral population health policy decisions. The right hand columns are of critical conceptual and practical importance. They indicate the fact that if health is truly multi-sectoral, no one sector has responsibility alone for population health improvement; decisionmakers in government, health care, business, education, and community organizations have to be involved in active partnerships and resource identification.

8. Comparative Cost Effectiveness and Value Across Population Health Determinants.

So far almost all of the previous discussion related to the effectiveness of a given health determinant or intervention or policy or program in improving health. This seminar has a focus on value and sustainability, which means that everything must ultimately be framed in a cost effectiveness perspective; that is, how much do we get in health outcomes from what we invest? The distinguished health economist Victor Fuchs put it this way in 1974²⁵ *How much, then, should go for medical care and how much for other programs affecting health, such as pollution control, fluoridation of water, accident prevention and the like. There is no simple answer, partly because the question has rarely been explicitly asked.* Previous research has said that the overriding population health question is *“What is the optimal balance of investments (e.g., dollars, time, policies)...in the multiple determinants of health (e.g., behavior, environment, socioeconomic status, medical care, genetics)... over the life*

course... that will maximize overall health outcomes ...and minimize health inequities at the population level?”²⁶

Considerable literature is being developed on comparative cost effectiveness within medical care. For example, Cutler and McClellan found for acute myocardial infarction treatment that between 1984 and 1998, costs had increased by \$10,000 per case while life expectancy had increased by more than a year (2001). Looking at breast cancer cost and outcomes between 1985 and 1996 they found a 4 month increase in life expectancy and a total cost increase of \$20,000 per case²⁷. There also are concerns that such gains may be coming at increasing cost. McClellan and Noguchi (1998) looked at 1 year hospital acute myocardial infarction expenditures from 1984-91 and 1992-94, finding the earlier “clearly worthwhile on average,” while the later period “more modest and clearly excessive”²⁸. Skinner and Fisher²⁹ analyzed more recent data, looking at acute myocardial infarction 1 year survival from 1986-2003 in relation to Medicare Part A expenditures for that period and found the earlier period to cost \$20,000 per Life Year (LY) but, for the period after 1996, costs increased to \$300,000 per LY primarily due to a flattening of outcomes. They speculate that this is due to a slowing of the spread of low cost therapies like aspirin as penetration rates reached 100%, coupled with a more rapid spread of high cost interventions such as Percutaneous Transluminal Coronary Angioplasty (PTCA) and stenting. Similarly, in the Cutler³⁰ paper cited above, assuming a 50% contribution from medical care, Cutler and McClellan showed an increase in costs from \$20,000/LY gained at birth in 1960-70 to \$40,000/LY in 1990-2000; similar costs per life year gained at age 65 increased from \$75,000 in 60-70 to \$145,000 in 90-2000. Cutler notes that the “former amount certainly reflects a good value, but the latter fails to meet many cost-benefit criteria.” Focusing on cost-effectiveness also draws attention to regional variation and the evidence that some more efficient therapies may be systematically underused in some parts of the country. Fisher and colleagues recently observed inflation adjusted Medicare growth rates varying from 2.3% in Atlanta and Pittsburgh to 5.3% in Dallas over the period 1992-2006³¹. Reducing the spending rate from the national average of 3.5% to the 2.3% experienced by San Francisco would save Medicare \$1.3 trillion by 2023.

Substantial issues remain over the cost effectiveness of prevention and of other interventions that are social, ecological, and behavioral. Very little research has been done to date to examine the comparative cost effectiveness of increasing high school graduation rates for long term health outcomes, reduced infant mortality, and known health risk behaviors. Studies on prevention have struggled with the distributional issues surrounding “who pays.” The first issue is how, given current financial structures, providers and hospitals can implement prevention practices if this leads to lower revenue from reduced illness, hospitalization, and utilization. The second issue is how the government budgeting process can accommodate programs like prevention that lead to time distant effects and outcomes, outside of the standard 10-year window, and how the same process can accommodate increases in quality of life, not just reductions in budgeted Medicare expenditures. One possibility for the latter is the adoption of some kind of cost per QALY metric for comparative effectiveness analysis. The United Kingdom, in creating the National Institute for Health and Clinical Effectiveness, adopted a standard of £20,000-30,000 per QALY as a benchmark cut-off level³² beyond which interventions would not be judged cost effective. Notably, by this standard, quite a number of common environmental interventions would likely not be judged cost effective³³ nor would a large number of medical treatments³⁴. Such a standard also fails to take into account important distributional issues, which a broad

national program of comparisons should include. It is of critical importance that future comparative effectiveness research takes into account the relative cost effectiveness across the multiple determinants of population health using a similar metric like dollars per QALY.

9. Could Pay for Performance in Population Health Work to Increase Value?

A 2006 Institute of Medicine report on Rewarding Provider Performance concluded that early experience with pay-for performance in medical care had been promising and recommended that Medicare begin to phase in this strategy to foster comprehensive and system-wide improvements in the quality of health care³⁵. Even though the effectiveness of pay-for-performance in medical care had been evaluated in fewer than 20 studies with mixed conclusions on impact, the need for reform was so great that beginning to move cautiously in this direction was endorsed by this panel.

But as we have argued above, improvements in the cost and quality of health care alone will be inadequate to significantly improve population health. Previous research asserted, “Population health improvement will not be achieved until appropriate financial incentives are designed for this outcome”³⁶ and proposed a 20-year timetable, which began with pay for performance in medical care but then moved on to develop such incentives for the non-medical determinants of health. The medical care sector cannot be held wholly accountable for broad health outcomes. It can only do that for which it is designed and responsible.

The full potential for improving population health cannot be achieved without first developing appropriate financial incentives and mechanisms. However, not nearly enough academic and policy debate, time, and money are being devoted to this challenge. Voluntary efforts are not powerful enough to achieve this on a “soft money” basis.

Could now be the time to begin to explore possibilities that go beyond medical care determinants, and to fund promising research and demonstration programs that will help us find the way to overcome the obstacles that will be greater than those in medical care alone? It is recommended that the best places where community leaders from a variety of sectors can test these mechanisms may be in rural areas and smaller States, where the scale is more manageable and where leaders in different sectors may know each other better and perhaps more easily address silo issues. But we must find these lessons wherever we can, and now is the time to start. Many determinants, such as education, the built environment, and medical care prevention, take generations to achieve their impacts. A decision not to move forward is a decision to waste potential years of good health that we know are achievable. Can we imagine what might be the result if market forces were aligned to produce health itself instead of primarily the medical care inputs into health³⁷?

10. The Altarum Culture of Health Agenda

Given the complexities of the many-layered determinants of health, and the lack of evidence for the cost-effectiveness of non-medical interventions, how should Altarum Institute best proceed? As part of a broad research plan, Altarum is developing an approach to examining the “Culture of Health.” Altarum identifies health as the subject of interest, not health care, and define health as a positive attribute, not merely the absence of disease. Altarum defines the Culture of Health in these terms:

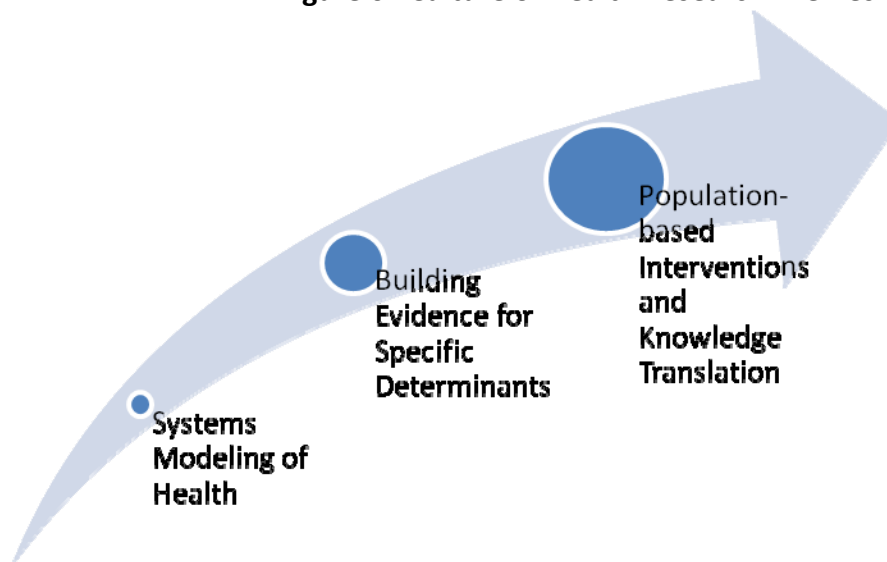
The health of individuals and of populations is influenced by a complex web of “upstream” factors, including the social, economic and physical environment, genetics and epigenetics, and individual capacity and behavior. These upstream factors form “cultures of health” – good or bad – in which each of us is embedded. Here individuals co-create health, constrained and supported by culture; communities create and strengthen healthy cultures; and policy makers seek to alter the sources of demand for medical care and raise our ability to effectively engage the health care delivery system. By understanding these relationships among culture, behavior, and health we will find the strongest leverage points to drive successful, sustained change.

The primary research themes for a Culture of Health are:

- Systems modeling of health,
- Building evidence for specific determinants and their pathways, and
- Population-based interventions and translation of new research knowledge.

These themes are shown in Figure 6 and form a logical progression, enabling early wins towards complex long term goals. These are described in more detail below.

Figure 6: Culture of Health Research Themes



Activities move from synthetic to real-world—increasing in scale, complexity, cost, and impact

Systems Modeling of Health

Under this activity, Altarum will explore and expand health modeling approaches using new methods in social epidemiology including system dynamics, agent-based modeling, neural network models, and other multi-causal, multi-consequence approaches. The research will expand data sources to include the “grey” literature (unpublished results) regarding community-based interventions and programs, as well as non-health care system sources of data, and link data using geography and spatial characteristics of the data. The results of this process will be new knowledge in the causal structure of the determinants of health, tools to

examine the “culture of health” in communities and populations, and policy tools using these new relationships to allow the cost effectiveness of non-medical policies to be assessed.

Building Evidence for Specific Determinants and Their Pathways

Having expanded the knowledge base outwards with our model-based research results, Altarum next should deepen our own research capabilities, to specific pathways and determinants. From the modeling process the Institute will prioritize next steps including areas of high leverage or low hanging fruit in outcomes and their determinants. Altarum will bring specific health and outcomes knowledge, modeling and simulation, community participation, and systems change frameworks together to generate new intervention and evaluation programs.

As a result of this work Altarum will have created linkages throughout the research and practitioner communities, tested model-based hypotheses, strengthened models with real-world examples, and gained additional insight into the translation of research into practice.

Population-based Interventions and Translation of New Research Knowledge

The third step is to translate research into public and private policy change at observable scales in real-world settings. Altarum Institute will take our newly recognized expertise and expand our research, knowledge transfer, and consulting service offerings to change cultures of health in communities and populations. The Institute will build multi-disciplinary, systems-based approaches to integrating public, private, foundation-funded, volunteer, and all other related policies into a coherent whole. Altarum will create new knowledge on cultural change itself, teaming with other experts in social marketing and other intervention methods to drive change in targeted mental models, beliefs, and behaviors.

Figure 7 specifies the core purpose for each of these themes and highlights the progression of activities.

Figure 7: Culture of Health Themes, Purpose, and Potential Activities

Theme	Systems Modeling of Health	Building Evidence for Specific Determinants and their Pathways	Population-based Interventions and Translation of New Research Knowledge
Purpose	<i>Create new knowledge on the multi-causal, multi-consequence determinants of health</i>	<i>Become experts in specific pathways and consequences via research, policy, and community participation</i>	<i>Translate research into policy and change behavior at the population level</i>
Potential Activities	<p>Bring new analytical models (e.g., agent-based, dynamic simulation, neural networks) to social epidemiology</p> <p>Identify and access linked community datasets</p> <p>Establish new datasets and elements with research community</p> <p>Develop new knowledge on the “fantasy equation” (what part of health is health care?) and the pathways of social determinants of health</p>	<p>Prioritize research and policy needs based on outputs from systems models and deepened understanding of ongoing determinant-choice-outcome relationships</p> <p>Develop research partnerships for primary data collection and action research on particular interventions</p> <p>Design and carry out primary data collection</p> <p>Engage with broad public health and research community to expand depth of reach-back and outreach</p>	<p>Design, carry out, and evaluate interventions to change specific pathways and population-level behaviors identified in first theme and refined in second</p> <p>Feedback results on culture change to refine models and policy proposals</p> <p>Evaluate translational efforts for best practice and outcomes</p>

Altarum has a challenging agenda. The Institute invites the research community to join with Altarum to further explore, define, and create change in policy, culture, and behavior that will lead to lasting improvements in the culture of health in America.

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