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Population Health: The Translation of Research to Policy

Case Studies and Commentary

Robert Wood Johnson Foundation Health & Society Scholars

Edited by Robert A. Hiatt, MD, PhD University of California, San Francisco

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The Robert Wood Johnson Foundation Health & Society Scholars (HSS) program was designed to build the nation's capacity for research, leadership, and policy change, while addressing the multiple determinants of population health. One of its goals was to produce a cadre of scientific leaders who could contribute to this research and spearhead action to improve overall population health and eliminate health inequities.

This report takes a case study approach using six diverse examples of science to policy translation generated by Scholars in the HSS program from 2003 to 2016. Because the HSS program was discontinued in 2017, the Milbank Memorial Fund published these case studies in 2018 in hopes that many audiences, including students, would use them to learn about the connections between research, decision making, and policy.

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Introduction

Population Health

Population health is a growing field of scientific inquiry, encompassing examination of the fundamental environmental, behavioral, and social determinants of disease in populations, along with their biological mechanisms.¹ In 2003, Kindig and Stoddart defined population health as "the health outcomes of a group of individuals, including the distribution of such outcomes within the group."² In the 15 years since this definition was published, others have expanded its scope and developed novel approaches to investigate the complex determinants of health and their interactions in a population. An example of the discipline's broadening is that populations need not be restricted to geographically defined areas, but rather can be defined by a common characteristic such as cultural background or social status.³ In the ongoing debate over national health care reform, the term population health has also been used by health care delivery systems to refer to the patients or individuals cared for in a provider system or health plan.

The multifaceted problems or questions that population health seeks to examine may be disease based but also include health outcomes such as life expectancy and disability. Attention to health inequities within and across population subgroups has also become a signature concern of population health scientists. Investigations may include such diverse domains and conditions as food insecurity, chronic stress, and suicide.^{4,5}

Population health science often takes a life-course approach, reflecting growing evidence that the health of populations is critically dependent not only on genetic attributes, but also on prenatal conditions; early human development, including preschool preparation; periods of susceptibility (e.g., adolescence); and environmental influences that may manifest later in life.^{6,7}

Population health science uniquely requires an interdisciplinary approach to develop questions and design methodologies. Research teams are frequently composed of domain experts in epidemiology, demography, anthropology, political science, economics, sociology, and psychology as well as the biomedical sciences.⁴ Population health science interacts with societal sectors such as education, agriculture, engineering, environmental sciences, labor, law, business, urban development, transportation, and government. This advances the concept that health can be a goal in all policies and recognizes that many of the factors important in the health of populations are "upstream" from the clinical presentation of disease and other manifestations of ill health. These transdisciplinary approaches⁸⁻¹⁰ generate innovative ideas and continue to evolve globally.⁴ Finally, population health science emphasizes the importance of translation and dissemination of new knowledge into useful applications.¹¹ This final step in the continuum goes beyond translation to "the bedside," with the goal of channeling findings into the interwoven sectors of society that affect the health of populations (e.g., health care systems, transportation, education, environment, and criminal justice). Action and impact are ultimate goals of many population health scientists, as improved population health may not be realized without mobilization of societal-level interventions and/or policy change. The translation of science to policy is itself a matter of scientific challenge, as population health science must be communicated to disparate audiences and decision makers in order to achieve its impact.¹²

How does one convey the complex pathways to be traveled by scientists hoping to have an impact on policy? How are the concepts of population health science and their translation to policy best taught when few scholars are equipped to individually cover its numerous disciplines? To contribute one response to this challenge, this report takes a case study approach, using six diverse examples of science to policy translation generated by Scholars in the Robert Wood Johnson Foundation Health & Society Scholars (HSS) program from 2003 to 2016. This collection of case studies aims to illustrate how interdisciplinary population health science integrates and translates learning and knowledge from many perspectives to influence health policy. We hope this report will be used as a teaching tool to illustrate the connection between research, decision making, and policy. It could have many audiences, including students in courses in policymaking, research methods, community health, or where one of the topics, such as food policy or substance abuse, is a focus of instruction.

Case Studies

As an instructional tool, case studies teach by example rather than by the didactic conveyance of information. They provide a channel through which scholars learn by observing the successes and failures of those who came before them. The objective of a well-written case study is to stimulate independent thinking, discussion, and debate. In essence, case studies present problems to be solved but do not necessarily present answers. From their origins in the study of law in the late 19th century, they are now commonly used in political science¹³ and a mainstay of education in the health sciences.¹⁴ The analysis of policy development is itself a well-formed science. Political scientists, for example, have studied the process in depth, and texts go into some detail about the steps necessary to establish a workable policy. Among these steps is the need to "tell the story" to the relevant audiences.¹⁵ Case studies of policy development can be used to tell that story. The studies in this report illustrate the process of translating research into policy and practice to improve population health. The diverse cases illustrate research that informs either big "P" policies (e.g., laws, statutes, or professional guidelines) or little "p" policies (e.g., practices adopted by health systems, businesses, or other organizations).

The case studies are remarkably diverse—an unplanned outcome. They represent the varied nature of the interests and skills of the authors and their own sense of where they could exert the greatest influence. Although these authors draw on the disciplines of epidemiology, sociology, health policy, urban planning, social work, and environmental health, their interests run much more broadly into studies in geographic information systems, social stigma, and documentary filmmaking. The central concept that holds them together is their common interest in understanding and improving the health of populations and using transdisciplinary approaches to achieve population health. The result is a rich offering from which educators can select examples for teaching in a variety of settings.

The intent is for these case studies to be used for skill building at the undergraduate, graduate, and professional levels. They are personal stories that can stimulate students to discuss the experiences relayed and to appreciate both the successes and challenges of integrating research into policy in all of its forms—laws, professional guidelines, or practices adopted by health departments, health systems, or local communities to improve the health of populations.

The Health & Society Scholars Program

The HSS program was designed to build the nation's capacity for research, leadership, and policy change, while addressing the multiple determinants of population health. Among its goals was to improve the nation's health by addressing the full spectrum of factors that affect health and create the evidence to inform related policies across multiple sectors of society.

Another goal of the HSS program was to produce a cadre of scientific leaders who could contribute to this research and spearhead action to improve overall population health and eliminate health inequities. During its tenure, the program trained 193 Scholars at six university sites (Columbia University; Harvard University; the University of California, San Francisco and Berkeley; the University of Michigan; the University of Pennsylvania; and the University of Wisconsin–Madison) to investigate the effects of contextual factors on behavior and biology to strengthen the knowledge base supporting population-wide interventions.

There is no inherent mandate in academia to translate the results of research, and there were differing views among faculty leadership about the appropriate timing for engagement in translation; whether it might divert attention from the core scholarship needed for

academic advancement; and the cultural differences across public and private universities in their expectations for the faculty and students to contribute to state and local problem-solving. However, in 2012, the program leadership agreed that all Scholars should:

- Gain basic exposure to the policy process.
- Learn how best to communicate their research to a variety of audiences.
- Be prepared to translate their research to policy and practice.

HSS program leaders strove to build awareness of the need for policy applications; to teach communication skills to reach diverse audiences, e.g., academics, policymakers, thought leaders, and community members; and to develop relationships with policymakers, the media, and professional organizations. Scholars used experiential learning, were exposed to researchers working in the translation of evidence to policy, and enjoyed course offerings and peer learning. Central to this effort was the development and use of case studies. The six case studies in this report are a result of this initiative. They do not all represent stories of the complete translation of science to policy, but rather present a mix of early experience and more mature results, all of which were considered useful for students interested in the ups and downs of the process of policy development and the lack of guarantees that science will be the only or even a key factor in the final decision-making process. It has frequently been observed that other factors such as politics, costs, and societal behavioral norms weigh heavily in societal decision making, and science may not win the day.¹²

Execution

The case studies in this report were developed by Scholars at various times after the completion of their training. Those who were invited to submit case studies were asked to:

- Address central questions in population health.
- Select questions and research that originated during their time in the HSS program.
- Include projects in which they were a lead investigator or co-investigator.
- Demonstrate an interdisciplinary approach to addressing a health issue.
- Highlight either a policy goal or policy consequences or outcomes of their work.

The selected case studies cover a wide range of important population health topics from food availability to global climate change. They are presented in a narrative, first-person style as though the author(s) were telling the story of the research study to a colleague or friend. The narrative is meant to be accessible to a student or faculty audience or those in policy and practice settings. Each case study includes a synopsis, learning objectives, an introduction

to the specific population health issue and the goal of the research, brief description of the study design and its execution, the results of the research, how the results were used to inform policy, and challenges faced along the way. Each study concludes with study questions and assignments.

The Robert Wood Johnson Foundation, the Scholars who produced these case studies, and those of us who shepherded the process along the way hope that readers will find these case studies inspiring and of value.

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Case Study 1 Healthy and Unhealthy Food Sources in New York City

Tracing the generation, evolution, and dissemination of policy-relevant research on the food environment

Authors

Gina S. Lovasi, PhD, MPH Dornsife Associate Professor Urban Health *Co-Director*, Urban Health Collaborative Drexel University

Andrew Rundle, DrPH

Associate Professor Department of Epidemiology Mailman School of Public Health Columbia University

Michael D.M. Bader, PhD Assistant Professor Department of Sociology Center on Health, Risk, and Society American University Washington, DC

Kathryn M. Neckerman, PhD Research Scientist Columbia Population Research Center Columbia University

Synopsis

This case study traces the generation, evolution, and dissemination of policy-relevant research on the food environment. The study was conducted by the Built Environment and Health (BEH) Research Group at Columbia University. This interdisciplinary research team includes epidemiologists, sociologists, urban planners, and geographers. The Robert Wood Johnson Foundation Health & Society Scholars (HSS) program played a vital role in the formation of this group by connecting researchers across the health and social sciences, providing seed funding for pilot research, and engaging scholars (including Lovasi at Columbia University and Bader at the University of Pennsylvania, their affiliations when they were HSS scholars) with a commitment to innovative, interdisciplinary research.

Learning Objectives

- Explain why the food environment is an attractive target for policy intervention.
- Describe and critically evaluate evidence for claims that either: (1) lowering the density of fast-food outlets or (2) increasing availability of supermarkets is likely to reduce obesity rates.
- Summarize the value of longitudinal data for understanding neighborhood effects on health.
- Specify ways that city-specific population health research on the food environment can inform local policies in zoning, economic development, and health.

Introduction

The BEH Research Group at Columbia University was formed at a moment when new currents in research intersected with a growing public concern to spark policy innovation. On the research side, population health approaches brought social science perspectives to public health problems, and the new availability of spatially referenced data allowed researchers to link human health data to detailed objective measures of the environments where people live, work, play, and learn. At the same time—the early 2000s—the "obesity epidemic" became a prominent focus of public concern. For several years, we could hardly attend a public health conference without seeing the Centers for Disease Control and Prevention obesity slides, which mapped the dramatic rise in adult obesity rates after 1985 (http://www.cdc.gov/obesity/data/prevalence-maps.html). A problem among children as well as adults, the increase in obesity and excess caloric intake led to higher rates of type 2 diabetes and cardiovascular risk factors across the population.¹⁻³

By now, it is well established that healthy diets can help prevent obesity, cardiovascular disease, and other chronic health conditions. The American Heart Association recently recommended "a dietary pattern that emphasizes intake of vegetables, fruits, and whole grains; includes low-fat dairy products, poultry, fish, legumes, nontropical vegetable oils and nuts."⁴ Eating these foods, avoiding "red meat, full-fat dairy products, and foods and beverages high in added sugars" and limiting total energy intake promotes health by providing important nutrients and helping people maintain a healthy body mass index (BMI).⁴⁻⁶ Yet most Americans' diets do not come close to this ideal. While nutrition advice can help individuals improve their dietary patterns,⁷ the effect of advice alone is minimal, leading researchers and policymakers to look elsewhere for strategies that simultaneously improve population health, are scalable, and are cost-effective.

Borrowing from the social sciences, researchers began to use the science of neighborhood effects and new spatially referenced data to study the "food environment"—the mix of food outlets near an individual's home, school, or workplace. Some evidence suggested that low-income people were more likely to live in "food deserts," places conceptualized as lacking access to affordable, healthy food, and that food deserts were linked to obesity.^{8,9} Investigators hypothesized that people who lived in neighborhoods with more supermarkets and other healthy food outlets would have better dietary patterns and lower rates of obesity and that exposure to unhealthy food might have the opposite effect.¹⁰

The idea had enormous appeal to policymakers as well as researchers. It suggested that city or state governments could promote health by using existing policy tools such as zoning, construction, loans, or tax incentives. Some policymakers have already sought to increase the number of healthy food outlets in identified neighborhoods, as with New York City's Green Carts and the Food Retail Expansion to Support Health (FRESH) initiative¹¹ and the federal Healthy Food Financing Incentive.¹² Others focused on unhealthy food outlets;¹³ concerns were raised especially about the concentration of fast-food restaurants near schools¹⁴ or in socially disadvantaged communities.¹⁵ Los Angeles enacted a one-year moratorium on new fast-food restaurants in the South Central neighborhood.¹⁶ In addition to limiting the number of fast-food outlets, policies have sought to improve the nutrition environment within food outlets often considered unhealthy, either by providing consumers with more nutritional information, like New York City's calorie labeling law, which was subsequently applied nationally through the Affordable Care Act, or by changing the mix of foods sold in these outlets, e.g., New York City's Healthy Bodegas Initiative.

As is often the case, policy enthusiasm outpaced research: in the early 2000s, there was little systematic evidence linking the food environment to diet, BMI, and disease outcomes such as cardiovascular disease or diabetes. We did not know, for instance, whether access to healthy food or exposure to unhealthy food was more important for health. Moreover, discussions of the food environment often drew on simplistic assumptions—such as, larger stores were more likely to offer healthy food or people tend to shop at the supermarket nearest their homes—that were plausible but had been subjected to little empiric testing.

We organized the BEH group in 2004 when Andrew Rundle, an epidemiologist, and Kathryn Neckerman, a sociologist, obtained seed funding from the HSS program at Columbia University. Gina Lovasi, a Health & Society Scholar at Columbia University, joined in 2006, and Michael Bader, who went on to be a Cohort 7 HSS at the University of Pennsylvania, joined in 2008. Funding from the National Institutes of Health in 2005 allowed us to hire a geographer and geographic information systems (GIS) analyst—essential resources for the work we planned to do. In our research on the food environment, the primary goal was to devel-

op new evidence about whether and how the food environment might shape health, with a focus on New York City. Even in this very dense city, many individuals have no or few healthy food sources near their homes. Historically disadvantaged communities, particularly African American neighborhoods, are especially likely to have low access to healthy food outlets.¹⁷ We hoped to learn whether placing healthy food sources within closer reach or limiting unhealthy food outlets could improve dietary quality (e.g., more fresh produce, lower reliance on bulk-purchased nonperishable goods) and health. In addition, informed by our own and others' research and by our growing knowledge of the city's food landscape, we developed ancillary projects that addressed conceptual and methodological issues in study of the food environment. Our research program was shaped by continuing discussions with colleagues in city government, some of whom became our research collaborators.

Study Design and Execution

Like most researchers studying the food environment, we began by using cross-sectional study designs in which individual-level health data were linked to measures of the neighborhood food environment. We were fortunate in our location: there were many data collection efforts at Columbia University and in New York City government that we could leverage for our research. Contacts with city government led to opportunities to use several large New York City data sets, including the Community Health Survey, an annual health surveillance survey of adults, and the NYC Fitnessgram, which collects objectively measured data on obesity and fitness among New York City schoolchildren. We were able to collaborate with the New York City Department of Health and Mental Hygiene on several research grants and analyses.

For our initial study of the New York City food environment, we used business micro-data (i.e., a list of businesses coded by location and type) to characterize the mix of food outlets in a neighborhood.¹⁸ Based on previous research, we used detailed industry codes in the business data to classify food stores and restaurants as "BMI-healthy," "BMI-intermediate," or "BMI-unhealthy."¹⁹ We defined healthy food outlets to include supermarkets, fruit and vegetable markets, and natural food stores. To identify "BMI-unhealthy" food sources, we also used industry codes but supplemented this strategy with name searches for local and national chain restaurants to make our classification more accurate.

Using GIS software, we defined neighborhoods for our study participants and measured the presence or density of different types of food outlets in these neighborhoods. We then examined how the distribution of food sources across neighborhoods was associated with obesity levels of neighborhood residents. In addition to these analyses, we conducted several ancillary studies. One used qualitative interviews to elicit perceptions of healthy food among Hispanic immigrants in the city. For another, we used the Nutrition Environment Measurement Study in Restaurants audit protocol²⁰ to compare nutrition environments in small corner stores (locally, "bodegas") and national chain fast-food restaurants.²¹ We also conducted a mapping study to learn more about disparities in access to healthy and unhealthy food in New York City.

Results

Consistent with a core assumption of research and advocacy on the food environment, we found that obesity was less common among people who lived near supermarkets and other healthy food outlets such as produce markets and natural food stores.¹⁹ We also found that the relative density of unhealthy compared with healthy food sources predicted higher BMI in New York City, while the absolute density of unhealthy food did not.^{19,22} As reported in earlier studies of food deserts, this result could mean that unhealthy food sources are not themselves problematic as long as people can access healthy food sources. Alternatively, it may be that unhealthy food outlets are so prevalent in New York City that the slight variation in density seen across neighborhoods is not sufficient to influence diet.

Our study of adolescents, however, yielded a surprising result: adolescents with more neighborhood fast-food availability had lower odds of obesity.²³ This finding is counterintuitive in light of what we know about the nutritional content and portion size of offerings at national chain restaurants, as well as their pricing and marketing strategies.^{1,15,24,25} However, our systematic review of the U.S. literature¹⁷ also raised questions about the idea that unhealthy food density is a major determinant of obesity rates in the contemporary U.S. context. Indeed, a previous national study found no association between neighborhood fast-food restaurant availability and fast-food consumption,²⁶ an association that would seem to be necessary for unhealthy food outlets to influence weight and health. If fast food were completely absent from the environment, people would not eat it, but it may not follow that incrementally higher fast-food restaurant density always increases fast-food consumption. A ceiling effect could be in play, in which the availability of fast food does shape dietary patterns but, above some threshold, increases in fast-food density have little or no effect.¹⁶

We explored competing explanations for this unexpected result linking fast-food availability to lower adolescent obesity and noted that fast-food restaurants were related to commercial investment in general: neighborhoods with a higher density of banks also had lower obesity rates, even though there is no apparent reason why banks would be directly predictive of adolescent diet or weight. It may be that fast food, banks, and other retail businesses after "retail" are markers of economic context or other neighborhood qualities associated with

lower obesity and better health.²³ The underlying economic forces leading to disinvestment of all kinds, reflected in our work by fewer fast-food outlets and fewer banks, might be an important factor affecting obesity. This analysis suggests that policymakers should be cautious about identifying solutions based on *correlations* without fully considering complex social forces that might be underlying *causes* of unequal health.

Other BEH studies refined and complicated our conceptions of a healthy food environment. Incorporating specific practices of ethnic groups provides a distinctive lens on the food environment. Our mixed-methods study found that many Latina immigrants did not consider supermarket food to be healthy; their conceptions of nutrition emphasized food that was fresh and local, such as produce from farmers markets or chickens from local slaughterhouses.²⁷ We also found that, among our Latina sample, residential neighborhood access to farmers markets was associated with higher reported consumption of fruits and vegetables, while residence near a supermarket was not associated with differences in diet. Furthermore, living in a co-ethnic Hispanic enclave was associated with healthier diets, and differences in dietary quality by neighborhood ethnic composition could not be explained by measured differences in the retail food environment.²⁸ This work suggests that the same kind of food environment could have different effects across communities defined by ethnicity or other social characteristics.

Our audit study measured the nutritional environments of fast-food restaurants and bodegas, both commonly considered unhealthy food sources.²¹ We found that bodegas offered more healthy foods than fast-food restaurants, while fast-food restaurants were more likely than bodegas to provide nutritional information such as calorie counts. Both bodegas and fast-food restaurants located in high-poverty neighborhoods had poorer nutritional environment scores than their counterparts in low-poverty neighborhoods. Here, too, the reality of the food environment is more complex than the industry codes in our business micro-data suggest. If the nutritional environment is systematically poorer in high-poverty neighborhoods, we could be underestimating its effect on health when using standard measures.

Lastly, we used a mapping study to see how our measures of food access might be affected by neighborhood characteristics that affect travel. Most studies, including our own, examine the food environment within a fixed buffer size—a half-mile or so—around the home, but neighborhood characteristics could moderate the effect of distance. In some neighborhoods, for instance, high crime or poor traffic safety may encourage residents to stay close to home. In others, excellent public transit or high rates of car ownership allow residents to take advantage of food outlets farther away.²⁹ Adjusting for these differences changes the patterns of disparities we observe.³⁰ For instance, car ownership rates tend to be lower in high-poverty neighborhoods. When we adjust for car ownership in our measures of supermarket access, the gap between poor and affluent neighborhoods grows wider.

Translating Research to Policy

Defining a public policy "takeaway" from these studies was not straightforward. We had found that access to both healthy food and unhealthy food seemed to be associated with lower obesity rates. In this case, however, what attracted mainstream media attention was the unexpected or counterintuitive results. For instance, our study of immigrant women's perceptions of supermarkets, in which we reported that Latina immigrants did not consider supermarkets to be "healthy," led to an interview for Andrew Rundle on "Latino USA," a National Public Radio show.³¹ The study of fast food and adolescents' BMI was covered in Los Angeles, where city government had limited new fast-food outlets in specific neighborhoods, and in New York City, where Mayor Michael Bloomberg's recently proposed ban on the sale of large sodas had drawn controversy. Michael Bader, first author of that paper, sought to highlight the broader issues of economic disinvestment. He was quoted in the *Los Angeles Times* saying, "My research has found banning fast food misses the root cause of unhealthy communities," and in the *New York Post* stating, "Maybe the worst places for your health are where fast-food restaurants won't locate."^{32,33} The *New York Post*, however, led with: "Nanny Bloomberg might want to reconsider his war on everything that tastes good."³³

Our research on the food environment attracted notice from researchers and policymakers in the New York City Department of Health and Mental Hygiene and elsewhere in city government. Even as we were conducting our research, the city was launching a number of initiatives to increase availability of healthy food in underserved neighborhoods, including: (1) a program of Green Carts, sidewalk stands that sell fresh produce; (2) the FRESH program, which supports the establishment or retention of grocery stores; (3) the Healthy Bodegas Initiative, which promotes the sale of produce and other healthy items at corner stores; (4) the Shop Healthy NYC program, which promotes stocking and display of healthy foods in grocery stores in targeted zip codes; (5) the Health Bucks program, which provides a bonus to customers using food stamps to purchase fresh produce at farmers markets; and (6) efforts to promote the expansion of farmers markets in low-income neighborhoods and to equip these markets with terminals so customers can purchase food with their EBT (food stamps) cards. These initiatives, aimed at the food environment, complement other regulatory steps, voluntary standards, and public education campaigns. Similar initiatives were launched in other major cities.

It is notable that, by and large, these measures addressed the undersupply of healthy food, not the oversupply of unhealthy food. One reason for this is the ubiquity of unhealthy

food.^{19,34} In New York City, unhealthy food sources, including fast-food restaurants, pizzerias, and corner stores, are 10 times more prevalent than healthy food sources.¹⁹ These counts don't even include the calorie-dense foods that are widely available from pharmacies, gas stations, newsstands, mobile vendors, and other businesses. In an environment that is so saturated with unhealthy food, restrictions on restaurants and stores would have to be Draconian to impact diets—and such policy measures are likely to be politically and legally challenging to enact. It may be more productive to focus on increasing the variety, value, and prominence of healthy options within fast-food restaurants, corner stores, and other "unhealthy" outlets.³⁵ New York City's Healthy Bodegas Initiative and Philadelphia's Healthy Corner Store Initiative have taken exactly that approach.

Although we cannot draw a straight line between our research and a specific food policy, our research was part of the context in which these policy measures were developed. At the request of Karen Lee at the New York City Department of Health and Mental Hygiene, Gina Lovasi led the development of a report on Built Environment Indicators for New York City and presented this report to a multiagency audience in 2008. Andrew Rundle provided testimony to the New York City Council and the New York City Planning Commission at 2009 hearings on healthy food access and the FRESH initiative and met several times with New York City's food policy coordinator ("food czar"), Ben Thomases.

We were also engaged in policy formation at the national level. In 2009, the U.S. Department of Agriculture's (USDA's) Economic Research Service provided guidance to Congress on the measurement of food deserts. The BEH group took part in a conference organized by the University of Michigan's National Poverty Center to help the Economic Research Service formalize a definition of food deserts for the federal government. Our working paper was cited in the 2009 USDA food deserts report to Congress, which in turn was incorporated into the USDA Food Environment Atlas (http://www.ers.usda.gov/topics/food-choices-health/food-access.aspx) and into ongoing analyses on the extent and consequences of food deserts by the USDA and research groups throughout the United States.^{36,37}

Successes and Challenges

BEH research on the food environment can count a number of successes. We contributed to a growing literature on the association between the food environment and health; documented disparities in healthy food access and unhealthy food exposure in New York City; highlighted conceptual and measurement questions in studies of the food environment; and engaged with the local and national policy conversation related to food and health. In an iterative fashion, our interactions with policymakers, community groups, and the press have fed back into our new research directions. Chief among these is a project that addresses a key methodologic

challenge in the research on the food environment and health: the fact that most studies relating the food environment to health, including our own, measure cross-sectional correlations and do not evaluate whether the temporal sequence supports causality.

In the largely cross-sectional literature linking the food environment to health, common causes such as lifestyle preferences and poverty may confound observed environment-health associations. Although longitudinal research is often recommended as a strategy to enhance the relevance of future research on local environments and health, many studies have incorporated change only on the health side, while assuming that the environment is fixed. Use of longitudinal data is a substantial advance in work on neighborhoods and health, yet lifestyle preferences and other common causes could still confound the association between baseline environment and changing health during follow-up. For example, someone who prefers to eat fresh foods might choose to live near a supermarket or farmers market and might also have a healthier dietary pattern over subsequent years. In addition, those areas with high resident demand for healthy foods would be expected to attract and sustain businesses that sell healthy foods. These patterns of neighborhood selection would tend to inflate the association between local availability of healthy food outlets and health at any time, making the observed correlation an overestimate of the causal effect of healthy food outlets on changes in health over time. The status quo of cross-sectional research also typically neglects how local policies such as zoning or investment affect the location of residents and businesses; this factor needs further academic research to help policymakers understand how they influence the patterns we study.

These limitations have motivated longitudinal research efforts to strengthen our understanding of whether living in a healthy environment influences diet or vice versa. Two strategies are often used to clarify the sequence of cause and effect in place-based studies using longitudinal data. The first strategy is to study people who move. Mobility experiments such as Moving to Opportunity for Fair Housing³⁸ observe what happens when randomly selected families are given vouchers to move to a different neighborhood with less concentrated poverty. Such experiments are intriguing in that they can capture responses to a new environment, although they may not be generalizable to residential moves that occur over the life course for a variety of reasons. In addition, the relocation-focused experiments are best suited to inform housing voucher policies, rather than policies that would focus on making neighborhood food environments more health-supportive. Thus, a second strategy is to study neighborhoods that change. Studies in this vein often leverage "natural experiments" such as policy changes. For instance, several such studies have considered a major change to the local context, such as a new supermarket, transit infrastructure expansion, or housing development.^{39,40} However, if these studies fail to support the original hypothesis, the result is often explained away based on lack of fidelity to the research question or to idiosyncratic barriers to population use of the new resource. Research using natural experiments in multiple sites is less vulnerable to these kinds of limitations.

The next phase of our research builds on both of these research strategies. In a project led by Gina Lovasi, "Communities Designed to Support Cardiovascular Health for Older Adults" (1R01AG049970-01A1 from the National Institute on Aging), we will analyze two population-based cohorts of older adults. We will take advantage of self-reported information on residential moves,⁴¹ supplemented with commercially available residential history data,⁴² providing unprecedented richness of information on residential stability and change in later life. With detailed survey data as well as linked profile information from LexisNexis (e.g., property ownership, vehicle registration, bankruptcy), we can explore changes in health and financial circumstances that might precipitate moves to a new neighborhood. These data on residential locations and health over time will be linked to a 25-year census of local businesses from the National Establishment Time-Series,⁴³ capturing key dynamics in the food environment.

Given their spatial and temporal scope, these data are likely to offer a number of natural experiments. In particular, supermarket openings or broader zoning changes are attractive because they are outside the control of any one study participant and thus likely to be independent of their preferences. With residential location data over time we can also examine whether participants appear to relocate in anticipation of, or in response to, shifts in the local food environment.

This work will also provide a strong platform for informing policy and understanding effect heterogeneity—in other words, when, where, and for whom the food environment matters most. Our research strategy, which relies on time-varying measures of both residential address and environment characteristics, will also allow us to consider the food environment as part of a broader context. Other aspects of the environment, including housing characteristics,⁴⁴ pollution sources,⁴⁵ daily stressors,⁴⁶ and physical activity opportunities, may all have effects on obesity that are not entirely explained by associated dietary behaviors. As research on the built environment continues, it will be important to assess how the multiple associations with health are related to each other and whether those associations are contingent upon each other.

Conclusions

Research on the environmental determinants of health and health behavior has successfully shifted attention from individual risk factors to the broader contexts that shape risk factors and related behaviors. Although the evidence linking the local food environment to dietary intake and health is not drawn from studies with traditional experimental randomization, this evidence has nonetheless reached an audience among policymakers and other stakeholders. As new data and computational resources become available, the policy-relevant evidence base will expand and enrich this evolving story. Government agencies, community groups, and business entities make decisions that have lasting impact on the homes, neighborhoods, lifestyles, and health of populations; evidence can both inform and help assess these decisions.

More remains to be done. Questions remain as to whether built environments can be effectively designed to improve health and how different populations would react to such changes. The population health research community has an opportunity to articulate both the importance of health for successful communities and the potential for policies and infrastructure investments to support healthy behaviors alongside economic, ecological, and equity goals. As decisions are made that have lasting structural and system-level implications for populations, the best currently available evidence should be shared, with attention to limitations and remaining uncertainty, and leveraged to limit harmful effects and optimize health benefits. Partnerships within and beyond the health sciences can generate and help to disseminate this evidence. The BEH group will continue to build on a decade of research innovation and translation in the context of growing policy interest to improve the urban food environment.

Discussion Questions

- 1. What has been the role of your own environment in shaping lifestyle patterns? Do you see ways that the opportunities for healthy or unhealthy eating have influenced your diet?
- 2. Self-selection of people into neighborhoods that match their lifestyles was discussed as one source of bias in neighborhood health research. How have you made decisions about where to live? Do your health-related preferences and resources such as supermarkets factor prominently into your decisions?
- 3. In considering policy on the food environment, research to date offers some guidance, and yet the evidence continues to evolve. How should the research community balance the interests of news media and policymakers, who would like a clear and simple message about what works, with the desire of researchers to accurately convey the state of existing scientific knowledge?

Assignment

Choose one or two commercial blocks near your home or school and list the food outlets (stores and restaurants) on these blocks. Include all stores that sell food, even if they are not grocery stores or restaurants. If there are food trucks or sidewalk stands that sell food regularly, include these as well. Which outlets should be considered "healthy" or "unhealthy" and why? Based on the research described in the case study, what local policies (if any) would you recommend to make this micro-food environment more supportive of healthy eating? How would you know whether your proposed change provided the anticipated health benefits? Defend your policy and research recommendation.

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Case Study 2 Fragile Health and Fragile Wealth

Understanding the relationship between mortgage strain and health inequality through the stories and experiences of working-class African American homeowners

Author

Danya Keene, PhD Assistant Professor Division of Social Behavioral Sciences Yale School of Public Health

Synopsis

This case study aims to better understand relationships between the recent mortgage crisis and population health through in-depth interviews conducted among working-class African American homeowners who were experiencing difficulty paying their mortgages. These interviews showed how racial inequalities in health can intersect with other racially stratified sources of risk to put vulnerable homeowners at risk of mortgage strain. Many participants in this study experienced mortgage strain following a health-related event that triggered a collapse of a fragile household budget. Like many working class African Americans, participants experienced poor health at relatively young ages. Additionally, they often lacked access to adequate personal and social safety nets that could buffer the consequences of illness. This qualitative study was followed by an analysis of data from a nationally representative sample of homeowners, in collaboration with Jason Houle, a fellow Robert Wood Johnson Foundation Health & Society Scholar (HSS). This quantitative analysis, like the qualitative one, found that the onset of illness or disability was associated with significant increases in the risk of mortgage strain, mortgage default, and foreclosure, and that these relationships were primarily mediated through job loss and health care costs. Together, these studies suggest that the policy discussion around stable homeownership must go beyond the current focus on housing finance reform and financial literacy to include efforts that strengthen the broader safety nets available to homeowners who become ill or disabled.

Learning Objectives

- Understand the intersection of mortgage strains and health inequity.
- Examine the strengths and limitations of qualitative research methods in producing policy-relevant work.
- Consider the intersections of health and social policies in efforts to improve population health.
- Consider the challenges of translating social research into policy.

Introduction

As a Robert Wood Johnson Foundation Health & Society Scholar, I sought to better understand the relationship between the recent mortgage crisis and health inequality through the stories and experiences of working-class African American homeowners who were experiencing mortgage strain. I began my HSS fellowship directly following the peak of the foreclosure crisis and saw this prominent social issue as an extension of my prior work on the intersections of racial inequality, health, and housing.

Low-income and minority homeowners have experienced particularly large numbers of home foreclosures, in part because they were more likely to receive risky subprime loans.^{1,2} When I began this project, I was interested in the effect of home foreclosures on African American homeowners, on their communities, and on existing race inequalities in health and wealth.

While an emerging body of research had begun to find associations between mortgage troubles and poor health, race was largely absent from these analyses.³⁻⁶ Furthermore, the emerging quantitative literature was unable to show how homeowners experienced and navigated their mortgage challenges. My qualitative project sought to address these gaps in the literature. By using semi-structured interview techniques that allowed participants to tell their own stories on their own terms, I hoped to shed light on the experiences and processes that connect mortgage strain to health, thus identifying parts of the process that could be amenable to policy and programmatic intervention.

While I initially sought to understand how the experiences of mortgage strain and foreclosure could contribute to poor health and health inequalities, my research focus shifted considerably after a few months in the field. This shifting is a common feature of inductive qualitative projects such as this one, where broad research questions are refined through an iterative process of data collection, analysis, and reflection.⁷ Specifically, as the interviews proceeded, I was struck by the extent to which participants' mortgage troubles were preceded by illness. I was also struck by how this poor health intersected with other sources of fragility in the public and private safety nets available to my participants. The health context of homeowners' financial experiences became the primary focus of my work.

Study Design and Execution

This study took place between March 2012 and May 2013 in a Philadelphia neighborhood that I refer to as Locust Park. It is a stable, working-class, almost exclusively African American neighborhood. It is home to a large number of older black homeowners who purchased their homes in the 1960s and 1970s from whites who were moving to the suburbs and thus contains a substantial number of long-term homeowners. I chose Locust Park in part because it had one of the higher rates of foreclosure in the city—nearly twice the city average. It was also heavily owner-occupied with nearly 80% of its residents owning their homes. While Locust Park's poverty rate was relatively low, it was a working-class community that had been particularly hard hit by the recent economic downturn.

I recruited an initial group of Locust Park homeowners through letters that a large regional mortgage counselor sent to their former clients. I recruited a small number of additional participants through referrals from those already in the study. I initially intended to interview families at various stages of the foreclosure process: those who were behind on their payments but still in their homes and those who had lost their homes to foreclosure. However, I was unable to find more than a few families who had experienced foreclosure, since at this time only about 2% of households were experiencing foreclosures. In addition, these displaced families were no longer residing at the addresses to which recruitment materials were sent. This sampling and recruitment issue likely played a role in the shifting focus of the project. Had I interviewed families who had gone through foreclosure, I probably would have learned more about the consequences of this event. Instead, I learned more about how participants came to be struggling with their mortgages.

This was an inductive qualitative study with 28 participants, all of whom were African American and 23 of whom were women. Most of the participants (18) had been in their homes for at least 10 years. Only nine were employed. Rather than setting out to test specific hypotheses, I was interested in broadly understanding how homeowners experienced mortgage strain. To accomplish this goal, I used a semi-structured interview format that allowed participants to tell their own stories of mortgage strain, which allowed me to ensure that important themes were covered. The interviews asked questions about buying and maintaining a home, securing a loan, making ends meet, social support resources, neighborhood context, and health and health care. Most interviews took place in participants' homes and lasted from one to three hours. I gave participants \$50 as compensation for their time. The project followed a grounded theory approach⁷ and, according to this approach, analysis was an ongoing process that occurred iteratively with data collection. After each interview, my research assistant, Dr. Amy Baker, and I wrote thematic summaries that both summarized the content of the interviews and discussed emerging themes. In accordance with grounded theory methodology, this early analysis allowed us to refine our questions to further interrogate emerging themes.

Once the data were collected, my research assistant and I constructed a codebook. First, we reviewed several transcripts and noted emerging themes. We then organized these themes into broader categories that comprised our codebook. Once a codebook draft was complete, we each coded a few interviews and met to discuss inconsistencies in our coding, overlap of existing codes, and codes that needed to be added. Once we were satisfied with the final codebook, it was used to code all of the interviews using the qualitative coding software Atlas-ti.

This analysis benefited from an interdisciplinary research team that approached the data from a number of unique angles. In particular, Dr. Baker's experience as a social worker brought to the data research questions about the interactions between homeowners and organizations. Dr. Julia Lynch, a political scientist, brought expertise in social welfare policy. I approached the data from the perspective of my interdisciplinary training in population health, drawing on both the epidemiological literature on health disparities as well as a large sociological literature on housing, place, and inequality. Qualitative data contain many stories, and this interdisciplinary perspective resulted in a story about the intersections of health and wealth inequality that is the focus of this case study. This narrative emerged in the early phases of data analysis and was further supported through the process of coding and organizing the data.

Results

Poor health leads to income loss

The interviews point to several intersecting pathways that connect poor health and mortgage strain. The most common among these pathways was the loss of income that resulted from illness and disability. The story of one participant, Theresa, illustrates this process. Theresa was a single homeowner who purchased her home with her husband in the late 1960s and paid off the mortgage in five years. After their divorce in the 1980s, Theresa maintained the home and her budget single-handedly through long work hours at two jobs. When the house needed repairs or extra expenses arose, she took on another shift. However, as she approached her late 50s, her health began to deteriorate. She suffered from debilitating

arthritis and could no longer work the long hours. Her only financial cushion was the equity in her home, and she took on a second mortgage. Then in 2006, at the age of 60, she lost her job. She explained, "Things got really bad after 2006 with trying to pay my bills because my health started failing me. So, I was classified as being disabled to work. Couldn't work because of the pain and everything." Not only was Theresa too sick to find a replacement job, but like several other study participants, she also was too young to qualify for age-related income supports. It took a year to negotiate her eligibility for disability. During this time, she accumulated large credit card debt. Seven years later, she remained in a constant struggle to save her home.

For Theresa, work in the form of overtime was the cushion she had relied on to make ends meet in the context of unanticipated expenses. Her failing health eliminated this cushion. The same was true for 43-year-old Leigh Jones, a registered nurse and divorced mother of four. After her divorce, Leigh took on a more demanding job to stay on top of her bills. However, she had to give up this position because of a neuromuscular condition that prevented her from working the long hours. She explained, "I hadn't had any flare-ups until I was on this job trying to juggle all these responsibilities...so I had to give it up because I had an exacerbation." In her subsequent struggle to make ends meet, she missed mortgage payments and received a foreclosure notice.

For some participants, it was not their own health but the health of a family member that led to reduced work hours. For example, 57-year-old Ronald owned a commercial cleaning business that was fairly successful. However, when his mother became ill with Alzheimer's disease, he downsized the business to take care of her. After she died, he was not able to recoup these hours due to the recession. At the time of the interview, he was struggling to keep the house out of foreclosure. He explained, "So then my mom got sick, I came in half a day. I was done at 12:30 p.m. to feed my mom lunch...okay, so that was seven years. Okay, yo, I'm not doing that no more. I've only got one truck now"—compared to the five trucks he had before.

The significance of poor health as a contributor to mortgage strain was most salient in the stories of older and middle-aged members of the sample. However, young and healthy adults were not immune to the health problems that occurred among their older family members. For example, 32-year-old Bria described relying on her parents for financial support when she purchased her home. However, in 2008, when she lost her job and fell behind on her mort-gage, her father, who was in his late 50s, had also recently become ill and lost income. She noted, "My parents...they helped me as long as they could. Like they helped a lot actually. But then my dad got sick, so then, you know, yeah, I couldn't—we couldn't—couldn't do as much. My mom was, you know, trying to make ends meet there, so I felt like I was a burden."

For several participants, not only did experiences of illness precede mortgage trouble, but the stress associated with mortgage strain seemed to exacerbate underlying health issues. In some cases, this then made it even harder to regain a secure financial footing through employment. For example, 51-year-old Felicia described how the threat of losing her home exacerbated her depression, which then interfered with her employment prospects. As she noted, "People won't hire people with sad eyes."

A second major theme in the interviews was the role of medical costs. Not only did health issues result in lost income, they also resulted in health care costs when participants were uninsured or underinsured. For example, Deborah was diagnosed with cancer in 2010 and though she was already receiving disability benefits for her chronic high blood pressure, many of her new medications were not covered by her insurance. When asked when it first became hard to pay her mortgage, she replied, "After I got sick and [needed] a lot of medicine that I was buying, my insurance wouldn't pay for it. And I started putting out money for medical expenses."

Theresa also described medical bills as part of her ongoing financial struggle. She explained, "Each time you go, you have to pay \$35 with my insurance. Even though I have insurance, I pay \$35 just for...the consultation."

Another common theme throughout the interviews was that participants did not have the resources to buffer the effects of the illnesses and disabilities they experienced. Most of our participants maintained their households on tight budgets with minimal cushion (other than their home equity) to absorb unexpected expenses or lost income due to illness. Many were divorced or single mothers who were raising children or grandchildren on limited income. Many described lacking emergency funds and continuously juggling bills. As 64-year-old Sherry explained, "I thought I'd have a little something saved or a little something put aside for emergencies or if something else breaks down, but that did not work out like that. It did not work out that way."

Additionally, several participants were among the most resourced members of their kin and social networks, leaving them with few places to turn for financial help when they fell behind on their mortgage. As 36-year-old Nicole explained, "Before, this [mortgage default], it seemed like I was the backbone of my family....When we got our home and everything, we helped everybody. My mom lived with me at one time. My twin sister lived with me at one time. My brother lived with me at one time and my older sister."

For some participants, the financial vulnerability associated with health shocks also seemed to be related to gaps in public safety nets. Lack of adequate health insurance was a major theme in the interviews. Participants also described a multitude of struggles in obtaining
other types of benefits including food assistance. They described long hours hunting down benefits and programs that could alleviate their financial distress.

Participants also discussed limited access to income supports after they were no longer able to work because of health issues. Because most participants were too young to qualify for age-related Social Security benefits, their only options for assistance were Social Security disability programs or other public assistance. In many cases, neither of these programs provided sufficient income for recipients to maintain their mortgage payments. As 56-year-old Walt explained, "When you're on a fixed income, I only get like \$800 a month, you know? I'm paying like \$700 a month mortgage."

Others fell behind on their mortgages because of bureaucratic battles that resulted in the delay of these disability benefits. For example, Theresa qualified for disability benefits, but it took over a year to negotiate her eligibility, in part due to lost paperwork. During this period where she had no income, she fell into a vicious cycle of debt. (For a more detailed description of the results, see Keene, Lynch, and Baker 2014.⁸)

In summary, the data from these interviews show that poor health, occurring in the context of under-resourced personal and public safety nets, can threaten fragile household budgets to create mortgage strain. Like many working-class African Americans, participants experienced poor health and disability at relatively young ages, before they were able to qualify for age-related income supports.⁹ To make matters worse, in the context of vast racial wealth inequalities,¹⁰ participants often had little family or personal wealth to draw on in the event of a health crisis, and existing public safety nets often proved inadequate. These experiences of vulnerability are likely not unique to African American homeowners. However, the magnitude of these health and wealth vulnerabilities is linked to an ongoing history of racial stratification that included discriminatory housing policies and wage structures.¹¹

This qualitative work tells the story of a group of homeowners from one community, providing depth that allows us to observe the complexity of financial strain and its intersections with health. However, I was also interested in whether and to what extent the relationships observed in this small sample played out on a national scale among both white and black homeowners. Thus, in a subsequent study, my colleague Jason Houle and I used nationally representative data from the National Longitudinal Survey of Youth to examine how worsening health predicted mortgage strain and foreclosure.¹² We found that the onset of illness or disability was associated with significant increases in the risk of mortgage strain, mortgage default, and foreclosure, and that these relationships were primarily mediated through job loss and health care costs. Additionally, many participants in this study were single or divorced homeowners, and their stories highlighted the challenges of getting by on a single income. Given the decline of marriage overall, it will be important to consider the added financial vulnerability of single-earner households.

Translating Research to Policy

I have conveyed the findings of this work to people and organizations involved in setting policy. As one example, I was invited to join a Foreclosure and Health Advisory Group that was organized by a Pennsylvania nonprofit law firm, Regional Housing Legal Services. This advisory group was comprised of community-based organizations, city agencies, state policymakers, and academics. I was able to share findings from the above study at the advisory group's first meeting. The experience these stories produced helped inform a conversation at this meeting about the intersection of health needs and foreclosure vulnerability. This initial meeting led to future conversations with Regional Housing Legal Services and the Pennsylvania Housing Finance Agency, a state agency that services a large number of home loans in the state, about a need for interventions that could address the depression and anxiety that created additional barriers for at-risk homeowners like Felicia (see page six). We proposed a modest low-cost intervention that would inform at-risk homeowners of subsidized counseling services. The state agency agreed to partner with us by distributing this information to a randomized sample of individuals whose mortgages they serviced. Although the specific intervention was ultimately not funded or carried out, I am hopeful that our research findings about the intersection of health and foreclosure helped lay the groundwork for future policy work and intervention development in this area.

I also anticipate that data from this study informed the work of the many agencies that were at the advisory group meeting by raising awareness about the intersections of health and housing inequalities. Intermediaries such as the participants of this group can be critical to the process of translating research knowledge into practice.

In addition to participating in the advisory group, my colleagues and I extended the reach of these findings beyond academia. For example, Julie Lynch and I spoke with an NPR reporter who subsequently produced a show on the intersections of foreclosure and health. Findings from the quantitative follow-up paper were reported on by the *Washington Post* and Reuters. In communicating with the media through press releases and conversations with journalists, we were careful to emphasize the overarching communication objective of our study: that our society needs to implement more effective safety nets for those who become ill or disabled to help mitigate the risk of mortgage trouble. We were concerned that an oversimplified punch line—for instance, illness leads to foreclosure—could miss the policy relevance of this work by framing foreclosure as an individual problem (the result of individual health behaviors that lead to illness), rather than a structural one. Being able to talk with journalists allowed us to

clarify and emphasize our message so that our findings and their implications were accurately and effectively conveyed.

Successes and Challenges

This project was successful in bringing a new perspective about the intersection of health and mortgage strain to both academic and policy conversations and in bringing the voices of homeowners into these conversations. One challenge I faced in translating the findings of this work into policy is that the interviews spoke most to structural problems that call for "big P" policy changes (for example, the racial stratification of wealth or the inadequacy of social safety nets) rather than programmatic changes that are easier to implement at a local level. However, by showing how participants experienced health challenges and how health challenges and mortgage strain are connected, the interviews did suggest some opportunities for smaller-scale interventions (for example, the provision of mental health counseling for at-risk homeowners) that may be able to weaken the link between getting sick and losing one's home.

Conclusions

These interviews showed how racial inequalities in health can intersect with other racially stratified sources of risk to put vulnerable homeowners at risk of mortgage strain. Although these interviews took place in the wake of the mortgage crisis, the dominant story they tell is not about the burst of the housing bubble or the well-documented rise in subprime lending. Subprime lending did play a role in mortgage strain for some participants, even among those homeowners who once owned their homes outright but then took out second mortgages. However, the loans themselves were rarely discussed as the primary source of mortgage trouble. Instead, interviews showed how loan terms intersected with long-standing inequalities in wealth and health that have resulted from ongoing structural processes. In this sense, the current study extends the discourse surrounding home foreclosure beyond the behaviors of borrowers and lenders.

The findings from this study suggest that the policy discussion around stable homeownership must go beyond the current focus on housing finance reform and financial literacy to include efforts that strengthen the broader safety nets available to homeowners who become ill or disabled. Specifically, these findings suggest a need to reduce the amount of financial burden borne by those who become ill through expanded health insurance coverage. These interviews took place prior to the passing of the Affordable Care Act, and it is possible that may have alleviated some financial burden of illness for those participants who were uninsured or underinsured. However, our findings suggest that even homeowners who have adequate insurance may experience adverse financial consequences of illness as a result of lost income. This suggests that in addition to improving coverage for medical care, expansions of unemployment insurance and disability benefits are also important. Furthermore, the removal of bureaucratic hurdles that cause delays in receipt of disability benefits may help prevent the onset of debt that, as illustrated by several participants in this study, can be hard to recover from. Finally, an expansion of existing mortgage forbearance and insurance programs may also be useful in protecting the home equity of those who fall ill. Given the well-established importance of stable housing and financial well-being, health policies that weaken the link between illness and home loss are likely to have broader implications for population health.

Discussion Questions

- 1. What are the strengths and limitations of qualitative research for doing policy-relevant population health research?
- 2. Thinking beyond what was discussed in this case study, what are other ways in which the researchers could have increased the policy relevance of this work? Who could they have reached out to? What recommendations could they have developed?
- 3. Discuss how the data presented here have or have not changed your perspective about the foreclosure crisis and mortgage strain more broadly.
- 4. What unanswered questions does the current case leave you with? How would you go about answering these questions?

Assignments

- Conduct a review of existing programs designed to help older homeowners—such as some of the participants in this study—avoid mortgage default and foreclosure. You can include both local and federal programs. Analyze these programs from the perspective of this case study. Discuss how these programs fit with what you learned in this study and how they do not fit. Propose recommendations for how existing programs could be modified, extended, or replaced.
- 2. Design a follow-up study based on this case study that can extend our knowledge of mortgage strain and health relationships and translate into more effective policies and programs. Describe the research question you will address and how it relates to the current case. Describe the methods you will use to address this question. Finally, discuss how you might translate this research into policies or programs.

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Case Study 3

Medical Marijuana as a Strategy to Reduce Opioid Overdose Deaths? Lessons from a Study of State Medical Marijuana Laws

Is legalizing medical marijuana an effective policy to reduce the rising tide of drug overdose deaths?

Authors

Brendan Saloner, PhD

Assistant Professor Department of Health Policy and Management Johns Hopkins Bloomberg School of Public Health Marcus Bachhuber, MD, MSHP Assistant Professor Division of General Internal Medicine Department of Medicine Montefiore Medical Center/Albert Einstein College of Medicine

Synopsis

This case study describes a collaborative project that combined our backgrounds in addiction medicine and health policy. We were led to this project through a shared interest in policy strategies to reduce opioid overdose mortality, which has more than quadrupled in the United States since the late 1990s. We hypothesized that access to medical marijuana, an alternative treatment for chronic pain, might reduce use of opioid painkillers at a population level and decrease overdose deaths. Using a quasi-experimental study design, we compared trends in overdose death rates in states that implemented medical marijuana laws to states that did not pass such laws. We found that enactment of a medical marijuana law was associated with a mean 24.8% lower opioid painkiller overdose mortality rate, relative to pre-enactment trends and trends in states without such laws. In 2013, when this study was conducted, it was the first study to link access to medical marijuana through changes in state laws to reduced mortality from opioid painkillers. In the following case study, we present the collaboration that facilitated this study, the process of developing our study design, and the dissemination and policy impact of our findings.

Learning Objectives

- Describe the epidemic of opioid misuse, addiction, and overdose and the hypothesized relationship between medical marijuana and use of opioid painkillers.
- Compare the benefits of using natural experiments versus other potential study designs to measure the impact of medical marijuana on population health outcomes.
- Explain some of the challenges in communicating study findings to the news media, and present some strategies that may be effective in improving communication.
- Identify future directions for research on medical marijuana and opioid painkillers, and describe how current research can inform federal, state, and local policy.

Introduction

What are effective public policies to reduce the rising tide of opioid drug overdose deaths?

Our shared interest in answering this seemingly straightforward question led us to collaborate during our time as postdoctoral fellows at the University of Pennsylvania. When we met, Brendan Saloner was in his second year of the Robert Wood Johnson Foundation Health & Society Scholars (HSS) program and Marcus Bachhuber was in his first year of the Robert Wood Johnson Foundation Clinical Scholars Program. During our training, we had both developed interests in substance use disorder treatment policy and in contextualizing the problems of drug and alcohol use within population health. We realized we not only shared a research interest but also brought together complementary skill sets. Marcus is a primary care physician with training in addiction medicine and has firsthand experience treating patients with substance use disorders. Brendan has a PhD in health policy and has experience evaluating how state and federal policies affect health and health care outcomes. We both have a passion for data analysis and for unusual study design.

Our starting point was the rising epidemic of opioid overdose deaths. The term "opioids" generally refers to both natural and synthetic derivatives of opium (from poppies), formulations that have been used to relieve pain since antiquity. Common modern prescription opioid painkillers (also called "opioid analgesics") include morphine, hydrocodone, and oxycodone. Heroin, which was marketed in the late 19th and early 20th centuries as a pain reliever and cough suppressant, is also an opioid.

Between 1999 and 2013, the number of people who died of drug overdoses involving opioid painkillers more than quadrupled, from 4,030 to 16,235 (Figure 1). Addiction to prescription opioids is intertwined with heroin addiction for many individuals, especially as individ-

uals addicted to opioid painkillers seek an inexpensive means to sustain their addictions. In recent years, rates of heroin overdose have also been increasing rapidly (Figure 1).¹



Figure 1. Age-adjusted rates for drug-poisoning deaths, by type of drug: United States, 2000-2013

NOTES: The number of drug-poisoning deaths in 2013 was 43,982, the number of drug-poisoning deaths involving opioid analgesics was 16,235, and the number of drug-poisoning deaths involving heroin was 8,257. A small subset of 1,342 deaths involved both opioid analgesics and heroin. Deaths involving both opioid analgesics and heroin are included in both the rate of deaths involving opioid analgesics and the rate of deaths involving heroin. Access data table for Figure 1 at: http://www.cdc.gov/nchs/data/databriefs/db190_table.pdf#1. SOURCE: CDC/NCHS, National Vital Statistics System, Mortality.

The rising tide of opioid overdose deaths is a complicated problem, but one important driver has been a change in physicians' treatment decisions for patients with chronic pain. Over the past few decades, health care providers, researchers, and policymakers have increasingly recognized chronic pain to be common and a significant public health problem.^{2,3} While medical providers almost universally recognized the importance of treatment of pain due to cancer and pain at the end of life, the idea that chronic pain from other causes (e.g., arthritis or low back pain) should be aggressively diagnosed and treated (as opposed to simply considered a predictable consequence of aging) is relatively new.

Improving the identification of non-cancer chronic pain through routine assessments in all patients and reducing "undertreatment" of chronic pain (i.e., not providing sufficient medical treatment to alleviate pain) have become cornerstones of medical care and are promoted by professional societies and organizations that accredit hospitals and clinics, as well as state medical licensing boards.⁴

In practice, prescription opioid painkillers for the treatment of chronic non-cancer pain proved both much less effective and riskier than originally believed. Up to two-thirds of patients who initially experience pain relief discontinue treatment for reasons such as side effects, lack of benefit, or both.⁵ Nevertheless, as these medications became more commonly used, medical providers and public health officials began seeing significant increases in opioid painkiller misuse, addiction, and overdose. By 2013, more than 4.5 million Americans reported using opioid painkillers nonmedically (i.e., without a prescription, at higher than prescribed doses, or for purposes other than treating pain).⁶

Marijuana (frequently called "cannabis" outside the United States) is currently most well known as a recreational drug, but its medical use for pain relief has been documented for thousands of years. In the United States, marijuana was legal and used medically until the 1930s, after which the federal government outlawed its use.⁷

Many modern clinicians and researchers advocate for marijuana's medical use in the management of chronic pain. The potential application of marijuana for pain management led us to wonder whether enactment of state legislation providing access to marijuana for medicinal purposes might lead some patients to move away from opioid painkillers and ultimately result in reduced opioid overdose mortality. As of 2015, 23 states and the District of Columbia have legalized marijuana for medicinal purposes.⁸ Specifically, most of these states have legalized medical marijuana for use in treating chronic pain, and in states for which information is available, the majority of patients enrolled in medical marijuana programs report chronic pain as the reason for use.⁹⁻¹¹

The relationship between medical marijuana and opioid painkillers has not been widely studied. Anecdotally, many health care providers hear from patients that marijuana is more effective than opioid painkillers in relieving pain, and, sometimes, that marijuana is the only treatment that helps. Surveys of people applying for medical marijuana cards or filling prescriptions at marijuana dispensaries have found that up to two-thirds (51%-66%) reported substituting marijuana for prescription drugs; however, the proportion who substituted marijuana for opioid painkillers is unclear.¹²⁻¹⁴ There is also evidence of a link between marijuana use and opioid painkiller or heroin misuse. Over one-quarter (26%-30%) of patients reported substituting marijuana for an illicit drug.¹²⁻¹⁴ In addition, a study of people who inject heroin found a link between marijuana use and less frequent heroin use.¹⁵

Study Design and Execution

In clinical research, the gold standard for determining the causal effect of a treatment (e.g., medical marijuana) on an outcome (e.g., opioid overdose) is the randomized clinical trial. While incredibly valuable, these studies take years to plan and conduct and require enormous budgets, and findings are not disseminated until a long time later. In the case of marijuana, its classification by the U.S. government as a schedule I controlled substance with "no currently accepted medical use in the United States, a lack of accepted safety for use under medical supervision, and a high potential for abuse" makes research even more difficult to conduct.

Although a randomized clinical trial to examine our research question was not feasible, medical marijuana laws were passed in different states at different times, presenting a clear natural experiment. These laws have varied in their scope (e.g., whether individuals are permitted to grow their own medical marijuana or must obtain it from a registered dispensary), but they all include state-regulated programs permitting uses of marijuana for medical treatment. Observational studies of such natural experiments are common in policy research where randomized controlled trials are not possible for ethical, logistical, or financial reasons. One advantage of this study design is that by comparing trends in states that passed medical marijuana laws with those that did not, we could identify changes in the outcome that are likely to be caused by the legislation, independent of other changes occurring at the same time.

We focused on overdose mortality as our outcome of interest. We identified death certificates as a potential source of data for our study because they are publicly available for research purposes from the U.S. Centers for Disease Control and Prevention. Death certificates include a probable cause of death, allowing us to identify cases where a person likely died from opioid overdose (a cause that coroners often confirm with toxicology). Death certificate data are released in aggregate, meaning that we could focus on the overall rate of overdose mortality for each year and state. We reasoned that an increase in the overall overdose mortality rate provides a clear signal that there is a problem of underlying misuse within a population.

We began with state-level mortality data for all 50 states from 1999 to 2010 and identified all deaths due to drug overdose that involved ingestion of prescription opioid painkillers. During this period, 13 states implemented medical marijuana laws, and we were able to compare changes in overdose death rates before and after implementation. To learn about our data, we conducted extensive descriptive analysis, creating line graphs to show changes in overdose death rates with and without medical marijuana laws. We also learned about our data by determining if there were any states that were "outliers," i.e., states that

deviated substantially from other states in their overdose mortality trends. For our main statistical analysis, we used regression models to account for repeated measures and to adjust for several confounders, such as other state policies aimed at improving opioid safety (e.g., prescription monitoring programs).

Results

Early in the analysis process, we identified a strong link between medical marijuana laws and overdose mortality. As we moved forward, we asked two senior colleagues with extensive clinical and analytical insight to join our project. These colleagues (Dr. Chinazo Cunningham and Dr. Colleen Barry) provided valuable feedback about how to refine our analysis and describe our findings.

We found that states that had enacted medical marijuana laws had a mean 24.8% lower opioid overdose mortality rate, after adjusting for several confounders. In a secondary analysis of opioid overdose deaths in each year following medical marijuana law enactment, we found that opioid overdose rates decreased over time: year one, -19.9%; year two, -25.2%; year three, -23.6%; year four, -20.2%; year five, -33.7%; and year six, -33.3%. This could suggest that as medical marijuana programs become more established and enroll more people, the benefits increase. These results were robust in several sensitivity analyses (i.e., we could confirm the findings using alternative statistical procedures).

Our findings that medical marijuana laws are associated with significantly lower state-level opioid overdose mortality rates has several implications. First, medical marijuana laws can potentially play a role in addressing a significant population health challenge beyond treatment of specific disorders. Second, and relatedly, our findings provided an intriguing new angle to dealing with opioid misuse: Most efforts to reduce harms from opioids have focused on simply decreasing access to this class of medications; our findings suggest that increasing access to alternatives may also be successful. Third, some policymakers have suggested that medical marijuana laws may increase misuse and addiction to other drugs (the gateway hypothesis), however, we did not find any evidence of this in the case of opioids.

We are cognizant that both marijuana use and opioid abuse are politically charged topics and were concerned that our findings could be distorted or manipulated to fit the agendas of special-interest groups or media organizations eager to "spin" the story. We therefore carefully considered how to present our findings so as to avoid misinterpretation. As much as we wanted to tell what our findings could contribute to policy decisions, we felt compelled to also communicate what they could not establish. For example, our study was not designed to determine whether medical marijuana is beneficial or harmful to health overall, nor could we definitively answer whether marijuana use leads to other drug problems. We did not address whether there are public health implications related to medical marijuana being diverted for recreational purposes or whether medical marijuana use is a risk factor for injuries or accidents (concerns that have been raised by public health researchers).

Translating Research to Policy

Our findings were published in *JAMA Internal Medicine* in October 2014.¹⁶ Timed to the publication of our findings in this high-impact journal, we carefully crafted a press release that would communicate our message (especially knowing that many journalists only read press releases and not final publications). Almost immediately after the press release was distributed, we received requests for comment from media organizations. Our article was covered in national media such as the *Los Angeles Times*, the *Boston Globe*, the *Philadelphia Inquirer*, and the *Chicago Tribune*, and was featured on national nightly television news programs (e.g., CNN and ABC News).

In speaking to the media, we were careful to emphasize the novelty of our findings while stressing the need for further research and the reality that even our carefully designed study could not independently establish causality. As the lead author, Marcus spoke extensively with reporters and was careful to walk them through our study findings. We believe that this improved the quality of those news articles. On the other hand, we also found that media reports that did not seek comment from our study team tended to sensationalize our findings, often making it seem as though our study could prove that medical marijuana reduced overdose deaths.

As a companion piece and to give our message a broader voice, Marcus and Colleen authored an op-ed detailing the study design and key findings for a general audience, which was published in the *New York Times* ("Of Pot and Percocet," August 29, 2014).¹⁷ The exercise of writing this piece was valuable as it encouraged us to focus on the aspects of the study that were most important for the public to understand and describe the further research we believed would be helpful. In crafting the op-ed, we were guided by a few simple principles: use numbers to illustrate key ideas and to focus readers' attention, explain both what we did and why it mattered, and conclude with a call to action (in our case, greater engagement among clinicians and researchers).

Our study's dissemination via multiple professional and mainstream channels directly contributed to the public conversation about medical marijuana legalization. For example, our report was directly referenced in the Florida news media during debates over Florida's Amendment 2, a ballot initiative to legalize medical marijuana in the state.¹⁸ We have

seen our research referenced in policy briefs written by major policy organizations and in editorials.^{19,20} At the invitation of the Medical Society of Delaware, we wrote a commentary for the state medical journal, published to coincide with the opening of the state's first medical marijuana dispensary.²¹

Two members of our study team (Marcus and Colleen) provided testimony to Pennsylvania legislators related to a proposed medical marijuana law. The bulk of the testimony was from clinicians, patients, and caregivers, but we were asked to comment specifically on our study findings. As with writing the op-ed, preparing testimony required us to carefully consider the most important aspects of the study and how to communicate our findings directly to policymakers. In addition, we had to anticipate and prepare answers to possible questions that lawmakers might ask.

Successes and Challenges

Our study has made a contribution to national policy conversations concerning medical marijuana. We have received strong interest from both colleagues and policymakers and their staffers. It remains to be seen what specific effects this research will have on population health. Our study comes at a time when there is renewed pressure from the American Medical Association and major research entities to improve the research evidence base for prescribing medical marijuana. We are hopeful that our findings will prompt federal policymakers to facilitate funding of more randomized clinical trials on the clinical effects of marijuana and ultimately to generate more evidence-based guidelines.

We have also learned from criticism leveled at our study. Because our analysis relies on aggregated data (an "ecological analysis"), it is not possible to determine what the impact of these policies is on actual individuals who are at risk of overdose.²² Indeed, a concern has been raised that aggregated analyses may be misleading about individual-level relationships. For example, if a study shows that high-income countries have higher rates of heart disease, it is tempting to conclude that high-income individuals have higher rates of heart disease (termed the ecological fallacy). However, within countries, higher-income individuals may actually have lower rates of heart disease if they have access to healthier foods or better medical care. In our specific case, a finding that medical marijuana laws are associated with changes at the state level cannot necessarily conclude anything about health conditions or risks of individuals using medical marijuana.

However, these state-level relationships do reveal associations between medical marijuana laws and opioid overdoses averaged over the population. This finding remains of interest to policymakers and even voters deciding whether or not to support medical marijuana ballot

initiatives. Moreover, whereas ecological studies are criticized for making generalizations across areas at a point in time (i.e., they are "cross-sectional"), our study takes advantage of the fact that we were able to observe changes within states over time, before and after the enactment of a medical marijuana law. This is inherently a much stronger study design, and one that is more likely to indicate a possible causal relationship.²³ Although we believe that our study provides a valid representation of a population-level effect, the ecological critique of our study has reaffirmed our care in choosing terminology to describe the meaning of our findings. It has also encouraged us to emphasize the importance of over-time comparisons, which is one of the key design features of our study.

We have learned several important lessons that we believe pertain broadly to policy analysis and population health research:

- 1. Know your audience. There is a need to tailor presentation of research to the concerns and knowledge of different groups. Thus, when we speak to the news media, we always keep in mind the question, "What would a person who has not encountered this issue before need to know in order to be well-informed?" We want our research to prompt conversations (such as conversations between patients and their doctors about treatment choices). When we speak to research colleagues, we emphasize study design and research methodology, since we hope that others will seek to replicate or refine our findings. When we speak to policymakers, such as state legislators, we try to provide evidence that they can use to evaluate whether a policy proposal is likely to improve population health. We want to help policymakers understand the relative risks of different clinical practices (especially the risks of opioid prescribing without regard to long-term consequences).
- 2. Be open to alternative explanations. Research is durable and does not end when a study is published. For example, other investigators encouraged us to consider the possibility that medical marijuana laws may have the greatest impact on populations that are using illicit drugs for recreational purposes rather than on patients with chronic pain who are using opioids prescribed by clinicians (since non-patients may also gain greater access to marijuana after the passage of these laws). Our findings do not definitively reach this question; however, future studies designed to answer this question will be useful in developing better policies, as policy should be concerned with positively impacting all individuals at risk of opioid overdose.
- 3. Partner with policymakers for greatest impact. As academic researchers, our greatest assets are our credibility and expertise. These are incredibly valuable to policymakers with portfolios that cover dozens of issues and limited staff resources to carefully delve into the research. When we interact with policymakers, we try to convey our respect for their expertise in the policymaking process. Policymakers, such as state legislators, have a

nuanced understanding of potential constraints on how research informs the process. We also keep in mind that the development of policy is iterative over time; participating in early stage activities such as providing comments or testimony can build relationships that will prove valuable later, when drafting proposed legislation or partnering with policymakers to evaluate its impact.

Conclusions

We return to the original question that inspired our research. Is legalizing medical marijuana an effective policy to reduce the rising tide of opioid drug overdose deaths? Our study provides some promising preliminary evidence that expanded access to medical marijuana could reduce overdose deaths, but our evidence is not definitive. We are heartened that others are now exploring this question, bringing to bear further evidence and robust methodologies.²⁴

We have become especially interested in the possible linkage of state databases that track opioid prescribing with registries that identify individuals authorized to use medical marijuana. Such research is useful because it can help establish the connection between entering a medical marijuana program and changing one's use of opioid painkillers. We also have widened our focus beyond medical marijuana to investigate other complementary tools to reduce harmful use of opioid medications. We have begun an examination of clinician opioid prescribing practices as another policy target. As we move forward, our research continues to be informed by the idea that even incremental interventions can make an important difference in the effort to reduce opioid overdose deaths.

Discussion Questions

- 1. Why is the use of opioid painkillers a public health problem, and why might policymakers want to explore medical marijuana for pain management?
- 2. What public health concerns would you have about expanding access to medical marijuana? How could these concerns be addressed through public policy?
- 3. Beyond medical risks and benefits, what are some social or philosophical issues raised by medical marijuana laws and how might these influence policymakers and voters?
- 4. One critique of the Bachhuber et al. study (reference #16) is that it does not necessarily tell us about the effect of medical marijuana on individuals. Explain this criticism. Since the results apply at a state level, what we can learn from these state-level results?

Assignment

Pick a state that has not yet implemented a medical marijuana law (http://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx). Imagine that there is a proposed state law to create medical marijuana dispensaries that will provide access to medical marijuana for individuals with chronic pain.

You have been asked to testify before a committee of the state legislature as a scientific expert. The committee has asked you to provide short testimony, written in clear, layperson's language, addressing these questions:

- 1. How many people die from opioid overdose in our state? How does that compare to national rates? (See box on the next page, "A Tutorial on Using the CDC Wonder Data," to identify the mortality rate from opioid painkillers in the state and compare that with the national rate.)
- 2. How might access to medical marijuana affect the opioid overdose rate? Summarize the available evidence, indicating what issues still need to be studied (i.e., gaps in the evidence).
- 3. Provide a recommendation about how the state should evaluate health impacts of the medical marijuana program.
- 4. Other than opioid overdose deaths, what health impacts are you concerned about tracking?

Here are five tips for writing and presenting effective testimony:

- 1. Be succinct! Keep your remarks to about two single-spaced pages when making oral presentations. Reserve time for questions and answers.
- 2. Immediately present your qualifications or background to establish your credibility.
- 3. Pick a few statistics that illustrate the breadth/depth of the problem and how different policy proposals might address them. (Note: Be very specific; policymakers want to know what is happening in their own communities.)
- 4. Connect the dots: do not assume that presenting evidence will be persuasive. Rather, be explicit as to how a policy will affect the underlying problem.
- Exhibit an awareness of the other participants in the conversation; know their positions and be prepared to address alternative perspectives or policy strategies they may present. (Note: Aim to provide analysis for different policy proposals without necessarily advocating for which policy should be adopted.)

A Tutorial on Using the CDC Wonder Data

Multiple causes of death data can be found at this link: http://wonder.cdc.gov/mcd.html.

You will be prompted to complete a query form. Here is some guidance about how to complete the sections of this form.

Section 1: Select "Group Results By": Box 1: State Box 2: Year

Section 2: Select your state(s) of interest.

Section 7: Under "Select Records" In the first box, copy the following:

X40 (Accidental poisoning by and exposure to non-opioid analgesics, antipyretics, and antirheumatics)

X40 (Accidental poisoning by and exposure to non-opioid analgesics, antipyretics, and antirheumatics)

X41 (Accidental poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism, and psychotropic drugs, not elsewhere classified)

X42 (Accidental poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified)

X43 (Accidental poisoning by and exposure to other drugs acting on the autonomic nervous system)

X44 (Accidental poisoning by and exposure to other and unspecified drugs, medicaments, and biological substances)

X60 (Intentional self-poisoning by and exposure to non-opioid analgesics, antipyretics, and antirheumatics)

X61 (Intentional self-poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism, and psychotropic drugs, not elsewhere classified)

A Tutorial on Using the CDC Wonder Data

X62 (Intentional self-poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified)

X63 (Intentional self-poisoning by and exposure to other drugs acting on the autonomic nervous system)

X64 (Intentional self-poisoning by and exposure to other and unspecified drugs, medicaments, and biological substances)

X85 (Assault by drugs, medicaments, and biological substances)

Y10 (Poisoning by and exposure to nonopioid analgesics, antipyretics, and antirheumatics, undetermined intent)

Y11 (Poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism, and psychotropic drugs, not elsewhere classified, undetermined intent)

Y12 (Poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified, undetermined intent)

Y13 (Poisoning by and exposure to other drugs acting on the autonomic nervous system, undetermined intent)

Y14 (Poisoning by and exposure to other and unspecified drugs, medicaments, and biological substances, undetermined intent)

And in the second box, copy:

T40.1 (Heroin)

T40.2 (Other opioids)

T40.3 (Methadone)

T40.4 (Other synthetic narcotics)

Section 8:

If you want to compare overdose rates between states (as opposed to just numbers of overdoses), make sure to select "Use standard age-adjusted rates" with the "2000 U.S. Std. Population."

Section 9:

Check "Show Zero Values" and "Show Suppressed Values" to see missing data.

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Case Study 4 How Practitioners Bring Population Health Ideas into Other Policy Sectors: Lessons from Transportation

Strengthening the connections between health and transportation

Authors

Carolyn McAndrews, PhD, MCP, MS Assistant Professor Department of Urban and Regional Planning University of Colorado Denver Secretary, Transportation Research Board Task Force on Arterials and Public Health

Ed Christopher

Transportation Planning Consultant Chair, Transportation Research Board Task Force on Arterials and Public Health Co-chair, Transportation Research Board Health and Transportation Subcommittee

Eloisa Raynault

Co-chair, Transportation Research Board Health and Transportation Subcommittee

Note: The information presented here is the sole responsibility of the authors and does not represent the views, opinions, or policies of the Transportation Research Board or the organizations with which the authors are affiliated. This paper was developed for the single purpose of exchanging information on a timely and emerging topic

Synopsis

There are clear connections between population health, transportation, and equity. The transportation system—in combination with the larger built environment—supports the basic ability to carry out life's activities. It provides access to jobs, education, health care, and natural places, but this access is often uneven. Moreover, transportation systems contribute to air and noise pollution, safety hazards, and social and economic isolation that result in adverse health outcomes and environmental justice concerns. Some of these connections have been well established in research and practice, but many are just emerging, including a deeper understanding of the distribution of the transportation system's health costs and benefits across populations. In this case study, we present the experience of a multidisciplinary group of practitioners and academics working together to bring population health into the mainstream of transportation. The group merges research and practice through its involvement in the Transportation Research Board, which is a Program Unit of the National Academies of Sciences, Engineering, and Medicine.

Learning Objectives

- Describe how the process of bringing population health into a new sector, such as transportation, is tied to existing organizations and organizational structures within the field.
- Identify how transportation practitioners learn about population health and how they apply this learning in their respective organizations to influence policy, analytical tools, and research.
- Explain how peer networks facilitate the processes of learning and applying population health in the transportation sector and how these networks can be strengthened and maintained.

Introduction

This case study presents our experience integrating population health into the transportation sector as founding members of the Health and Transportation Subcommittee of the Transportation Research Board (TRB). The TRB was established in March 2011 as a Program Unit of the National Academies of Sciences, Engineering, and Medicine. It informs public policy decisions through applied research and knowledge transfer. We believe the subcommittee's experience can serve as a model for researchers and practitioners in other sectors.

We have brought population health and transportation together primarily by serving as a focal point for communication about these topics. Our activities have included planning workshops and technical sessions at conferences, disseminating research, and fostering a peer network. Subcommittee participants tap into these conversations, learn why population health issues are important, and, in turn, serve to catalyze interest in population health within their respective organizations and at large.

Participants include practitioners in government agencies (e.g., local, state, and federal), nongovernmental organizations, the private sector (e.g., consultants and industry experts), and researchers in academia. A leadership group comprising 16 people guides the direction of the subcommittee; the broader membership, indicated by the number of recipients on its email listserv, includes more than 380 people. The subcommittee also reaches people through its presence on Facebook, Twitter, LinkedIn, and its website.¹

The Robert Wood Johnson Foundation Health & Society Scholars (HSS) program played a direct role in the formation and development of the Health & Transportation Subcommittee by encouraging scholars to frame their work as part of the larger mission to improve population health. Scholars received training in knowledge transfer that specifically called on them to pursue their research in arenas where it could influence policy and practice. This clarity of purpose meant that when Carolyn McAndrews was introduced to Ed Christopher—who, at the time, was developing the idea of the Health and Transportation Subcommittee—she immediately recognized its significance and committed to be part of it. As the subcommittee took shape, Carolyn was able to tap into other fellowship networks, which helped strengthen the subcommittee as it built itself up in this new field—the intersection of transportation and population health.

TRB is not the first organization to foster linkages between population health and transportation, but it is an important player because it is a mainstream forum where the transportation and health communities can coalesce. One of the main functions of its over 200 multidisciplinary committees and subcommittees is to review manuscripts submitted for presentation at the annual meeting and for publication in its journal of record, *Transportation Research Record*. Another organizational role of committees and subcommittees is to develop research problem statements.

Our subcommittee's position within the TRB organization illustrates how health is a crosscutting topic that brings together professionals in the field of transportation who would otherwise work separately. The subcommittee has four parent committees: Environmental Justice in Transportation, Urban Data and Information Systems, Travel Behavior and Values, and Transportation and Sustainability. Through its parents, the subcommittee is linked to three sections (Social, Economic, and Cultural Issues; Data and Information Technology; and Travel Analysis Methods)

and two groups (Planning and Environment and Policy and Organization).

The mission of the subcommittee is to improve understanding and evaluation of the health impacts of federal, state, regional, and local transportation policies, procedures, and actions. Its scope includes a wide array of topics with attention given to vulnerable populations. Top-ics include, but are not limited to:

- Sustainable and active transportation modes (e.g., walking, biking, public transit)
 - Mobility and accessibility
 - o Safety
 - Freight and aviation impacts to health

- Transportation-related air pollution and noise impacts
 - Social cohesion; other social, physical, and mental health impacts of transportation; and the distribution of these health impacts in the population (based on factors including income, race and ethnicity, sex, age, and English proficiency)
 - The use of health impact assessments and health metrics and indicators to advance the consideration of health impacts in transportation decision making
 - The institutionalization of health-related concerns in transportation through transportation planning, policy, and practices such as engineering and design solutions

Study Design and Execution

The goal of our work, or the study design in this case, is to share how the subcommittee has served as a platform for practitioners outside of the health sciences to bring health-related ideas into their own fields.²

Health sciences have been part of transportation policy and practice for decades. These connections were forged around issues of road safety and air quality. But many issues have not been adequately addressed. One challenge for the subcommittee is to bring health concerns above and beyond road safety and air quality into the mainstream of transportation planning, policy, and practice. A second challenge, and a means for success, is to develop relationships between health and transportation professionals through peer networking.

Framing the subcommittee as a forum for peer networking and relationship building is consistent with what is known about successful knowledge transfer. Forums such as this, which are purposeful, open, semiformalized networks of peer exchange, provide a venue for the work of specialized knowledge brokers who are "intermediaries between the producers and users of research."³

A study of 30 cities in Northern Europe and North America found that transportation practitioners turned to their informal peer networks and to case examples to support innovation, not directly to academic research.⁴ This pattern is supported by policy literature from across sectors: knowledge transfer and innovation occur through relationships.⁵ These characteristics of knowledge transfer forums—that they are associated with a professional organization and that they provide opportunities for professional meetings—align nicely with the organizational form of the subcommittee.

This process of knowledge transfer between the two fields is significant because the larger social goal of improving population health depends not only on the activities of the health sector but also on the activities of other sectors such as transportation. This implies a need

to establish models of "shared governance" between these two sectors.²

We think this case offers insight into the larger question of how this shared governance—or Health in All Policies—starts to happen in practice. We followed a process to bring healthrelated ideas into transportation practice.

Ready-made population health research is rarely taken off the shelf and applied directly to transportation plans, programs, and policies. Instead, based on our experience as leaders of the subcommittee, the process of bringing health-related ideas—indeed, science—into transportation involves roughly equal parts learning a new health vocabulary, learning about health organizations and their roles, learning about existing health science, and building personal relationships with leaders in the health community. Thus, bringing health science into transportation practice resembles the "science in action" model elaborated by Bruno Latour and the "soup of policy communities" model proposed by John Kingdon.^{6,7}

A little bit of fun goes a long way. With input from members of the subcommittee, Ed developed an interactive workshop about health and transportation that centers on playing a Jeopardy-type game. The game includes categories and questions that familiarize practitioners with basic terminology, concepts, and organizations from the health sector such as epidemiology, social capital, health disparities, social determinants of health, health impact assessments, the master of public health degree, and the County Health Rankings. He has implemented this training for different audiences (e.g., professionals in state departments of transportation and professionals in regional planning organizations). Participants enjoy playing the game, and its content primes them for further discussion and learning. Some have called this Population Health 101 for transportation planners.

Among transportation professionals, there is significant demand for learning about the intersection of health and transportation. For example, at the 2013 TRB annual meeting, the subcommittee hosted a standing-room-only session, "Navigating the Intersection of Transportation and Public Health." This session had broad support among a number of groups and committees within the TRB organization, which contributed to the successful turnout. The session proceedings also included the results of a survey of 177 TRB committees about their interest in public health.⁸ It was not too surprising to some of us that almost 30% of the committee chairs said that their committees had a specific interest in public health.

Organizing these conference and training sessions and workshops is one of the subcommittee's most successful activities. A recent workshop, January 2016, focused on institutionalizing health in transportation agencies, covering topics such as staffing, funding, and management buy-in.⁹ The workshop included testimonials from staff members of transportation and health agencies that have made significant progress toward stronger integration. Workshops such as these, in which participants learn directly from peers, tend to be successful because the focus is on how scientific ideas are implemented in practice instead of presenting scientific research as something that stands alone from practice.

In dealing with any emerging policy topic it is important to get the word out by reaching practitioners as well as the decision makers. The subcommittee has reached people through publications that target both audiences. The subcommittee spearheaded an effort to produce a health-themed issue of *TR News* in the fall of 2015.¹⁰ *TR News* is a bimonthly magazine published by the TRB that covers the latest transportation research and emerging topics. It has a distribution of more than 10,000 people and organizations. Similarly, the May/June 2013 issue of *Public Roads*, published by the Federal Highway Administration, included an article by Ed Christopher and Eloisa Raynault about many of the public health-related activities underway at metropolitan planning organizations, at state departments of transportation, and within the U.S. Department of Transportation.¹¹

Results

Three interrelated activities reflect progress with knowledge transfer between population health and transportation. These include the development of analytical tools, applied research, and policy.

Developing analytical tools has been a precursor to bringing environmental ideas into transportation policy, and the model may also apply to health.¹² For the case of population health, policy development requires analytical tools to understand the potential effects of transportation plans, policies, and programs on health-related exposures and outcomes. Health topics are increasingly included in tools such as population-based travel surveys, statistical models of travel behavior used to forecast the effects of new policies, and impact assessments for transportation projects and plans.

In 2015, the subcommittee conducted a three-hour workshop about technical tools that bring health ideas into transportation.¹³ Examples of these tools include the Transportation Health Tool (a collaboration between the Centers for Disease Control and Prevention and the U.S. Department of Transportation), the Framework for Integrating Health into Transportation Planning and Project Delivery (a project by the Federal Highway Administration), and the

County Health Rankings (an initiative at the University of Wisconsin Public Health Institute, sponsored by the Robert Wood Johnson Foundation). While it appears that there is a proliferation of tools for analysts, the conclusion from the workshop was that there is a great deal to be done to put these tools to work. We pose this as a challenge to both the population health and the transportation communities and are actively working to focus the subcommittee on this issue.

Applied research is already an important part of transportation practice, and the TRB is a key source of this research. The TRB administers the National Cooperative Highway Research Program (NCHRP), which is funded by state transportation agencies, and oversees its budget of \$32 million for applied research each year.

In an attempt to establish a health-related foothold in this otherwise highway-dominated research program, the subcommittee successfully proposed a task force to inform the planning, design, construction, and operation of arterials (major roads) and corridors while considering the implications for population health. The task force was established in January 2015, and its members include leaders from the TRB's various transportation disciplines and an equal number of health professionals. Its objective is to produce a catalog of vetted research problem statements that the NCHRP, or any other group interested in applied research, could pick up and advance. Similar to the subcommittee, the task force has established a web presence where its meeting notes and other materials can be accessed.¹⁴

Prior to calling for the task force, the subcommittee worked with various TRB committees to submit problem statements to the Transit Cooperative Research Program—another applied research program administered by the TRB focused on public transit—and the NCHRP. Although these proposals were not selected for funding (likely because they were out of the mainstream of what these programs typically fund), their substance may be of interest. The transit proposal, "Transit Planning with Public Health in Mind," called for the development of a guidebook for public transit agencies and planners that would help them decide how, when, and where to include public health in the planning and decision-making processes for public transit systems and agencies.¹⁵ The proposed project also addressed how public health agencies could consider transit in their planning, as well as institutional arrangements in which transit and public health agencies could work together to advance a common agenda. The second proposal called for quantifying the health costs and health benefits of transportation projects.¹⁶ In both cases, guidebooks for practice combine lessons from existing practice with reviews of existing research, to the extent that research on these topics exists.

More generally, the subcommittee is active in developing research statements and proposals and hosting calls for research papers. The research statements are posted on the subcommittee's website, as are the subcommittee's meeting notes, newsletters, and research links.¹

Translating Research to Policy

Translating TRB-based activities into policy—above and beyond analytical tools and applied research—is a long, slow process, especially because several agencies (state transportation agencies, regional planning agencies, and local governments) need to be involved, each with its own political leadership and decision-making processes. To make inroads into the policy arena, in 2014, the subcommittee hosted a panel discussion with leaders from three state transportation agencies and one state commissioner of the public health department.¹⁷ These policymakers discussed how to fund programs at the intersection of health and transportation, as well as the cultural challenges of working on interdisciplinary policy issues. Some of the key takeaways from the discussion, as expressed by the top decision makers, were:

- Make friends across the aisle and build trust. Transportation and health people speak different languages. Therefore, we need interagency working groups to talk about shared goals. We need to be learning from each other.
- Data provide a powerful tool to instruct transportation agencies about how they spend resources. Data also demonstrate the connection between health and transportation. We need an evidence-based assessment showing the health benefits of implemented projects.
- Inertia is real and is a challenge to overcome when trying to motivate an industry (transportation) that has not traditionally considered health. On the public health side, professionals can contribute to changing the conversation by focusing more on expansive policies and systems, such as the built environment, rather than specific programs.¹⁷

Beyond the subcommittee, other groups have documented the inclusion of health concerns in transportation policy and planning. Beginning in 2012, the Federal Highway Administration began documenting cases of metropolitan planning organizations and state departments of transportation that have integrated health concerns into their planning and programming processes.^{18,19} To facilitate learning about the implementation of health ideas, the subcommittee invited presentation and discussion of these reports at its annual meetings. As one state Department of Transportation Secretary put it during the subcommittee's panel discussion, "The challenge is to turn public health into not a unique thing, but instead into how we do business. Show me the exception and tell me why it should not be the exception."

The TRB Health and Transportation Subcommittee's deliberate effort to network multiple groups of practitioners—planners, engineers, public health practitioners, and urban designers—has helped create a forum for multidisciplinary knowledge transfer.

The subcommittee has also been working on a model of networking students with dual master's degrees in public health and urban planning. Although many planners have an interest in population health, few actually practice in both disciplines. We see these individuals as key boundary spanners who would benefit the most from targeted professional development. Professional organizations such as the American Public Health Association (APHA) and the American Planning Association (APA) are potential partners in both developing and leveraging peer-learning networks. Recognizing that networks work best when they include cross-disciplinary sectors, the APHA and the APA recently launched a new initiative, the Plan-4Health project, which aims to build local capacity to address population health goals and promote the inclusion of health in nontraditional sectors.²⁰ These are just two of the "outside" organizations to which the subcommittee has a direct link.

Successes and Challenges

Because the subcommittee is formed through a transportation organization, its culture primarily reflects transportation, and its social connections are stronger there. Expanding the reach of the organization is one of the subcommittee's main challenges, as it is difficult to reach population health practitioners who do not (and sometimes cannot) attend TRB meetings. Similarly, the TRB has strong connections to transportation agencies and organizations, but drawing members from other organizational and cultural contexts would help diversify the focus of the group. The subcommittee wants to be "the place for health and transportation," but important conversations about this topic happen in environments that don't communicate with the TRB.

The voluntary nature of the subcommittee's organization also presents a challenge. The group has many members and an active core group, but it is a challenge to routinely attract and incorporate fresh voices and leadership in the volunteer model. It is also challenging to implement new ideas because everyone has other responsibilities. The subcommittee needs a strong core group of committed people who can keep it going, generate ideas, and recruit others to become involved.

From our experience with the subcommittee, health experts need to be at the table. Otherwise, transportation practitioners predictably talk about what they already know (e.g., infrastructure, travel patterns, transportation politics), instead of expanding their knowledge base to focus on new paradigms that are important for advancing health in transportation (e.g., social determinants of health, models of health behavior, and patterns in health over the life course).

In addition, this multidisciplinary peer network needs to include people working in various capacities within their disciplines, including the private and nonprofit sectors, academia, and multiple levels of government. This process also needs diverse social, cultural, and political representation to ensure that multiple perspectives inform innovation. The same broad participation that reinforces healthy communities planning is needed to build this professional community.

Conclusions

Strengthening the connections between health and transportation is a process of cultural, institutional, and organizational change. These connections ultimately have implications for how our cities and regions operate with respect to the movement of people and goods. They will also dictate which transportation technologies and solutions are funded and implemented. But most importantly they will shape the way in which everyday people carry out their day-to-day activities. But, most importantly, through this subcommittee, we are taking steps that enable transportation and public health to fulfill their broader social welfare missions.

Discussion Questions

- 6. What other approaches to its organizational development, mission, or framing of health research and practice might be worth a try?
- 7. How would this process of knowledge transfer be similar or different if instead of bringing health ideas into transportation, health professionals were bringing transportation ideas into health?
- 8. This case presents very little information about specific research questions and scientific ideas. Why? What does this tell us about the knowledge transfer process?

Assignment

How Professional Peer Networks Advance Healthy Communities Planning

The assignment is to conduct an interview with an expert practitioner or community member involved in healthy communities planning and/or design. The interviewee may work in any institutional context: government, consulting or private sector, nonprofit, community organizing, academia, etc. This person is an expert because he/she has a rich understanding of the issues at stake when linking people, places, public health, and policy.

The purpose of the interview is to learn how this practitioner uses professional peer networks to advance her work. This is an open-ended question that will be answered through the process of conducting the interviews and discussing the interviews with the class.

The assignment has two parts.

Part 1. Preparing for the interview

In coordination with identifying an interview subject and arranging an interview (about 30 to 60 minutes, depending on the interviewee's availability), each student will carry out background research about the interviewee and her area of expertise to help prepare a set of interview questions. Develop a set of questions that will allow the interviewee to share insight into how multidisciplinary relationships and forums help advance her work. About three or four open-ended questions with probes is sufficient.

To guide the development of interview questions, state what you want to learn from this expert. This "interview theme" should be stated in 50 words or fewer.

Combine the 50-word interview theme, background research, and interview questions into a brief background memo (no more than 1,000 words). This is the first deliverable.

Please seek out information about qualitative interviewing in preparation. For example: https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resourc-es/conduct-interviews/main.

Part 2. Conducting the interview, writing the transcript, and presenting the interview

Be on time to the interview and, before beginning, explain to the interviewee (again) the purpose of the interview and what to expect. You may record the interview. Be sure to ask for permission from the interviewee if you elect to do this.

Create a "summary transcript" of the interview, including the interview questions and the interviewee's responses. This summary transcript is an edited version of the word-for-word transcript, and its purpose is to communicate the key ideas.

The final submission should include the first deliverable (background research, interview guide, 50-word interview theme), the summary transcript, and a reflection (no more than one single-spaced page) on what you learned from the interview.

During class, each student will briefly present her interview (about five minutes per student), and the class will have a group discussion about what was learned, collectively, from these various voices of community health practice.

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Case Study 5

Forefront Suicide Prevention's Wheel of Change: Catalyzing a Social Movement to Prevent Suicide

Working to make Washington a model suicide prevention state and implications for the field of population health

Author

Jennifer Stuber, PhD

Associate Professor Faculty Director and Co-Founder, Forefront Suicide Prevention School of Social Work, University of Washington

Synopsis

In the United States each year, over 44,000 people die by suicide. It is not widely recognized that, after cancer and heart disease, suicide accounts for more years of life lost than any other cause of death.¹ Suicide deaths are the tip of the iceberg. Serious thoughts about suicide, plans, and attempts are common.²

Despite the magnitude of the problem, public resources and systems-oriented approaches to reducing suicide are in an early phase. Suicide prevention efforts are primarily based on a medical model leading to the development of clinical interventions that identify individuals who are at risk for suicide and then treat these individuals. However, to achieve a significant reduction in suicide rates, it will be necessary to impact multiple factors including changing: 1) hearts and minds—specifically, the culture and myths surrounding suicide; 2) behaviors— in particular, increasing the number of people who are equipped to help individuals at risk for suicide; and 3) systems and policies to bring about large-scale changes in the population health problem of suicide. Forefront Suicide Prevention (www.intheforefront.org) is leading a social movement in Washington State to implement a comprehensive approach to suicide prevention with the long-term goal of disseminating approaches developed in Washington to nearby states with the highest suicide rates. The conceptual model underlying Forefront's work to make Washington a model suicide prevention state and its implications for the field of population health will be described in this case study.

Learning Objectives

- Understand suicide as a significant population health problem.
- Summarize the current state of the suicide prevention field including where opportunities for growth exist if we are to significantly reduce the suicide rate.
- Learn the story of how one organization, Forefront Suicide Prevention, is providing leadership and building capacity to make Washington a model suicide prevention state.
- Consider the catalysts that make policy and systems change possible.

Introduction

In 2013, a new suicide prevention organization, Forefront Suicide Prevention, was formed as a multidisciplinary collaboration of University of Washington (UW) faculty. Its co-founders were a public health professor who specializes in health policy and a social worker turned suicide prevention expert. Today the organization's programs and approaches incorporate collaborations with other departments and schools across the UW campus. Forefront Suicide Prevention is leading a social movement in the state of Washington to implement a comprehensive approach to suicide prevention with the long-term goal of disseminating approaches developed in Washington to nearby states with the highest suicide rates.

Forefront's roots in heartache highlight the importance of personal stories to catalyze social change. The personal story in this case was that of Matt Adler. Matt was a successful attorney, husband, and father of two young children. On February 18, 2011, he ended his life with a firearm. In the three months leading up to his death, Matt was in contact with three mental health professionals, each with their own independent clinical practice, who were attempting to treat Matt's anxiety disorder and worsening depression. Matt's mental health disorders were related to the downturn in the economy and the potential implications for his law practice.

After Matt's death, as his widow, I secured his medical records in the hopes of gaining greater insight into why Matt killed himself. What I read was disturbing—each of the three mental health professionals who had contact with Matt knew of his suicidal thoughts and knew of a specific plan; however, none took any significant action. Possible actions they should have taken include: completing suicide risk screening, formal suicide risk assessment, creating a safety plan, contacting family or friends to assist in keeping him safe, and/or advocating immediately for more stepped-up treatment such as inpatient hospitalization or more assertive outpatient treatment with a provider who had specialized skills in suicide care.
Figure 1. The author and her family



Using my academic appointment as a bully pulpit, I researched best practices in suicide care, contacted suicide prevention experts across Washington, and then reached out to a state legislator with a background in community mental health to tell my husband's story and the failures of his care. To be clear, I saw the concurrence of these three providers acting ineffectively in addressing my late husband's suicide risk as a systems failure. Suicide prevention care has not been prioritized within primary care, mental health, or treatment for substance abuse despite the fact that mental health and substance abuse are the leading risk factors for suicide.³ These actions brought to light a systemic problem in Washington's legislature that was also documented by research: namely, that most mental health professionals do not have adequate training to prevent suicide.⁴ This is the equivalent, in my mind, of a cardiologist not being trained to respond to a patient's heart attack.

Study Design and Execution

The study design took the form of an initiative in this case. The frame of patient safety was key to moving state legislation to address this problem. The two leading individual risk factors for suicide are mental health and substance abuse disorders.¹ With the support of mental health and substance abuse providers, the Matt Adler Suicide Assessment, Management, and Treatment Act of 2012 (EHB 2366) was quickly passed.⁵ EHB 2366 requires these professionals to be trained in how to assess, manage, and treat individuals who are at risk for suicide and to receive ongoing training to maintain licensure. This law was the first of its kind in the nation and has led to similar laws being passed in 10 other states.⁶ Professional

skills training in suicide prevention is now being disseminated on a larger scale than suicide prevention experts believed was possible during their lifetimes.

Forefront came to exist in part to assist with the implementation of EHB 2366 by training behavioral health professionals. However, co-founders Sue Eastgard and I realized that to reduce suicide in one state would also require a much more comprehensive, multisystems approach.

Even within health care systems, training of mental health professionals on its own is inadequate to ensure appropriate suicide care for at-risk patients. In reality, most people who die by suicide never see a mental health professional leading up to their deaths. An estimated 45% of suicidal patients saw a primary care provider within one month to one year preceding their death, compared with 20% who saw a mental health care professional in that same time.^{7,8} Thus, training in appropriate suicide care must extend beyond mental health professionals to other types of providers. And, even with all health care providers trained in relevant care, providers will struggle to take the appropriate actions to address patients' suicide risk without systems-based approaches.⁷ For example, a systems-based approach would put into place a screening tool for all patients inclusive of follow-up and care transition plans for patients who are at risk.

Forefront's conceptualization of a comprehensive approach to suicide prevention is consistent with a population health approach. A population health approach would describe the role that every single person can play in suicide prevention. There are skills every person can learn in order to recognize and respond when a person is at risk for suicide. This is not dissimilar to training laypeople in CPR. It would ensure systems that people live and work in, including health care, educational, employment, criminal justice, and correctional systems, have prioritized suicide prevention. Teachers, corrections officers, human resources personnel, academic advisers, journalists, pharmacists, and firearms retailers must all understand their roles in suicide prevention. This extends into both their personal lives and professional settings, and they need to be supported by our societal systems to fulfill these roles.

Forefront's mission is to reduce suicide by empowering individuals and communities to take sustainable action to prevent suicide, by championing systemic change and restoring hope. Forefront's current geographic focus is Washington, with a suicide rate of 15.7 per 100,000, compared to a national rate of 13.9 per 100,000.⁹ The first goal of the organization is to demonstrate that reducing suicide is possible within one geographic region, with the long-term aspiration of disseminating innovation to other nearby states with the highest suicide rates. Although a new organization, Forefront's budget and staff have grown exponentially in a short time.

In this case study, I will describe the conceptual underpinning of Forefront's goal to make Washington a comprehensive suicide prevention model state, with the long-range goal of reducing suicides. I will emphasize how it seeks to change policies and systems and what the catalysts are for policy transformation. But first, an overview of the current state of the suicide prevention field.

In the United States each year over 44,000 people die by suicide. However, this figure is considered an underestimate due to misclassification of some lethal accidents and drug overdoses. After cancer and heart disease, suicide accounts for more years of life lost than any other cause of death.¹ Suicide deaths are the tip of the iceberg: The Centers for Disease Control and Prevention estimates that there are approximately 25 suicide attempts for every reported suicide death, with many suicide attempts resulting in expensive hospitalizations and emergency room care.² Suicide attempts and deaths have devastating ripple effects. For every individual lost to suicide, research-based estimates suggest that 147 people are exposed (6.3 million annually). Among those, 18 experience a major life disruption.¹⁰

The leading risk factors or characteristics that make it more likely that an individual will consider, attempt, or die by suicide include: 1) mental health disorders; 2) alcohol and substance abuse disorders; 3) history of trauma or abuse including a family history of suicide; 4) extremely distressing life events such as a major physical illness, financial ruin, or a significant relationship breakup; and 5) easy access to lethal means.¹¹

Risk factors do not cause suicide. Common warning signs include talking about or wanting to kill oneself, looking for a way to kill oneself (such as searching online for means or buying a gun), feeling and/or expressing hopelessness, being in unbearable pain or feeling a burden to others, and notable changes in behavior such as extreme mood swings or changes in sleep behavior. It is when risk factors combine with multiple warning signs that concerns about suicide increase.

Most suicides are preventable, and approximately 80% of at-risk individuals express "warning signs."¹ The Healthy People 2020 goal is to reduce the rate of suicide by 10%.¹²

The suicide prevention field has focused on a medical model leading to layperson and clinical interventions that identify individuals at risk for suicide and triage or treat these individuals. Some of the most promising and evidence-based practices are:

- Training for laypeople and clinical training in suicide prevention skills such as: Question, Persuade, and Refer (otherwise known as QPR), and Assessing and Managing Suicide Risk (AMSR).
- Clinical assessment and screening tools used in mental health and primary care settings such as the Columbia-Suicide Severity Scale and the patient stress questionnaire PHQ-9.

- Medications such as lithium (evidence is controversial).
- Psychological treatment interventions including cognitive behavioral therapy (CBT) and dialectical behavior therapy (DBT) for individuals with a history of suicide attempts.
- Sending caring letters or text messages to individuals after a suicide attempt from a clinician who interacted with that person during treatment to help maintain continuity in care.

Less studied are protective factors that can buffer individuals from suicidal thoughts and behaviors. These factors include access to effective clinical care for mental, physical, and substance abuse disorders; close connection to family and community; cultural and religious beliefs that discourage suicide and support instincts for self-preservation; and skills in problem-solving and resilience.¹¹

In sum, the suicide prevention field has focused on understanding individual level determinants and clinical interventions. There has been less focus on policy and systems changes that will be needed to reduce suicide rates.

Results

Most suicides are preventable. Suicide prevention policies have begun to be enacted at the federal, state, systems, and organizational levels. The following is an inexhaustive list of policies that hold the most promise of reducing suicide rates.

The National Strategy for Suicide Prevention details 13 goals and 60 objectives for reducing suicides over the next 10 years.¹³ The extent to which this strategy will be implemented and effective is not yet determined. The Suicide Prevention Resource Center (www.sprc.org) is devoted to suicide prevention, and there is a National Suicide Prevention Lifeline with availability 24 hours a day/seven days a week that does suicide threat assessments and refers people to local behavioral health resources. There are other lines specific to the needs of veterans, youth, and LGBTQ populations. A significant federal suicide prevention law, the Garrett Lee Smith Memorial Act, provides funding for youth suicide prevention grants.¹⁴

Concerted efforts within health care and military systems also impact suicide prevention, as follows:

• Henry Ford Health Care System, Detroit. A unique depression care model for patients created in 2001 resulted in a long period without a single suicide in this health system's patient population.¹⁵ This initiative was carried forward to a national initiative known as Zero Suicide in Health and Behavioral Health Care (zerosuicide.sprc.org).¹⁶ Under this model, health care and behavioral health care systems make a commitment to suicide prevention and to implementation of a specific set of strategies and tools. A handful of health care systems across the United States are taking this pledge of patient safety

voluntarily, although additional policy changes may be needed to drive this change forward systemically.¹⁵

• U.S. Air Force. In 1997, the Air Force Suicide Prevention Program was implemented based on 11 overlapping core elements. The program emphasizes leadership and community involvement in reducing suicide such as universal training around suicide prevention, implementation of suicide prevention protocols, and tracking and response to suicide events. Suicide rates were significantly lower after the program was launched than before; however, continuous implementation efforts and ongoing monitoring are needed to maintain the effects.¹⁷

In recognition of these approaches, The Joint Commission recently issued a sentinel alert urging all health care organizations to develop clinical environment readiness by identifying, developing, and integrating comprehensive behavioral health, primary care, and community resources to ensure continuity of care for individuals at risk for suicide.¹⁸

In state legislatures, there is a growing focus on suicide prevention training for health and mental health professionals and laws that are designed to increase the readiness of schools and institutions of higher education to prevent youth suicides. Catalyzed by a law passed in Washington in 2012 (HSB 2366), several other states have since passed similar laws. Forefront was instrumental to the passage of these laws in terms of the role it played in building stakeholder groups and by bringing those directly affected by suicide and those with suicide prevention expertise to testify for these new state laws.

More than a dozen states also now have laws on the books requiring key school personnel to have training in suicide prevention. These laws vary in scope from ensuring that school counselors, social workers, and nurses are trained in suicide prevention to requiring that school teachers receive training. A few states also require school crisis plans for suicide prevention and activities that reduce risk and promote healing after a student suicide death and that schools take steps to strengthen relationships with community-based mental health providers.

Most efforts to prevent suicide focus on why people take their lives. But it is becoming increasingly clear that how people take their lives is perhaps even more important. How a person attempts suicide plays a key role in survival rates. If we can put a practical barrier between the means a person plans to use in suicide and access to those means during a time-limited crisis, it can ultimately prevent suicide. "Means safety" (reducing a person's access to highly lethal means) is an important part of both clinical and community-based approaches to suicide prevention. Prior research in the suicide prevention field suggests this practice of supporting families in means safety is one of the most effective suicide prevention strategies.¹⁹

The concept of means safety is based on the following understandings:

- Many suicide attempts occur with little planning during a short-term crisis.
- The means used in suicide attempts determine whether an attempter lives or dies.
- Firearms do not cause suicide, however, they are the most lethal and common means used in suicide.
- Ninety percent of attempters do not go on to die by suicide later.
- Systematic efforts to reduce access to lethal means have been shown to save lives.¹⁹

Background checks, waiting periods to purchase firearms, and extreme-risk protection orders are examples of laws that may play a role in suicide prevention. Several states are beginning to enact stricter gun laws motivated in part by high suicide rates, although these types of laws also run the risk of alienating individuals who already own firearms and of further stigmatizing individuals living with mental health conditions. It is important to make firearms owners more aware that suicide accounts for roughly two-thirds of all firearms fatalities in the United States, and to educuate people about the need for locked storage of firearms and advance planning in case the owner of the firearm becomes at risk for suicide.

Education regarding firearm-related means safety begins with the assumption that firearms are an important part of American history and that gun ownership, especially in rural parts of the country, is a way of life. Education may take the form of safe firearms storage and use practices and widespread dissemination of safe storage devices such as gun safes and lock-boxes. Further, teaching firearms dealers and concerned family members and friends skills for how to temporarily and voluntarily remove firearms and other lethal means from the homes of individuals at risk for suicide is another key element of this approach.

For example, the New Hampshire Firearms Safety Coalition, composed of firearms dealers and suicide prevention experts, is working to disseminate suicide prevention materials at gun stores. Several other states are now following this lead.²⁰

A few states are also passing laws to study firearm suicide, to increase access to safe storage devices, and to raise suicide prevention awareness for gun owners and retailers. A new law passed in Utah is taking a proactive approach to studying firearm suicide deaths to enhance future prevention efforts.²¹ This is particularly important as the state has one of the highest rates of gun ownership in the country, and firearm suicide is the leading cause of death among youth.

A state law in Washington (HB 2793) funded the Safer Homes, Suicide Aware campaign.²² It uses the frame that nearly 70% of all suicide deaths are by firearms or prescription over-

doses and that these items, commonly found in people's homes, are not safely secured. Forefront worked to build a strong relationship with organizations that have a Second Amendment rights focus and with legislators on both sides of the political aisle to obtain maximum buy-in to implement the law at community events such as gun shows.

The law requires that a coalition of Second Amendment rights groups, gun dealers, and suicide prevention experts develop and disseminate materials for distribution to gun owners; requires changes to the state's booklet on firearms safety; and funds the development of new training for gun retailers on how to counsel customers about means safety and safe storage practices. This law has as an additional focus: training pharmacists to counsel patients on safe medication storage and disposal. Materials for pharmacies on suicide prevention and overdose will also be created. Maintaining this dual focus on firearms and prescription medications increased the comfort level of Second Amendment rights groups who saw that suicide prevention is not just about means safety as it pertains to firearms.

In summary, the state's efforts around suicide prevention increased with new laws aimed at advancing the skills of health care and school personnel alongside state initiatives and laws focusing on means safety.

Translating Research to Policy

The Wheel of Change developed by the Social Transformation Project²³ makes clear that to bring about social transformation, it is essential to work in three domains of human systems to change hearts and minds, behaviors, and structures (see Figure 2). Hearts and minds are the culture surrounding the issue inclusive of hopes and dreams, attitudes and feelings, and what we believe is possible or impossible. Behaviors are what we do to address the social issue inclusive of the skills and specific actions taken by individuals. Structures are the external systems within which we live and work; that is, the policies, systems, institutions, organizations, and communities that shape human existence.

Figure 2. Wheel of Change



Catalysts for Social Transformation Policies

To implement a comprehensive approach to suicide prevention needed to change hearts and minds, behaviors, and structures, we have gleaned key elements that facilitate policy and systems change. These are also relevant to other population health issues.

- 1. Bring forward and support individuals directly affected by suicide to tell their powerful stories with a hopeful message in legislative, media, and community contexts.
- 2. Mobilize these individuals by providing tools for effective advocacy, with careful attention to identifying individuals directly affected by suicide who are in key positions to make structural and policy changes, such as constituents in the districts of legislators who are able to move legislation forward.
- 3. Identify policy champions such as state legislators and other systems-level advocates who both care about suicide prevention and are skilled politically.
- 4. Build coalitions of the various groups that will be affected by policy changes to find agreement on controversial issues outside of a political context.
- 5. Bring research about the population health issue forward by having experts present to both testify and refute the testimony of lobbyists and to engage with media.
- 6. Develop messages and frames for the issue that are compelling to media, politicians, and those affected by the issue. For example, the law that required mental health professionals to receive training in suicide prevention was framed as a public safety issue.

Successes and Challenges

Forefront as a case study is significant for the field of population health because in seeking to bring about a positive social transformation to significantly reduce suicide rates and create a model suicide prevention state, Forefront operationalizes work in all three domains of human systems. What follows are specific examples of ways in which Forefront seeks to change these three human domains in relationship to the issue of suicide.²⁴

- 1. Hearts and minds to change the culture and myths surrounding suicide:
 - a. News coverage is a key factor in shaping public attitudes and beliefs on nearly all subjects. Forefront is helping to shape news coverage of behavioral health and suicide. In the last three years, the organization has contributed to hundreds of news and opinion stories on the topics of mental health and suicide prevention to help change the public conversation about these issues to one with a prevention and recovery focus.²³ In collaboration with the UW Department of Communications and the journalism major, Forefront provides education to professional and student journalists in Washington on how to accurately, safely, and authentically report on behavioral health and suicide. An in-class simulation of how to report on a campus suicide is part of the curriculum for journalism students and the campus newspaper. We arrange for journalists to speak with experts on suicide prevention and support individuals directly affected by suicide in telling their powerful stories to news media. Each year, we also offer a news media award for the best reporting on suicide prevention and mental health.
 - b. Individuals who are directly impacted by suicide because they have made a suicide attempt or have lost someone close to them to suicide are a special focus. Dozens of volunteers who meet these criteria (as well as suicide prevention experts) have received training and support to become effective media and legislative advocates and to provide basic suicide prevention awareness education to others. These individuals can be instrumental in changing the hearts and minds of others because they are passionate about seeing social change happen. Forefront is supporting individuals directly affected by suicide in post-traumatic growth, a process whereby traumatic experiences can be transformed into growth opportunities while simultaneously developing champions for the cause who can assist in changing hearts and minds.
 - c. Forefront hosts awareness events through the installation of the Washington Safer Homes, Suicide Aware Memorial. Built on the lawn of Washington's state capitol during the legislative session, this memorial symbolizes the number of individuals who lost their lives to suicide in the state in the last year. Mock headstones to represent these lives are staked into the ground. The colors of the mock headstones symbolize

the different means used in each suicide: red (firearms), white (suffocation), yellow (poisoning), green (jump, cut, pierce), and blue (other). The installation is accompanied by banners conveying key information about means safety.

Figure 3. Safer Homes, Suicide Aware Memorial



- 2. Behaviors to increase the number of people who are equipped to help individuals at risk for suicide:
 - a. Forefront has trained over 30,000 behavioral health, school, health care professionals and laypeople in lifesaving, relevant suicide prevention skills. We collaborate with the UW schools of medicine, pharmacy, social work, and nursing to develop tailored curricula and to implement training across disciplines. Evidence in the suicide prevention field suggests that if you train enough individuals within a system or community, suicide rates can be reduced.
 - b. Forefront is implementing the Safer Homes, Suicide Aware campaign in rural Washington, where the rates of suicide are the highest, to help clinicians and other social service professionals learn how to identify individuals who are at risk for suicide and supply families with counseling and free safe storage to increase means safety. The work is happening in gun shows and other community events that draw large numbers of veterans and men in the middle years.

3. Structures and policies at the organization and systems levels to bring about large-scale changes in the population health problem of suicide:

a. Forefront has worked with legislative sponsor Rep. Tina Orwall, individuals directly affected by suicide loss and attempts, and suicide prevention experts across several disciplines to pass seven pieces of state suicide prevention legislation. Among other things, these laws call for: all health care professionals to receive suicide prevention training; an increase in the readiness of Washington's public schools and institutions of higher education to prevent suicide; and development of a new state suicide prevention

plan. Forefront is based at the UW, which is the state's largest public university making a significant contribution to implementing the state's suicide prevention plan in collaboration with other state agencies.

- b. Forefront, in collaboration with the UW College of Education and the School of Nursing, is supporting 29 high schools to build a comprehensive approach to suicide prevention with its Forefront in the Schools program and is working with Washington's largest institution of higher education, UW, in implementing the Husky Help and Hope program. In the coming years, Forefront seeks to disseminate its school and campus-based programs throughout Washington State.
- c. Forefront championed the Washington Suicide Safer Homes bill to build a public health campaign to disseminate public education on means safety to gun dealers and owners throughout Washington. In doing so, Forefront found common ground among groups who typically are at odds on the issue of firearm fatalities and is working collaboratively with experts in injury prevention at the UW School of Public Health and with Second Amendment rights organizations to implement the law.

Forefront's Wheel of Change strategies are helping Washington to become a model suicide prevention state. The state, under the direction of Governor Jay Inslee, recently launched its "Action Alliance for Suicide Prevention," a group of leaders in both the public and private sectors, who are charged with looking comprehensively at Washington's health care, school, higher education, corrections, veterans, and tribal health care systems to identify ways in which suicide prevention can be made a greater priority. Figure 4 depicts what a model suicide prevention state looks like as conceptualized by Forefront. This model is the basis for the alliance's new charter outlining its goals and activities.

Model suicide prevention state	
Engaged systems and organizations	
Community approaches	
Universal education and role-specific training	
Care for individuals directly affected by suicide through loss or attempts	

Figure 4. Model suicide prevention state

Conclusions

Forefront is focused on the goal of reducing suicides in Washington State. The organization has a logic model that links its programs and strategies to short- and long-term measures of changes in hearts and minds, behaviors, and structures. If we are successful, we will cumulatively reduce Washington's suicide rate. One of the ways we know we are already achieving success is that Washington's suicide rate has decreased relative to other states. If Forefront is successful in achieving its short-term goal of suicide reduction in Washington, the long-term plan is to broaden its approach to those states with the highest rates of suicide in proximity to Washington.

Discussion Questions

- Did anything about this case study surprise you or stand out for you? What are your thoughts and feelings after reading about the founding of Forefront and the population health issue of suicide prevention?
- What role does engaging multiple disciplines and systems play in this case study?
- Does this case inform how you might bring about structural and policy changes to a population health issue of your choosing? Why or why not?
- Describe a possible Wheel of Change for a population health issue of your choosing.

Assignment

Consider a population health issue that you are concerned about and strategies to change hearts and minds, behaviors, and structures to impact this issue. Consider frames or a way of explaining this issue that would be compelling for those you seek to influence. What are the data and research that support your strategies and frames? Who are you seeking to influence and why? Who can you bring on as allies? Who might be an adversary, and what are some counterarguments for this possible opposition? Can you think of any personal stories that are illustrative of your issue? Sketch out a plan for how you intend to take action on your population health issue, inclusive of a time line of key activities.

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Forefront would not have been possible without my participation in the HSS program. For one, even though I had already developed a deep personal connection to the issues of mental health, as a doctoral student, I was discouraged from pursuing this focus. As an HSS fellow, my mentor, Bruce Link, gave me the courage to live into my professional purpose of focusing on mental health policy, the stigmatization of mental illness, and, now, the prevention of suicide. The HSS program also underscored for me the necessity of multidisciplinary collaboration and gave me the language and skills to make these kinds of collaborations work. The suicide prevention work we have accomplished in Washington would not be possible without the contributions of many individuals in fields as diverse as educational psychology, communications, political science, psychiatry, psychology, public health, nursing, and social work. The skills I now have in developing a vision and in strategic planning processes also stem from my time in the HSS program. The program gave me the capacity to "think big" and to know that social transformation in population health can only occur when you change hearts and minds, behaviors, systems and policies.

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Case Study 6

Exposure to Heat Waves: Making Film and Policy

Raising awareness about the health effects of heat waves and climate change by producing a film

Author

Sabrina McCormick, PhD

Associate Professor Department of Environmental and Occupational Health Milken Institute School of Public Health George Washington University

Synopsis

This essay is both a professional and personal accounting of a topic that I began to study as a Robert Wood Johnson Foundation Health & Society Scholar (HSS) at the University of Pennsylvania. The health effects of heat waves and climate change began as a piece of research, became more central to my work in policy, and then became a story in a television series. Heat drives the most critical health impact of climate change. In the United States, exposure to heat waves kills more people than all natural disasters combined. However, identifying deaths caused by heat waves is a difficult and controversial issue. These estimations have policy ramifications at the federal level because the Environmental Protection Agency (EPA) uses them as the central indicator for human health impacts of climate change. Paradoxically, health effects of heat exposure are largely ignored, even within the most vulnerable populations. Therefore, public education and education of policymakers is critical. I produced a story for a Showtime television series on the effects of climate change, *Years of Living Dangerously*, with heat as the central story line and Matt Damon as the celebrity correspondent.

Learning Objectives

- Understand the risk of heat exposure for health.
- Identify the controversies regarding calculating death from heat exposure.
- Understand how research can be of service to policy.
- Become familiar with film as a tool for translating research.

Introduction

I was trained as a sociologist at Brown University and, while there, took film classes at the Rhode Island School of Design. I focused on environmental health and chemical toxins in my academic work and made my first two short documentary films as a student, one in Brazil and the other in the United States, both on environmental causes of breast cancer.

As a Robert Wood Johnson Foundation Health & Society Scholar, I developed a new area of expertise in climate change and health. I was particularly interested in the social dimensions of this subject—how we even identify what illnesses are caused by climate change, how people perceive these risks, and how health could be used to talk to people who couldn't care less about climate change. I focused on three topics: heat-related exposures, West Nile virus, and chemical toxins. The research I conducted at the University of Pennsylvania shifted my academic focus to climate change and changed the trajectory of my career. At the time, I was, and possibly still am, the only scientist working on this environmental health issue.

My first area of research in climate change was exposure to heat waves. As a Scholar, I began working with an HSS alum, Marie O'Neill, an epidemiologist trained at Harvard University. Dr. O'Neill had been conducting research on the effects of air quality and heat in Latin American cities but was left with questions regarding how preparedness could be executed. We made a complementary interdisciplinary team with the quantitative and qualitative approaches we took to the question of heat exposure. We received funding from the U.S. Centers for Disease Control and Prevention (CDC) to study how U.S. cities were responding to heat wave exposures, the weather-related disaster that causes the largest number of deaths. As part of our proposal, we committed to reporting our findings to each of the cities where research was conducted: Phoenix, New York, Philadelphia, and Detroit. We found that cities were largely inexperienced in heat preparedness and that high-risk individuals neither perceived themselves to be at risk nor took advantage of city-provided resources during extreme heat events. I continued this research on heat and examined a number of facets of heat exposure.

In the initial phases of my investigation of the history of heat death controversy, it became apparent that, in Philadelphia and other cities, medical examiners and coroners felt hamstrung:

The methodology to identify heat-related deaths was uncertain, resulting in a possible underestimation of risk from heat. Over time, I discovered the policy relevance of this issue. I began a two-year position at the Global Change Research Program at the EPA, the primary office responsible for providing research regarding climate change impacts to the federal government. Concurrently, I served as the only social scientist on the Adaptation Science Task Force for the Council on Environmental Quality and Office of Science and Technology Policy, as well as a member of its Climate Change Communication Task Force, and other interagency committees. As a part of the first task force, we completed the first federal climate adaptation plan. While at the EPA, I came to understand that the estimation of deaths from heat had real policy ramifications. Heat mortality was one of the few human health indicators being used by the agency to estimate the impact of greenhouse gases. Working in an administration that was intent on addressing climate change, I understood that better estimation of heat death could improve regulation of greenhouse gases, therefore protecting the public's health from climate change.

After I left the EPA, I returned to academia as an associate professor in the Milken Institute School of Public Health at George Washington University. There, I began investigating how to improve estimation of heat death. I also began work translating my research findings to the broader public.

Climate change has happened slowly, although sudden changes are now being recorded as a pattern of recent weather events. As I began to study heat, I realized it was the most pressing health-related impact of climate change.^{1,2} Global temperature averages have climbed by 1 to 2°F in the last century and are projected to increase 2 to 11°F by 2100.³ Epidemiologists have found a consistent relationship between extreme heat and heightened mortality.⁴ In the years 1979 to 2002, cumulative mortality due to heat was higher than floods, tornados, hurricanes, lightning, and earthquakes combined.⁵ Heat waves lead to poor health via two main pathways: 1) extreme temperature rise leads to heatstroke, and 2) cardiopulmonary problems and respiratory illnesses are often linked to shifts in air pollution concentrations caused by increasing temperatures.⁶ Cities are particularly vulnerable to heat waves due to dense environments that lack green space.⁷ Urban heat islands⁸ occur in cities where temperatures spike eight to 10 degrees above average.⁹ Heat waves have been thought to disproportionally affect older adults and people of low socioeconomic status, which may partially explain why little public pressure has developed to address their impacts.¹⁰

Heat waves are expected to increase in frequency and severity with climate change.¹¹ They have resulted in a rising number of crises and mass mortality events domestically and internationally, including in Philadelphia, where 118 people died in 1993; in Chicago in 1995, where approximately 800 people died within a few weeks; and in Western Europe, in 2003, where an estimated 70,000 people died."^{12,13} In 2009, thousands of people died in Western India when

a heat wave and drought occurred simultaneously.¹⁴ In 2010, an unprecedented heat wave combined with an outbreak in forest fires sparked a public health crisis in Moscow that resulted in thousands of deaths.¹⁵ Most recently, 2017 was the third-hottest year ever recorded on Earth.¹⁶ These increasing temperatures heighten the chance that such extreme weather events will occur.

There is confusion as to what constitutes a heat-related death, raising concerns about potential underestimation.¹⁷⁻¹⁹ Social contention about what constitutes a heat-related death has driven debates among policymakers, medical examiners and coroners, and academics since the 1970s, resulting in shifting approaches to estimating deaths. A recent analysis published by the CDC almost doubled the estimates previously reported for the United States, yet this estimate is still far from that in comparable countries like the United Kingdom. In the 1993 Philadelphia heat wave, the medical examiner found that many deaths clearly caused by the heat wave were not calculated as heat related because of the narrow definition for heat-related deaths. He expanded the definition beyond the traditional criteria of a body temperature measured at greater than 105°F to include a body being found in an enclosed environment with heightened ambient temperature and the person being seen alive before the heat wave.²⁰ The medical examiner also used a similarly broadened definition in the 1995 Chicago heat wave when approximately 800 heat-related deaths were calculated. However, in that case, the mayor denied the validity of the medical examiner's death calculations, claiming they were an overestimation, even when the examiner claimed they were an underestimation.¹² Death estimations then became a subject of contestation that involved a politically charged conversation between Chicago's medical examiner, the mayor, other city institutions, and the CDC.

The medical examiners in Milwaukee, Chicago, and Philadelphia called for a standardized definition of heat-related deaths as a part of the National Association of Medical Examiners Ad Hoc Committee on the Definition of Heat-Related Fatalities.²¹ They recommended a broad definition in which exposure to high ambient temperature either caused the death or significantly contributed to the death. A year later, the same group conducted an analysis of heat-related deaths in the Chicago heat wave to test their expanded definition and found that it still did not capture the total number of deaths.²²

Currently, there remains no widely accepted criterion to classify heat-related deaths.²³ Death certificates are the most commonly used source in many studies to investigate the impact of heat waves on mortality.²⁴⁻²⁶ Epidemiologic studies examine increases in different types of mortality comparing periods in which heat waves did and did not occur.^{15,18,27,28} They used general mortality, non-accidental mortality, or more specifically cardiopulmonary, cardiovascular, or respiratory mortality²⁴⁻²⁸ to assess the impact of exposure to extreme heat. Nonetheless, this approach does not clarify how many excess deaths are specifically attributable to heat.

Study Design and Execution

To better understand how many people are dying of heat and what drives potential underestimation, I designed a study of the process of diagnosing a heat-related death. The central research questions were:

- a. What are the diverse social constructions of heat-related death and how do they affect its calculation?
- b. What proportion of deaths can be described as diagnosed heat death, possible heat death, probable heat death, and non-heat death as compared to official estimates?

The study was qualitative and based on two types of evidence: 1) semi-structured interviews investigating how multiple social actors involved in identifying heat-related deaths describe their logic, rationale, and process for collecting and submitting evidence; and 2) an in-depth investigation of possible heat-related death records in New York City from 2009 to 2013 to identify how deaths were or were not being identified as resultant from heat exposure.

Approximately 25 interviews were conducted in New York, Los Angeles, and Philadelphia with medical examiners, coroners, physicians, and epidemiologists who work at the federal level on this issue. We also constructed a novel database of 1,500 records of heat deaths using deaths reported by the New York City Office of the Chief Medical Examiner as an official heat death or possible heat death based on International Classification of Diseases (ICD), 10th revision, codes on the death certificates. The CDC defines deaths coded as exposure to excessive natural heat (X30) and attributed to effects of heat and light (T67) as official heat deaths. We included deaths identified with ICD codes considered by epidemiologists as heat-related deaths in their analyses. We examined death records of these kinds during heat-wave periods from 2009 through 2013. Our findings suggested several reasons that heat-related deaths may be underestimated and, in particular, why in New York City there may be fairly substantial underestimation.

Translating Research to Policy

Accurate science is the basis for regulatory policy at the EPA, among other agencies. Therefore, when seeking to develop science that affects policy, it's important to think first about which regulatory tools the science might advance or support. For example, the Clean Air Act is used to regulate airborne pollutants, so evidence is needed to make the Clean Air Act appropriately strict or targeted toward protecting vulnerable populations. Evidence that offers such details can be used directly in policy. In addition to regulatory policy, there is programmatic policy for which other kinds of research are necessary. To support the advancement of particular kinds of

programmatic policy, it's important that scholars identify which kind of programs they seek to influence and define projects that can help articulate how those programs can best be developed or administered. If you need to, ask someone working with that policy or at least in the agency you think you may be able to affect.

Successes and Challenges

A central impediment to action on climate change was the lack of public concern about and awareness of the health implications of climate change. I became a producer on *Years of Living Dangerously*, a nine-part Showtime series about climate change that won the Emmy for Best Documentary Series in 2014. The series illustrates the impacts of and solutions to climate change around the world. Each episode features a celebrity correspondent who takes the viewer on a journey to understand one particular topic. The correspondent acts as a proxy for the audience, asking questions to find out people's opinions and elucidate the scientific evidence.

I produced a story starring Matt Damon on the issue of heat death underestimation. We took Matt on an excursion through his home city of Los Angeles to reveal how heat affects human health and to investigate how many people might actually be dying of heath-related deaths. In the story, he meets the Los Angeles medical examiner who says there has only been one official heat death that year. He also meets an EPA scientist who says that her estimates show hundreds of deaths. Along the way, we meet a father who lost his son in a heat wave on the football field and the CDC experts who are trying to prevent heat deaths.

This episode and the issue of estimating heat deaths was difficult to portray on film because heat is an invisible threat, and the issue of underestimation is both highly scientific and abstract. My intention was to show that heat affects many more people than previously understood and to make clear to policymakers that climate change will kill more people than current projections demonstrate. My intention was to demonstrate that heat deaths were going unexamined, resulting in a lower level of awareness about the health impacts of climate change. Since the EPA uses heat death as a basic measurement for the health implications of climate change and the basis for regulatory policy, the implication of the story is that measurement of heat death and related regulatory policy must be improved.

I was asked to present this episode on Capitol Hill and was a member of a panel speaking to the many members of Congress who came to the screening. While it is difficult to estimate the impact of this work, I believe that I realized my goal to educate the public about health impacts of heat and of climate change and to affect congressional perception of these issues.

Lessons Learned

A critical lesson I learned while working in the policy arena was that policymakers, and especially elected representatives, are most interested in conducting activities requested by their constituents, often powerful constituents. Power can be wielded by financial interests as well as by drivers of influence on the public discourse. Elites, such as academics and experts, can influence public discourse, but I observed that our efforts are sometimes hampered by a lack of awareness on the part of both the general public and niche interest groups that might be able to leverage our evidence-based scientific research to advance policy.

The first and, by far, the most important lesson is the absolute necessity of commitment to my own ideas and taking risks. The change each one of us makes comes from committing to a vision of what we believe is the truth and working to achieve it every day. The vast majority of my ideas are absolutely terrible. It is only through trying the best ones that I come to realize which are viable.

This overall lesson is certainly true when working in a government context. The most effective people are those who pay little attention to the rules or bigger agendas and instead simply stick to their bullheaded ideas of what must be accomplished. Ask for forgiveness, not permission.

The second lesson is the incredible importance of mentors and collaborators. None of the work I have described would have happened without the long list of incredible mentors who supported me, to whom I could turn in moments of need, and most of whom have become good friends. These mentors helped me identify opportunities to engage in my profession in new ways, supported my ideas even when they seemed unattainable, and introduced me to people who would also believe in me. Taking the time to find mentors, to cultivate them, and to enjoy being their friend is as important as doing the work itself. And, that means giving back to them what they give you. Mentors often end up or start out being collaborators. When you build a cadre of people around you who can support you, your work will grow faster and have a much bigger impact, especially if you pick the best people you can possibly find to work with.

Conclusions

There are many routes to affect policy as an expert, academic, or scientist. Working at the local level is almost always the quickest way to effect policy change, and that change can filter up to federal policy. If you choose not to work inside the government, learning how to make research policy-relevant will forge a different and creative path to structural change. As a result of this research, policy work, and filmmaking, I appreciate more of the challenges inherent in being an expert attempting to affect policy at multiple levels and at scale.

Discussion Questions

- 9. How does heat affect human health?
- 10. How should research in the field of climate change and health be designed to promote mitigation and adaptation?
- 11. Why are film and public education important to policymaking?
- 12. What are some principles for working as a researcher to affect policy?

Assignment

This assignment has two parts. First, identify a policy that your research could affect. Articulate the pathway through which findings from your research might affect that policy. Make sure to identify what scale policy you aim to affect. Second, conceptualize a documentary or narrative film story line that could portray your findings to a specific audience. Write a paragraph that describes how this story would be told, how you would present the stakes of the issue, the specific messages contained therein, the main story line, and the expected responses on the part of the viewers.

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Commentary

This collection of six case studies was work undertaken by Robert Wood Johnson Foundation Health & Society Scholars (HSS) who either translated research initiated or ideas stimulated during the authors' experiences in the HSS program. As the Robert Wood Johnson Foundation has turned to a new emphasis on the Culture of Health (https://www.rwjf. org/en/library/annual-reports/presidents-message-2014.html), HSS has been discontinued, along with the Foundation's other human capital programs. The legacy of HSS, however, has been enormous and sustained. Hundreds of Scholars were trained in the program and have gone on to influential positions in academia, government, foundations and other not-for-profit organizations, and industry. This report represents an important facet of this legacy by illustrating through personal stories the capacity for population health science to impact policies designed to improve the lives of individuals and the well-being of communities.

As a final step in exploring the translation of evidence to policy, following the compilation of the case studies, in November 2016 HSS's National Program Office at The New York Academy of Medicine sponsored a workshop at the National Academies of Sciences, Engineering, and Medicine in Washington, D.C. The workshop brought together several of the program's Scholars, including those who had produced the case studies, selected HSS faculty members, and leaders in science, policy, and the media who might be end users of the research findings (see table of attendees). The goal of the meeting was to provide a platform to discuss the key elements of effective training for the translation of evidence into policy. Using three of the case studies as a point of departure, the participants engaged in a dialogue regarding the nature of evidence that is most useful in the policymaking process and how best to communicate it. A summary of the key points from this lively and rich discussion follows.

In general, there was broad agreement that creating training environments for the translation of science into policy remains essential. Faculty directors from two of the HSS sites (Wisconsin and Michigan) led this portion of the meeting; their key points and those of several Scholars are highlighted.

At the Wisconsin site, the construct for scholarly activity on "knowledge exchange" and "knowledge transfer" draws on the seminal work of John Lavis and others in Canada.^{1,2} Lavis et. al. have been concerned with creating organizational frameworks for knowledge translation strategies specifically focused on policymakers. At Wisconsin, exposure to the concept and function of knowledge exchange was a central training tenet and considered a teachable

skill. Leaders of the Wisconsin site stressed that connections to community resources were key to the pedagogic process, and specific time and effort was devoted to facilitating Scholars' introductions to decision makers and those who could assist in the knowledge exchange process.

At the Michigan site, the focus was more on the fundamental scientific aspects of population health rather than its dissemination and implementation. However, they adopted Kingdon's three-stream policy framework for instructing their Scholars on research translation.³ Kingdon's political science framework identifies a *problem* stream that describes some social or political condition as a problem; a *policy* stream that provides a solution to the problem; and a *political* stream that requires consensus across a variety of decision makers and the political will for action. These streams make it more or less likely that a research solution will be applied in practice and policy (e.g., Medicare in the 1960s). Debates at Michigan revealed differences of opinion between economists on the one hand and social scientists and epidemiologists on the other, as to the strength of the available scientific evidence to drive policy change from various disciplines. A volume that resulted from a conference titled Making Americans Healthier highlights aspects of that debate (https://www.russellsage.org/publica-tions/making-americans-healthier).

While not sufficient by itself, participants emphasized that for those who wish to translate their research into practice, effective communication training via mentoring or coaching is a critical skill. One media leader emphasized the "core curriculum" of communication as identifying who you want to reach and what they want to know and developing a clear message for each audience. Elements of effective communication include enthusiastic presentation of research to get one's message across, skill in dealing with controversial topics, and learning to talk with those who dismiss the science.

The workshop also highlighted the central need to relate policy change efforts to the needs of the people being served. Experience in community engagement and, again, communication skills are essential. It was pointed out during the discussion that Colorado State University, a land-grant institution, trains students to talk with the farmers who may benefit from the university's research in order to maximize its relevance. In other settings, it was recommended that population health researchers use an interdisciplinary team approach to engage the people and institutions that will use the research before project launch. In fact, some suggest that this occur while still in the intervention or research design phase, as these end users can clarify the standards of evidence that will be needed to effect policy changes.

As the focus of the workshop shifted to the "practice" of translation, communication continued to be an important theme, along with the importance of effective partnering. These collaborations might be with community groups that may be closer to understanding the needs and goals of those who may be affected by a policy; with advocacy groups that can use researchers' evidence in their work, especially with sectors outside health; and with media from the beginning of the project so that they fully understand the project goals and can advise on communication strategies along the way. One participant said, "We are not just subjects of the media, but we also have to be messengers with them." Other key partners identified are those who can help the researcher navigate the system and serve as local champions for the change process being sought.

As population health professionals seek to become more effective in translation to other sectors, researchers were encouraged to attend other professional meetings (e.g., transportation and urban planning) to understand their vocabularies and identify the points of impact for population health important in these latter sectors. Solutions to complex societal problems almost invariably demand such multidisciplinary exploration. Early and sustained exposure to colleagues in other disciplines is needed so scholars and practitioners can increase their opportunities to learn to speak the other "languages" that are critical to effective research and practice collaborations. One participant observed that think tanks are increasingly asked to conduct environmental scans to synthesize evidence across multiple sectors versus more narrow evaluation of a specific project. Because of the relative novelty of working at the intersection of disciplines and sectors, a challenge may be how to use population health scholarship and methodologies to tackle problems where there is yet no evidence.

The discussion with policymakers indicated their need for tools to help them weigh the relative benefits of investment in one intervention versus another, e.g., creating a matrix of evidence-based options and identifying which are "best buys" for population health. Researcher understanding of the regulatory and legal frameworks within which the policymaker or politician operates can help clarify the kinds of evidence needed to adapt the choice of interventions to local circumstances and make them more sustainable. Researchers should be aware of the short-term time frame in which results are needed by policymakers who, as one participant noted, may lean toward "shovel-ready projects" rather than those that support medium- to long-term capacity building.

Other commentary recognized that true policy change may require a long time to accomplish and is unlikely to occur within the usual three to five years of a research grant. The standards of evidence demanded by agencies and policymakers will differ, and even with data, politics may mitigate against or expedite action. However, small steps can be made on the path to significant change, especially when supported by data and accompanied by patience and sustained efforts. In conclusion, the workshop strongly supported the continued training of scientists from diverse disciplines to become conversant in the frameworks and processes that effectively translate new research into policy applications. Participants reinforced the importance of (and challenges in supporting) multi-sectoral and interdisciplinary scholarship, communication, and collaboration to understand the broad determinants of heath and solve the complex problems needed to achieve real advances in population health. Workshop attendees were unanimous about the importance of continuing dialogue among researchers interested in translation and policymakers and opinion leaders who must act, often regardless of the quality of the evidence. These case studies from the HSS program are intended as a legacy contribution to this important process.

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November 2016 Workshop Attendees

Affiliation while attending the workshop is indicated.

Courtney Ferrell Aklin, PhD	Chief of Staff, National Institute on Minority Health and Health Disparities
Dawn Alley, PhD	Director, Prevention and Population Health Group at the Center for Medicare and Medicaid Innovation
Christine Bachrach, PhD	Co-Director, Robert Wood Johnson Foundation Health & Society Scholars program
Jo Ivey Boufford, MD	President, The New York Academy of Medicine, and Co-Director, Robert Wood Johnson Foundation Health & Society Scholars program
Ed Christopher, MS	Metropolitan Planning Specialist (retired), Federal Highway Administration's Resource Center
Kristin Harper, MPH, PhD	Harper Health & Science Communications
Robert A. Hiatt, MD, PhD	Professor and Chair, Department of Epidemiology and Biostatistics, University of California, San Francisco
James S. House, PhD	Angus Campbell Distinguished University Professor of Survey Research, Institute for Social Research, University of Michigan
Bill Keyrouze, MS	Manager of Technical Programs, Association of Metropoli- tan Planning Organizations
David A. Kindig, MD, PhD	Co-Chair, IOM Roundtable on Population Health Improve- ment, and Co-Director, University of Wisconsin Robert Wood Johnson Foundation Health & Society Scholars program

Lindsey Leininger, PhD	Senior Health Researcher, Mathematica Policy Research
Alan I. Leshner, PhD	Chief Executive Officer Emeritus, American Association for the Advancement of Science
Gina S. Lovasi, PhD, MPH	Associate Professor of Urban Health, Co-Director Urban Health Collaborative, Drexel University
Sheryl Magzamen, PhD	Assistant Professor of Epidemiology, Department of Environmental and Radiological Health Sciences, College of Veterinary Medicine and Biomedical Sciences at Colorado State University
Sabrina McCormick, PhD	Associate Professor, Department of Environmental and Occupational Health, Milken Institute School of Public Health, George Washington University
Michael McGinnis, MD, MA, MPP	Leonard D. Schaeffer Executive Officer at the National Academy of Medicine
Jeffrey D. Price	Program Manager, Robert Wood Johnson Foundation Health & Society Scholars program
Brendan Saloner, PhD	Assistant Professor, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health
Carol Schadelbauer	Principal and Co-Director, Training Programs, Burness
Yonette F. Thomas, PhD	Science Advisor for Urban Health, The New York Academy of Medicine
Barbara Turk	Director of Food Policy, New York City, Office of the Deputy Mayor for Health and Human Services

Biographical Notes on Contributors

Marcus Bachhuber, MD, MSHP, is an assistant professor in the Division of General Internal Medicine at Montefiore Medical Center/Albert Einstein College of Medicine in the Bronx, New York. He completed his medical degree at the University of Pennsylvania School of Medicine followed by residency and chief residency at the Einstein-Montefiore Primary Care and Social Internal Medicine Residency Program. He completed a fellowship with the Robert Wood Johnson Foundation Clinical Scholars Program at the Philadelphia Veterans Affairs Medical Center and the University of Pennsylvania where he also obtained a master of science degree in health policy research. In addition to being a primary care provider, Dr. Bachhuber conducts research focusing on health system and policy approaches to addressing prescription drug misuse.

Michael D.M. Bader, PhD, assistant professor of sociology at American University, studies how cities and neighborhoods have evolved since the height of the civil rights movement. He links long-term patterns of neighborhood racial change to the ways that race and class influence the housing search process. He studies how these changes affect the health and well-being of Americans and potentially exacerbate racial health inequality. To accomplish this research, Dr. Bader has developed methodological tools that combine survey data with "big data" to study neighborhood environments.

Ed Christopher is an independent transportation planning consultant with over 35 years of public sector experience at the regional, state, and federal levels.

Robert A. Hiatt, MD, PhD, is professor and former chair of the Department of Epidemiology and Biostatistics at the University of California, San Francisco (UCSF), and the associate director for Population Science of the UCSF Helen Diller Family Comprehensive Cancer Center. He was a core faculty member of the Robert Wood Johnson Foundation Health & Society Scholars program at UCSF. He received his medical degree from the University of Michigan and his doctorate in epidemiology from the University of California, Berkeley.

Danya Keene, PhD, is an assistant professor of social behavioral sciences at the Yale School of Public Health. Her mixed-methods research examines the social and policy determinants of health inequalities, with a focus on issues related to housing and place. Dr. Keene received her PhD in public health from the University of Michigan and was a Robert Wood Johnson Foundation Health & Society Postdoctoral Scholar at the University of Pennsylvania.

Gina S. Lovasi, PhD, MPH, is now the Urban Health Collaborative Co-Director and Dornsife Associate Professor of Urban Health at Drexel University. She was assistant professor at Columbia University when she developed her case study. She received a bachelor of science degree in ecology, behavior, and evolution at the University of California, Los Angeles, and a master of public health degree and a doctor of philosophy degree in epidemiology from the University of Washington. Dr. Lovasi is a social epidemiologist with a commitment to using longitudinal spatial data and emerging statistical approaches to shift the field of urban health research toward more convincing, cohesive, efficient, and actionable knowledge generation. Her research focuses on how policies and urban infrastructure influence cardiovascular and pulmonary health, as well as differences in these effects across population subgroups with relevance to health equity. She leads coordinated efforts across the multiple institutions that are coming together to help develop rigorous, action-oriented research focused on longitudinal assessments of neighborhood characteristics and their trajectories of change.

Carolyn McAndrews, PhD, is an assistant professor in the Department of Urban and Regional Planning at the University of Colorado Denver. Her research focuses on the health, safety, and environmental effects of transportation and land-use systems.

Sabrina McCormick, PhD, (www.sabrinamccormick.com) is an associate professor at George Washington University and Senior Fellow at the Wharton School. She investigates the human drivers and effects of climate change, and produces films that compel audiences to engage in these issues. She was lead author on the Nobel Prize–winning Intergovernmental Panel on Climate Change and has advised Congress, the State Department, and the White House. Dr. McCormick's film work includes her feature film, *Tribe;* the Showtime series *Years of Living Dangerously* (http://theyearsproject.com/), which won the Emmy for Best Documentary Series in 2014; *After the Cap*, and *No Family History*, among others. Dr. McCormick's research has been featured on NBC Nightly News, *Time Magazine*, the *Chicago Tribune*, and many other media outlets.

Kathryn M. Neckerman, PhD, is a research scientist at the Columbia Population Research Center at Columbia University. She was associate director of the Robert Wood Johnson Foundation Health & Society Scholars site at Columbia, and, with Andrew Rundle, co-founded Columbia's Built Environment and Health research group. Research interests include urban inequality, walkability and health, and urban transportation.

Eloisa Raynault is a business intelligence analyst at the Port of Seattle, focused on exploring and visualizing data to drive critical decisions. She has extensive experience in the transportation, environmental, public health, and social responsibility domains. Previously, she was the transportation, health, and equity program manager at the American Public Health Association (APHA), where she examined and tracked the public health and equity impacts of transportation systems and policies and shared resources on these topics with the APHA's more than 50,000 members and affiliates. She serves as a member of the National Academy

of the Sciences' Transportation Research Board Health and Transportation Subcommittee, the Environmental Justice Committee, and the Air Quality Committee.

Andrew Rundle, DrPH, is an associate professor of epidemiology at the Mailman School of Public Health at Columbia University. His research focuses on the determinants of sedentary lifestyles and obesity across the life course and the health-related consequences of these conditions. Dr. Rundle co-directs the Built Environment and Health Research Group (https://beh. columbia.edu), a transdisciplinary team of researchers studying how neighborhood built and social environments influence diet, physical activity, and, in turn, obesity risk. He also directs childhood obesity research for the Columbia Center for Children's Environmental Health. His work on neighborhood health effects has been used as part of the scientific rationale for the New York City Active Design Guidelines, for the Mayor's Food Policy Task Force's Food Retail Expansion to Support Health (FRESH) initiative, and for the International WELL Building Institute's WELL Building and WELL Community Standards.

Brendan Saloner, PhD, is an assistant professor of health policy and management at the Johns Hopkins Bloomberg School of Public Health. Dr. Saloner investigates policies to improve health and health care of vulnerable populations, including policies related to the prevention and treatment of substance use disorders. He was a Robert Wood Johnson Health and Society Scholar at the University of Pennsylvania. Dr. Saloner holds an early career grant from the National Institute on Drug Abuse.

Jennifer Stuber, PhD, is an associate professor of social work at the University of Washington. After losing her husband to suicide in 2011, she channeled her grief into co-founding Forefront Suicide Prevention, a University of Washington–based social impact center that empowers individuals and communities, champions systemic change, and advocates for survivors of suicide loss and attempted suicide. She has helped pass six significant pieces of suicide prevention legislation in Washington State, the first state to mandate suicide prevention training for all health, counseling, and behavioral health professionals. Dr. Stuber has formed alliances with Second Amendment rights organizations to tackle firearm suicide, the cause of half of all suicide deaths. Recently, she led the launch of Safer Homes Suicide Aware, a statewide campaign to train pharmacists, firearms retailers, and health care professionals to be on the front lines of engaging with patients and customers to promote safe storage of lethal means.
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