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Executive Summary

The Robert Wood Johnson Foundation Health & Society Scholars (HSS) program was designed to train early career researchers to become interdisciplinary leaders in population health science. It accepted its first cohort in 2003 and ended in 2016, having trained 193 scholars at six sites: Columbia University, Harvard University, the University of California, San Francisco/Berkeley, the University of Michigan, the University of Pennsylvania, and the University of Wisconsin. Scholars came from 30 primary disciplines, including sociology, epidemiology, psychology, economics, city planning, history, neuroscience, and anthropology. They were mentored by faculty from similarly diverse backgrounds, who helped them develop interdisciplinary research skills and conduct research targeting important population health questions. In addition, the program gave scholars the opportunity to hone their leadership and engage in knowledge exchange and transfer work, to ensure that the products of their research were used to improve health. Finally, while serving the scholars, the sites also worked to promote interdisciplinary scholarship and population health research across their host universities.

Rationale for This “Lessons Learned” Project. This report details the history of the HSS program. Program documents, interviews, and statements at meetings were used to investigate the strengths and weaknesses of the program and to explore its perceived impact on the scholars, the faculty involved, the universities that hosted sites, and the field of population health. The goal was to draw lessons from the experiences of faculty, scholars, alumni, and program staff that may prove useful for future training programs in population health. Audiences that may find this report helpful include educators designing educational and research programs in population health, educational administrators interested in the challenge of changing organizational culture and practices to promote interdisciplinary scholarship, and population health researchers who mentor early career scholars.

Key Findings. The vast majority of scholars who completed the program have pursued academic careers. Their success assuaged early fears that interdisciplinary research interests could handicap them on the job market, although alumni continue to report challenges associated with carrying out interdisciplinary population health research. Other past scholars have joined foundations and think tanks, started their own businesses, or gone to work for the government or in the private sector. Many alumni use terms such as “life changing” to describe the program. Faculty involved in the program also describe a transformative experience, one that pushed their own research in new and fruitful directions. Moreover, the universities hosting the sites have changed to accommodate interdisciplinary research to an extent that no one in the program initially expected; this reflects the sites’ consistent and varied efforts to draw new faculty into population health projects and to break down institutional barriers to interdisciplinary research. Finally, scholars, faculty, and National Advisory Committee members have contributed to the maturing field of population health science, helping to lay a research base and improve the

1. Although the term “field” is used throughout this document, it is not meant to indicate that population health is a discipline; many researchers consider it an approach that integrates the contributions of many disciplines.
field’s visibility through seminal research articles, books, symposia, documentaries, and testimony before Congress.

Interviewees consistently mentioned six factors as being essential to the program’s success:

**Cohorts.** At individual sites, continual interaction among scholars from diverse backgrounds and between scholars and faculty fostered cross-disciplinary collaborations and sparked new ways of thinking. A site-based model that allowed for this everyday proximity was seen as a fundamental part of the program.

**Mentorship.** Intensive mentorship from senior interdisciplinary scholars was a core part of the program. Providing generous funding to support mentorship by program directors was crucial, as faculty did not receive the typical reward for mentorship in academia: a trainee to help carry out their research objectives. Instead, mentors were charged to encourage mentees to become independent researchers.

**Curriculum.** Didactic classroom work was kept to a minimum, and each site developed its own curriculum. One element all sites shared, however, was a population health seminar that provided a common grounding in the field for scholars and practice in communicating across disciplines. Each site mixed and matched additional curricular elements, including traditional courses, short (2-day) courses, working groups, symposia, and salons, to meet the needs of its scholars.

**Research and Training Funds.** Each site was provided with funds to use for research and training purposes. In addition to using these funds to support scholar and faculty research, the sites developed ingenious ways to use this money to pull in new faculty, facilitating their interdisciplinary mission and raising the profile of the program around the university.

**Flexibility.** From the beginning, faculty developed the program alongside Foundation staff. Through the years, input from scholars, alumni, faculty, the National Program Office, the National Advisory Committee, and Foundation staff ensured that the program was dynamic enough to meet the changing needs of its scholars. In addition, each of the six sites was given latitude to pursue program aims in its own way. This allowed sites to individualize their approaches; practices that worked well could then be shared across sites.

**University Culture and Structure.** Placing the sites in environments that supported interdisciplinary research was imperative for ensuring the availability of essential resources, such as office space; a willingness on the part of the administration to invent new systems to work across traditional departments and even campuses, and the administrative support to maintain these systems; and reassurance that faculty involvement would be regarded favorably in tenure and promotion decisions.

Facets of the program that interviewees felt could be improved included:

**Program Length.** Universally, scholars and site directors expressed that developing into an interdisciplinary population health scholar in 2 years was
difficult. Many felt that extending the program for 1 additional year would be extremely beneficial, especially for scholars whose research was shifting dramatically.

**Disciplinary Diversity.** The diversity of disciplines represented by scholars and faculty in the HSS program was unprecedented and grew yearly, but interviewees noted challenges in attracting scholars in fields such as the biological sciences and mathematics; in addition, the program was geared toward academic careers. Future programs might realize even wider diversity by involving core faculty in underrepresented academic disciplines, as well as involving partners from outside academia.

As the program ends, future challenges will include ensuring that a robust network exists on which alumni can draw, forging relationships with new partners devoted to population health science, ensuring that new training programs in population health begin, and continuing to demonstrate the value of the population health approach to the wider research, policy, and practice community.
Abbreviations

ACA  Affordable Care Act
ACO  Accountable care organization
ADHD attention-deficit/hyperactivity disorder
AIDS acquired immune deficiency syndrome
DSM  *Diagnostic and Statistical Manual of Mental Disorders*
HHS  U.S. Department of Health and Human Services
HIV human immunodeficiency virus
HSS  Robert Wood Johnson Foundation Health & Society Scholars
HUD  U.S. Department of Housing and Urban Development
IAPHS Interdisciplinary Association for Population Health Science
IOM Institute of Medicine of the National Academies
MCAT® Medical College Admission Test®
NAC National Advisory Committee
NBA National Basketball Association
NIH National Institutes of Health
NPO National Program Office
NSF National Science Foundation
OBSSR Office of Behavioral and Social Sciences Research
PBS Public Broadcasting Service
Penn University of Pennsylvania
R&T Research and Training (funds)
RWJF Robert Wood Johnson Foundation
UCLA University of California, Los Angeles
UCSF University of California, San Francisco
UCSFB University of California, San Francisco/Berkeley
WHO World Health Organization
At the close of the 20th century, the United States was spending more on medical care than any other country, yet ranked poorly on many measures of health and well-being. Also, an appreciation of the many nonmedical factors that affect health was growing. We had come to learn from Michael Marmot’s work, for example, that the lower your social class, the more likely you are to suffer from coronary heart disease [1] and that social and community ties contribute to a longer life [2]. Awareness of the stark health disparities between groups in the United States was also increasing. For example, in 2001, researchers documented that blacks living in metropolitan areas were 81% more likely to die prematurely than whites [3].

Motivated by findings like these, researchers had begun exploring a new approach to studying health—the population health approach. In 1990, Bob Evans and Greg Stoddart proposed an influential model in which not only health care and individual behaviors but also social and physical environments and genetic endowment influenced health and function [4]. By 1998, the Office of Behavioral and Social Sciences Research (OBSSR) at the National Institutes of Health (NIH) had proposed a framework for health research that spanned the social, behavioral, and biomedical fields and analyzed data at multiple levels, from the social/environmental to the behavioral/psychological down to organ systems, cells, and molecules [5]. Shortly after, in 2000, John McKinlay and Lisa Marceau argued for a shift from focusing on risk factors to investigating multilevel explanations and different types of interventions in public health [6]. Finally, Lisa Berkman and Ichiro Kawachi’s textbook Social Epidemiology, released in the same year, illustrated how concepts and methods from sociology, psychology, political science, economics, demography, and biology could be brought to bear on important health problems [7].

Although the seeds were being planted, the population health approach had not yet become established in the United States. A Google search for “population health” in 2001 yielded only roughly 300 hits [8]. Sherman James (Research Professor of Epidemiology and African-American Studies, Emory, and National Advisory Committee member) says of this period:

I think that the visibility for population health, at least in the circles that I moved in, was practically zero. Maybe there was some vague, shadowy notion, but one rarely even heard the term “population health” [9].
“People didn’t talk about population health very much,” agrees Berkman (Professor of Public Policy, Epidemiology, and Global Health, Harvard) [10]. Even Pamela Russo (RWJF Senior Program Officer), who would come to devote her career to working on population health at the Robert Wood Johnson Foundation (RWJF), had to acquaint herself with the term. “When I first came to the Foundation and Michael McGinnis said, ‘I’d like you to lead the population health science and policy team,’ I wasn’t familiar with the term,” she says [11].

Nevertheless, by 2001, there were signs of growing interest in population health throughout the United States. Consider education: At the University of California, Los Angeles (UCLA), Jonathan Fielding (Professor-in-Residence, Fielding School of Public Health, UCLA) taught a class on the determinants of health; at Albert Einstein College of Medicine in New York, students had been learning about social medicine for decades; and at Dartmouth, the Health, Society, and the Physician course had been required of all medical students for years. The University of Pennsylvania (Penn) had an undergraduate Health & Societies program, and the University of Wisconsin had featured an entire Population Health department for some time. Medical historians such as Allan Brandt and Charles Rosenberg of Harvard University had long encouraged readers to view our health care system and our responses to medical problems such as lung cancer and human immunodeficiency virus (HIV) through a social and historical lens [12-14], and the Department of Social Medicine at Harvard was exposing medical students to these ideas. Finally, at Berkeley, Len Syme taught the first course on the social determinants of health. It was initially offered in 1968, and some of his early students included Marmot, Berkman, and George Kaplan [15].

Publications and conferences also revealed the growing appeal of population health. Göran Dahlgren and Margaret Whitehead’s well-known rainbow diagram appeared in print in 1991 [16], and ever since it has helped introduce the multiple determinants of health to new audiences (Figure 1). Articles with titles such as “Purchasing population health: aligning financial incentives to improve health outcomes” [17] and “The relevance of population health to academic medicine” [18] were appearing in the literature. And the Institute of Medicine (IOM) had published a report on the determinants of health, concluding that “health and disease are determined by dynamic interaction among biological, psychological, behavioral, and social factors” [19]. In addition, the World Health Organization (WHO) had been emphasizing the link between poverty and disease for some time, and in 1998, it published an influential report entitled Social Determinants of Health: The Solid Facts [20]. Finally, in 2000, OBSSR sponsored a conference—Towards Higher Levels of Analysis: Progress and Promise in Research on the Social and Cultural Dimension of

2. These examples are illustrative and are not meant to be exhaustive.
Health—organized by David Takeuchi and Christine Bachrach (Co-Director, HSS National Program Office). By this time, the NIH was spending approximately 10% of its budget on behavioral and social sciences research and training [21].

At RWJF, a growing interest in population health was evident. The Foundation had grown concerned about the disconnect between health care spending and health outcomes in the United States. By 2001, the RWJF endowment had grown to nearly $9 billion, and it had organized its staff into a Health group and a Health Care group, committing equal grant support resources to each [22]. One of the priority areas of the Health group, led by McGinnis (Program Founder; Leonard D. Schaeffer Executive Officer, National Academy of Medicine), was population health science and policy. In 1993, McGinnis had coauthored an article called “Actual Causes of Death in the United States” with Bill Foege in the Journal of the American Medical Association [23]. This article showed that roughly half of deaths were due to potentially preventable factors that fell outside of the purview of health care, including tobacco and alcohol use, diet, and activity patterns. It was factors such as these that the Health group at RWJF was designed to address. Specifically, its aims were to (a) cultivate leadership and investigator capacity to improve population health, (b) promote the development of research methodologies and interventions that could enhance understanding and action for population health improvement, and (c) focus the policy debate on the means to improve population health.

At the time, this agenda seemed daunting. Among those familiar with population health, there was consensus that it was in the earliest stages of becoming a legitimate field [24]. At that time, some of the barriers foreseen for the field included disciplinary parochialism, disease-specific funding, the nature of universities, and an incongruence with reductionist models of science. In particular, researchers interested in population health were worried
that without plausible biological pathways by which population-level phenomena could get “under the skin,” the field was unlikely to be taken seriously. In addition, they were concerned about this type of research being compromised “by the appearance of advocacy on the part of scientists” [24]. Finally, researchers perceived no great demand for population health studies from domestic policymakers, although some scientists believed that a coming crisis in medical care, precipitated by an aging population, would create such a demand [24]. These, then, were some of the most important challenges to the nascent field of population health in 2001.

The Rationale for the Creation of the RWJF Health & Society Scholars Program

By 2001, public health figures concerned with health disparities believed that it was essential to provide government agencies, universities, and public health organizations with experts that had knowledge and skills in population health [25]. An IOM report, for example, emphasized the importance of both understanding the interconnections between the determinants of health and developing leaders who could use this knowledge to mobilize action to improve health [26]. Such experts were in short supply at the time. Given the success of other RWJF human capital initiatives, such as the Clinical Scholars and Scholars in Health Policy Research programs, in populating new fields with talented researchers, the Foundation decided to develop a fellowship program that focused on the science of population health. “One of the major leverage points for any philanthropy to make a difference over the long term is building human capital, developing the seed corn for future leadership,” says McGinnis [27]. His plan was to create a program analogous to the Clinical Scholars program but drawing from a broader, multidisciplinary base [28]. The vision was to “involve all the individuals, the best and the brightest in all fields, working together across disciplines to improve the capacity for society to be healthy” [27].

From the beginning, it was always going to be a program that was interdisciplinary in nature. In fact, that was its principle raison d’être. Not only did we have to involve molecular biologists, lawyers, sociologists, physicians, and nurses to build a population health capacity, but we [also] needed to have them work across their boundaries in an interdisciplinary fashion,

says McGinnis [28]. McGinnis felt this new program was needed to move research away from individual risk factors and toward investigating the broader determinants of health [29]. Thus, one of its major goals was to train leaders who could “design, implement, and evaluate population-wide interventions to improve health and reduce disparities in health” [25].

Life occurs at the busy intersections in which we exist, in which we live and work and move. What is fundamentally important for society to progress is to have people who understand the dynamics at those intersections, so our aim was to develop a generation of intellectual and program leaders who could help us not only understand what the dynamics were at those intersections but could move us actively into a healthier society.

–Mike McGinnis
At the time, few other training programs were related to population health. The Kellogg Foundation had recently launched a career development program in Society and Population Health for minority fellows. In addition, the Population Health program of the Canadian Institute for Advanced Research, founded in 1987, had initiated a postdoctoral and graduate student training program shortly before the RWJF Health & Society Scholars (HSS) program began. Relative to these programs, HSS was seen as a large-scale, comprehensive, national training initiative [24].

Although McGinnis felt that the program was a natural next step for the Foundation, it dealt with issues to which the board was not accustomed [28]. As stated in an HSS board précis,

This program presents challenges beyond those encountered in the Foundation’s previous training programs, which generally focus on relatively uniform training backgrounds, or focus on a single topic area. The potential barriers to interdisciplinary training and career development have been repeatedly enumerated [30].

Thus, a careful deliberation and planning process ensued, to ensure the program’s success.

During a series of meetings that started in 2000, McGinnis, Russo, James Knickman (Robert Derzon Chair in Public and Health Affairs, New York University; then at RWJF), Seth Emont (Principal, White Mountain Research Associates; then at RWJF), Carol Chang (Chief Programs Officer, American Red Cross; then at RWJF), and others in the field began to determine what shape this new program would take. Would it focus on identifying promising sites of population health science research? Or on supporting talented scholars doing work in this field? At a Center for the Advancement of Health meeting in August 2000, participants with expertise in population health, social epidemiology, postdoctoral training administration, and interdisciplinary research were asked to give their thoughts on the proposed program; in addition, 42 hour-long interviews were conducted with 35 of those experts [24]. In September 2000, another meeting about the program took place at the IOM [29]. During the planning phase, one of the early topics of discussion was defining population health, which proved contentious; eventually the program was named the “Health & Society” scholars to avoid endless debate [31].

After input from many leaders in the field, the Foundation decided to create a hybrid program that focused on both sites and scholars. “We elected to do predominantly a

The goal was for the scholars to shift their paradigms, understand how other disciplines thought, what their methods were, what their data sources were, what their general theoretical conceptual frameworks were, what their language was.

–Pamela Russo
scholars model, but with outstanding sites, creating an environment that would nurture the scholars in population health science and policy,” says Russo [11]. Early career scholars were seen as an especially important focus, given previous work by Diana Rhoten that showed that graduate students are the glue that holds together interdisciplinary bonds, bridging faculty from different backgrounds [32]. Russo explains:

If you had a talented grad student or postdoc that people wanted to work with, that was what created the bonds between departments much more powerfully than anything else. And so that influenced our thinking, having these incredibly talented scholars who people want to work with, as well as the sites themselves [31].

Some Reflections on the Meaning of Population Health

The health outcomes of a group of individuals, including the distribution of such outcomes within the group.

–Dave Kindig and Greg Stoddart

It represents the engagement of all of society’s resources to improve the overall health of the population. It generally refers to activities that are undertaken that don’t just affect one individual directly but are targeted at things that can make a difference for many individuals.

–Mike McGinnis

We think about mean levels, average life expectancy, or mortality rate. But the other important part of population health is the distribution. ... What we want to do is see who is in the tails at each end. Who is doing extraordinarily well and who is doing really poorly? The goal of population health is often twofold: to move the mean to a better place and often to pull those who are farthest behind.

–Lisa Berkman

It is an approach to science that is heavily infused with a commitment to social justice, with a commitment to finding ways to improve the health of everyone. ... It’s an intellectual quest to figure out what these major determinants are and then to act on them.

–Sherman James

It’s really an approach, a conceptual framework, that is inherently about multiple levels of influence, that’s inherently about integrating social and biomedical factors, that’s inherently about more than medical care and that incorporates the social sciences, policy, and many other disciplines and also that has a very explicit concern with health equity and health disparities.

–Ana Diez Roux

The opportunity for children, family, individuals to live in a safe place with the opportunity to live a long, happy, rewarding life.

–Doug Jutte
At a Population Health Science & Policy retreat that RWJF hosted in January 2001, the staff wrote that HSS would be considered successful if it “builds the field in ‘health’ as well as the Clinical Scholars program has done in ‘health care.’” In a 2002 planning meeting, the Foundation stated that “the expectation is that Scholars will pursue research careers and become leaders in an emerging multidisciplinary field of population health.” The official goals of the program were to train scholars to:

- Investigate the connections among biological, genetic, behavioral, environmental, economic, and social determinants of health; and
- Develop, evaluate, and disseminate knowledge, interventions, and policies that integrate and act on these determinants to improve health [25].

The Field of Population Health Now

Today, a Google search for the term “population health” yields more than one million hits. Knickman observes, “All of a sudden the idea that we’re spending too much on medical care and that we could maybe spend a lot less on medical care if we spent more money on social determinants became more and more a dominant way of thinking” [33]. “The world has transformed,” Dave Kindig (Site Director, Wisconsin) agrees. “It used to be that in the mid-to-late ’90s, I could give all kinds of talks on what does population health mean and the multiple determinants and stuff like that, but everybody knows it now. Social determinants roll off people’s lips” [34].

One of the events that led to this improved visibility was the WHO Commission on Social Determinants of Health, chaired by Marmot [35]. Active between 2005 and 2008, the commission was established to draw attention to the role of social factors in producing ill health and health inequities; its goal was to support related policy changes. In 2008, it published its final report, *Closing the Gap in a Generation: Health Equity Through Action on the Social Determinants of Health* [36]. This report ended with these sentences: “Reducing health inequalities is, for the Commission on Social Determinants of Health, an ethical imperative. Social injustice is killing people on a grand scale.”

The WHO Commission was followed by RWJF’s Commission to Build a Healthier America, created in 2008 [37]. Chaired by Mark McClellan and Alice Rivlin, the commission made a number of recommendations to help Americans live longer, healthier lives. These recommendations include investing in children, integrating health into community development, and taking a more health-focused approach to health care financing and delivery. HSS faculty such as Paula Braveman (*Professor of Family and Community Medicine, University of California, San Francisco*) and David Williams (*Professor of Public Health, Harvard*) synthesized and presented much of the evidence for the Commission report, drawing on the work of many other HSS faculty. In short, this high-profile Commission recommended approaches informed by population health science.

In addition, the Healthy People 2020 program of the U.S. Department of Health and Human Services (HHS) has taken a broad approach to answering the questions “What makes some people healthy and others unhealthy?” and “How can we create a society in which everyone has a chance to live a long, healthy life?” It has implemented a “place-based” framework...
to analyze determinants in five areas (economic stability, education, social and community context, health and health care, and neighborhood and built environment). Like the Commission to Build a Healthier America, its goal is to promote health nationwide [38].

Most recently, the Affordable Care Act (ACA) has promoted a population health approach to improving the health of U.S. citizens. The Institute for Healthcare Improvement’s Triple Aim has come to serve as a roadmap for governmental health programs [39], and one of the three aims is to improve the health of populations (the others are to improve the experience of care and to reduce per capita costs of health care). Increasingly, policymakers are recognizing that improving population health will require changes that lie outside the realm of health care. As a result, a number of ACA initiatives, spread across multiple programs and agencies, seek to improve population health by concentrating on upstream factors present in communities [40]. Here is a sampling of these programs:

- Shifts in the payment structure for Medicare and Medicaid now provide financial incentives to keep people well. The Medicare Shared Savings Program encourages accountable care organizations (ACOs), groups of health care providers who agree to take responsibility for the quality and cost of care that a population of patients receives.
- The ACA requires health insurance plans to provide first-dollar coverage for all age-appropriate preventive services recommended by the U.S. Preventive Services Task Force. In addition, a new National Prevention Council, chaired by the Surgeon General, acknowledges the broad determinants of health by including representatives from 20 federal departments, agencies, and offices, encompassing sectors such as housing, transportation, education, environment, and defense.
- The Partnerships to Improve Community Health program allows state and local government agencies and community-based organizations to compete for funds to prevent chronic diseases and reduce health disparities through evidence-based interventions. Further, each applicant must address problems identified in a recent community health needs assessment that engages community and public health experts. The resulting programs, which are generally nonclinical, seek to reduce tobacco use and exposure, improve nutrition, increase physical activity, and generally enhance opportunities to prevent chronic disease.
- To maintain their not-for-profit status, hospitals must now conduct a community health needs assessment every 3 years to describe the community they serve and identify its most pressing health needs; to demonstrate their community benefit, they must then devise a strategy to meet those needs.
- To better address health disparities, the National Center on Minority Health and Health Disparities is now an institute at the NIH, and Offices of Minority Health now exist in six federal agencies (the Agency for Healthcare Research and Quality, the Centers for Disease Control and Prevention, the Food and Drug Administration, the Health Resources and Service Administration, the Centers for Medicare and Medicaid Services, and the Substance Abuse and Mental Health Services Administration). The directors of the six offices constitute a Health Disparities Council tasked with carrying out an HHS Disparities Action Plan. In addition, to address the broad range of the social determinants of health, a Federal Interagency Health Equity Team, which includes representatives from the Departments of
Agriculture, Commerce, Education, Housing and Urban Development (HUD), Labor, and Transportation, and the Environmental Protection Agency, works to ensure intersectoral support for the Action Plan.

Thus, the ACA has raised the profile of population health, even in many sectors that have not traditionally concerned themselves with population-level measures of health—or with health at all. In McGinnis’s view,

*The notion of population health is now not only a legitimate notion, it is a vanguard notion. ... One of the elemental initiatives embedded in the ACA is the notion of accountable care organizations. ... What those organizations are accountable for is not just quality care to you and me but the overall health progress of the population [27].*

Similarly, Dawn Alley (Cohort 4, Penn; Acting Deputy Director of the Preventive and Population Health Models Group at the Center for Medicaid and Medicare Innovation) observes, “HUD published an article in *Health Affairs* talking about their role in health. What a totally remarkable achievement on their part, but there is an increasing recognition [of the role of nonclinical factors in health] and multisector cooperation and collaboration” [41].

One issue that has emerged from this attention, however, is the multiple working definitions of population health currently in use. Most population health researchers consider a population to consist of all the individuals living within a given area, whether it be a nation or a neighborhood. By contrast, many organizations responsible for the health of clients define population health as the health of the people that they serve directly.³ Careful attention to both the definitions of population health being used in clinical, academic, and government settings and the relationships between subpopulation health and total population health can ensure that individuals interested in population health are able to communicate productively. Making the effort to work together is key, as the ACA has provided population health researchers with an unprecedented audience for their findings. The various organizations supported by this new funding are eager to improve the health of the populations they serve, creating the opportunity to collaborate across sectors to improve total population health. Thus, population health researchers are poised to provide much-needed information to both policymakers and the many institutions with a growing concern for promoting health, preventing disease, and reducing health disparities.

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³. Though Niñon Lewis has defined the design, delivery, coordination, and payment of high-quality health care services for a population as population medicine, rather than population health [42].
Just as the focus on population health has grown in the policy realm, increasing attention is being paid to it in academia—especially in the education of new physicians. For example, a new section of the MCAT®, introduced in 2015, is entitled “Psychological, Social, and Biological Foundations of Behavior.”

These revisions reflect the recognition that behavioral and social factors not only play major roles in health and illness, but also interact with biologic factors to influence health outcomes. Fundamental knowledge about behavioral and social sciences is critical to the effective practice of medicine. ... Tomorrow’s physicians will need to understand demographic changes, the effect of culture on adherence to medications, and the ways in which changes in incentives and payment systems will affect their practices,

write Kaplan et al. [43]. To prepare their pre-med students for these changes, many universities are bolstering their population health–related offerings.

This new focus has proven popular even after students gain admission to medical school. Of the pathways available to medical students at the University of California, San Francisco, for example, the Health & Society track is the largest [44]. It familiarizes students with current research in social and behavioral science, population health disparities, and health systems and policy [45]. In addition, the University of Texas recently launched a new medical school in Austin with a major focus on population health: One of the core medical knowledge competencies is biopsychosocial factors, including a focus on the major social determinants of health and population-level health disparities [46].

Population health offerings outside of pre-med and medical education have also been expanding, at both the undergraduate and the graduate level. Thomas Jefferson University has an entire College of Population Health, offering MAs and PhDs [47]. Northwestern University has a Society, Biology, and Health cluster/certificate program at the graduate level that attracts students from fields such as anthropology, sociology, psychology, human development, and social policy [48]. Harvard has a new Population Health Sciences PhD program, and New York University has a Department of Population Health, offering various graduate degrees. The Sociology Department at the University of Colorado Boulder offers a Population & Health specialization. And these represent just a smattering of the population health programs now available to students.

Population health articles are also increasingly being published in policy journals, including The Milbank Quarterly and Health Affairs [49]. Medical journals and journals that traditionally focus on health care financing and delivery, including Health Services Research, The New England Journal of Medicine, The Annals of Internal Medicine, and Diabetes Care, have published population health–related
articles and special issues [49]. Thus, population health research is becoming more visible to researchers in other fields.

More importantly, as the field matures, more and more examples of population health science in action illustrate its utility. One prominent example is the County Health Rankings [50]. In 2004, the University of Wisconsin Population Health Institute began ranking the health of Wisconsin’s counties [51]. They measured the physical environment, social and economic factors, clinical care, and health behaviors to track how policies and programs translate into health outcomes, including quality and length of life. The rankings were covered in newspapers, television shows, and radio programs across the state, and local public health officials used them to educate policymakers and community partners, assess needs, and identify program targets. On the basis of this success, the program expanded, and currently data are available for every county in the nation [52]. Communities are using these data to convince policymakers that change is needed, and policymakers have used the data to develop new programs and marshal support for them. The data have also proved useful for tracking change.

Challenges for population health remain, however. There is currently an absence of support for population health training at the NIH. “There isn’t another source for that kind of training grant money,” notes Russo [31]. And although the visibility of population health has increased tremendously in some circles, it may not be widely recognized everywhere. “I think that outside this particular community of scholars, most academics would not be able to distinguish population health from public health. Those two terms would be conflated in the minds of most people,” says James [9]. Ensuring that the value of population health’s interdisciplinary approach and focus on upstream health determinants is appreciated and that there is a source of training for new population health scholars will determine the impact of this new field.
The Robert Wood Johnson Foundation Health & Society Scholars Program

Creation and Establishment at Sites

Initially, 21 institutions were asked to apply to participate in the planning phase of the program [30]. Throughout the selection process, The Robert Wood Johnson Foundation (RWJF) was looking for a broad conceptualization of health (vs. a focus on health care); a commitment to interdisciplinary research, as evidenced by representation from many disciplines; strong leadership; a strong plan for mentoring independent, interdisciplinary scholars; ties to the community; and a focus on intervention and practice, in addition to research. Excellence in working across departments and disciplines was especially important.

In academia, that’s an unnatural act, to really work legitimately across departments and disciplines. We first had to look for universities that had that predisposition—that had that commitment at the very highest level—to drive training that was truly interdisciplinary. Then we had to identify faculty working at the various universities who could provide not only the mentorship but also the security. … The investment of the faculty into nurturing that spirit is absolutely vital,

says Mike McGinnis, the program’s founder [27]. Pamela Russo (RWJF Senior Program Officer) agrees, “The real revelations come forward when you get that sort of mixing across those disciplines, so that required intense collaboration. … The faculty and site directors had to create the environment where that could happen” [11].

A Technical Advisory Board reviewed the qualifications of the sites that applied and picked 10 finalists for site visits. Then, based on the applications and the site visits, the board chose the sites that would participate in the planning process. Although the original plan was to pick five sites, “the applications were so good that our review committee couldn’t decide between number five and number six, so we funded six,” remembers Russo [11]. The sites were located at Columbia University, Harvard University, the University of Michigan, the University of Pennsylvania (Penn), the University of California, San Francisco/Berkeley (UCSFB), and the University of Wisconsin. These institutions were chosen carefully; in addition to the factors listed above, they were also important symbols.

In retrospect, the ability of very prestigious universities that were involved in this process from the beginning—the universities that everybody watches to see what they’re doing—and the fact that they would take a program like this on, to have the expert faculty that were willing to make the commitment and grow that commitment over time, really sent a signal that this was the future and you should really watch this space,

says Jo Ivey Boufford (Co-Director, HSS National Program Office).

Once the six sites were chosen, RWJF provided a 1-year grant for them to work with the Foundation to plan the program. “We had three meetings across a 9-month period to hammer out what … the design [would be] and how the program would be conducted. How
it would have some coherence across the sites but also allow for some uniqueness,” says Russo [11]. This was the first time that such a lengthy, collaborative planning process had been conducted for one of the RWJF human capital programs. James Knickman (Former Vice President of Research and Evaluation at RWJF) explains:

Rather than us designing it and then you have all these smart people at universities and you’re going to say well this is our bright idea, it seemed it would be more vibrant if they had a seat at the table. Also, then they can see the tradeoffs that one has to make and how different senior faculty around the country have different views of exactly how it should be structured and understand how we got to where we got to [33].

These planning sites then became the implementation sites.4

Each site played to its institutional strengths, says Sherman James (National Advisory Committee Member) [9]. In some ways, they operated as independent experiments; when a practice at one proved successful, it could be adopted by the other sites and tweaked if need be. Transdisciplinary working groups, for example, ended up spreading to almost every site (discussed further in the section below on Curriculum) [53]. Christine Bachrach (Co-Director, HSS National Program Office) observes:

One of the things [the program] did right was not making all the sites do things exactly the same way. We saw the benefits of that diversity, both for the kinds of people who ended up being trained and also for figuring out how to work productively across disciplines [54].

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4. Because of the 2008 economic downturn, HSS was forced to eliminate two sites, the University of Michigan and the University of Pennsylvania, after the 2012–2014 cohort scholars completed their tenure.
The Population Health Focus at Each Site

Columbia: This site’s joint home between the uptown School of Public Health and the downtown School of Arts and Sciences brought the two campuses together to collaborate at an unprecedented level. The least structured of the programs, its focus continually changed to reflect the interests of current faculty and scholars.

Harvard: This site’s exploration of population health initially focused on four core disciplines: social epidemiology, public policy, the history of science, and neuroscience. Later it also began to stress translational research.

Michigan: This site sought to build bridges between causal factors (cells to society) to understand and improve population health and eliminate health disparities. It tended to use large databases to address population health questions.

Penn: Two site directors who were also former site directors of the RWJF Clinical Scholars program and the absence of a school of public health ensured a unique focus at this site, which had close ties to the medical, business, and communication schools. Health economics was one particularly strong area.

UCSF: This site spanned the Health Sciences campus at UCSF and the Arts and Sciences campus at Berkeley, bringing together the two in a way that had never been done before. Throughout the program, a life course approach to interactions between context, behavior, and biology defined this site’s approach to population health.

Wisconsin: A strong focus on translating knowledge into policy and practice defined this site, which had a strong relationship with the nearby state government. This site was particularly strong in health economics and the social sciences.


Role of the National Program Office

“The structure of the program was really site-led, with the National Program Office (NPO) providing the glue for supporting the sites,” says Boufford [55]. Specifically, the NPO managed the national recruitment and selection process for scholars, organized the annual meetings, and carried out site visits and evaluations either every year (2003–2009) or every other year (2011–2015). During these visits, evaluation teams that consisted of NPO and National Advisory Committee (NAC) members would interview site directors, scholars, and key university representatives (at the level of vice president, provost, or university executive leadership) to determine what was working and what was not working at each site; these visits helped promote cross-site learning, connections between NPO and NAC members, scholars, and faculty, and the identification of areas in which the NPO could play a greater role. In addition, one session in each site visit included only the evaluation team and the scholars, to ensure that the scholars’ ideas about the program were heard. It also provided support for the development of the field and alumni network, which included
managing the program’s websites and social media accounts, including maintaining a Facebook, LinkedIn, and Twitter presence [53,55]. “I’m always posting collaborations between alumni from different cohorts and different institutions,” says the RWJF Health & Society Scholars (HSS) Deputy Director, Gerard Lebeda [25]. In addition, “the website is used by folks in the program, and people now see it as a magnet for finding these very unusual young professionals,” says Boufford [55]. Finally, toward the end, developing the leadership component of the program was added to the NPO’s mandate [56]. During the later years, the NPO also convened site directors and faculty to develop frameworks on leadership development [57] and translating research evidence to policy and practice [58] that were used to promote consistency in these areas of training across the sites.

Initially, the NPO was located within RWJF. Russo and Knickman co-directed the program, with Carol Chang and then Kim Lochner and Lebeda providing additional support and leadership. Starting in 2007, however, an external NPO housed in The New York Academy of Medicine began managing the program. By that time, the program had grown large enough to justify an external NPO that could devote itself to promoting the field of population health more broadly [25]. It was expected that the new NPO would have greater capacity to raise the visibility and awareness of population health as an interdisciplinary field to academics, funders, and policymakers [53]. The New York Academy of Medicine, devoted to improving the lives of disadvantaged and vulnerable populations living in cities, was a fitting home. The first directors of this external NPO were Boufford, president of The New York Academy of Medicine, and David Vlahov. When Vlahov stepped down in 2011 to begin a new position as dean of the School of Nursing at University of California, San Francisco (UCSF), Bachrach, of the Maryland Population Research Center, took his place. Boufford observes:
Lebeda moved from RWJF to The New York Academy of Medicine to continue as Deputy Director, easing the transition. “Gerard Lebeda has really provided the backbone for the program. He came with the program and helped us work through the trials and the challenges,” says Boufford.

The external NPO was able to steer the program toward one of its original goals, policy translation. Vlahov remembers, “Jo and I agreed when we first came on board there was very much of a research perspective that was research for the sake of research, more basic social science research. What we worked to infuse was ‘What are the policy implications of the work?’” [59]. He views this approach as largely successful: “People built that into the conversation, and people produced that in the output in terms of publications, conversations, linking with other people.”

The NPO also provided professional development support to facilitate alumni becoming leaders in the field of population health. In 2009/2010, it commissioned a study by the New York University Wagner Research Center for Leadership in Action to explore how to nurture program alumni as they became leaders in the field. The study found that most pre-tenure alumni had little time to focus on interdisciplinary research or activities aimed at building the field of population health [60]. However, in the years since, many alumni have been granted tenure and assumed leadership positions. Therefore, in the summer of 2015, HSS sponsored a leadership workshop for alumni from the first five cohorts. The activities reflected issues raised during a focus group held at the 2015 annual meeting and a pre-conference survey of those planning to attend. Sessions included topics such as Leadership Styles, Managing People, Mentoring, Time Management (including Clarifying Priorities, Finding Balance, and Getting Things Done), Leading Difficult Conversations, and Challenges in Advancing
Your Career in Population Health. Its primary objectives were to equip participants with the skills necessary to advance their careers as leaders within academic and nonacademic settings, the field of population health, and interdisciplinary scholarship and practice.

The shift to an external NPO was more costly than operating the NPO inside the Foundation, but Knickman feels that the greater amount of time that it could devote to the program made the cost worthwhile. “One lesson learned is that having that nurturing and caring and feeding function is not a bad investment,” he observes [33].

Recruitment of Scholars

The HSS program was open to individuals who had completed their doctoral training by the time of entry into the program [54,61]. It targeted PhDs, post-residency or fellowship MDs, RNs with PhDs, and JDs, although most scholars had PhDs or MD/PhDs [62]. Some debate occurred about whether the program should serve postdoctoral candidates or junior faculty. In practice, applicants were generally graduate students in their last year, postdocs, or junior faculty, and as time went on, the proportion of soon-to-graduate PhD student applicants grew. Among Cohort 1 applications, for example, only 33% of applicants were graduate students, but by Cohort 11, 64% were PhD students about to complete their degrees. Russo speculates that the high proportion of young faculty in the first years may reflect pent-up demand for the program, as no similar programs had existed when they graduated.

Discussion about the ideal career stage for scholars continued over the life of the program. Site evaluators noted some evidence that scholars who had completed their postdoctoral training before entering the program were able to use their time more productively [63], and some program faculty proposed actively recruiting scholars who had moved beyond the postdoctoral stage [64]. The Columbia site, for example, said they would prefer junior faculty rather than scholars who needed to spend a year finishing PhD work before starting on new projects [65]. Recent graduates were also attractive to some site faculty, however. Nancy Adler (Site Director, UCSFB) states:

*I’m a firm believer now that to train people to do transdisciplinary work, the postdoctoral period is probably the critical moment, because they come in with skills and a discipline they can share and then they can work to broaden that work with others [66].*

The program attracted researchers at various steps along the early career stage, allowing the NPO, the NAC, and site directors to select the scholars that best matched their criteria.
Unlike the other RWJF fellowship programs, which attracted applicants with relatively uniform backgrounds, HSS was designed to recruit scholars from diverse backgrounds. At a planning meeting in 2002, for example, the target disciplinary backgrounds included epidemiology, demography, anthropology, architecture, medicine, statistics, and history; biology and nutrition were later added as well [62]. By the last call for proposals, the program was inviting applications from “a variety of fields, including, but not limited to: behavioral and social sciences; biological and natural sciences; health professions; public policy; public health; history; demography; environmental sciences; urban planning; and engineering.”

The NPO invested significant resources in recruiting new scholars from diverse backgrounds. In 2011 and 2012, for example, it sent out roughly 31,000 brochures and call-for-application announcements and set up well-attended informational sessions at the Population Association of America annual meeting and the American Society of Health Economists convention [67]. Vlahov observes:

Getting a person from urban planning, that contributed a lot; getting people from the humanities, from the clinical sciences, and bringing them together—it was the diversity that was important to achieve, and that’s why I think the outreach strategies were important and, I think, successful [59].

Indeed, this outreach drew in applicants from pools that otherwise would probably not have been aware of the program, especially at the beginning. Both José Pagán (Cohort 1, Penn) and Allison Aiello (Cohort 1, Michigan) remember learning about the program from mailers [68,69].

All applications were submitted online in a centralized process. This online application system let the NPO keep track of applicant data, aiding the recruitment process. Information was collected on ethnic and racial diversity, gender, geographic characteristics, disciplines, and how applicants learned about the program [70]. Roughly half of the applicants learned about the program through a colleague, but the website and the sites themselves were also important modes of recruitment [70]. “Initially we had what we referred to as feeder universities, places that knew about the program and scholars who would come,” says Russo [11]. Indeed, 22% of Cohort 11 applicants received their graduate degrees from one of the six HSS sites, and earlier in the program this percentage was even higher (36% for Cohort 4, for example). She observes, however, “At last count,

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5. Data on the ethnicity/race of applicants were collected starting in 2005, and data on gender were collected starting in 2003. However, in 2008, as part of an overall policy change, the Foundation stopped gathering information on applicants’ ethnicity and gender.
we had people who had gotten their terminal degrees at over 100 different institutions across the nation.”

Initially, no one knew what the demand for the program would be. The first call for applications generated 150 responses for 18 spots, though, and with time, the number of applications grew. In the most recent round of applications, there were approximately 30 applicants for every available slot [11]. “What surprised me was the range and excellent preparation of a number of applicants to the program from the very outset,” says Harvey Fineberg (NAC Chair) [71].

In addition, the variety of applicants’ home disciplines and geographic origins increased. In Cohort 1, applicants came from 23 areas of study, with psychology (20%), sociology (15%), and medicine (11%) being the best-represented disciplines. By Cohort 11, applicants came from 33 disciplines, with sociology (24%), psychology (15%), epidemiology (9%), and public health (7%) being the most popular disciplines. By that point, disciplines such as engineering, math and computer science, kinesiology, and nursing were represented as well.

There were more physicians, there were more people from the neurobiological side, some from the hard science side, and so that was good. There were times when it seemed to be dominated by epidemiologists and sociologists, and I think we were pleased that it got to be more and more diverse in terms of discipline,

says Knickman [33]. Similarly, Cohort 6 applicants obtained degrees from 66 different schools, whereas Cohort 11 applicants received degrees from a total of 103 schools, indicating an increase in the breadth of universities from which candidates were drawn.

Of note, the racial and ethnic diversity of the applicants was greater than that of any other RWJF scholar program not explicitly targeted at minorities [31,72]. Russo notes that one of the things that came out of the initial collaborative planning process “was the focus on disparities and the importance of also attracting scholars who were coming from underrepresented or disadvantaged backgrounds” [31]. In the first 6 years of the program,
when data on gender were collected, 65%–75% of applicants were women, and in years 3 to 6 (for which race and ethnicity data are available), 39% of applicants were white, 15% black, 8% Asian, 7% Hispanic, 3% other, 1% multirace, and 27% did not answer. Russo believes that the program was especially successful in attracting diverse applicants due to a combination of the emphasis on health disparities and creating a welcoming environment for all:

> People saw a place where if that was their passion, they could come. And they saw faculty who either worked on disparities or were themselves [members of] a minority population, they saw a mentor they could identify with. And there was just a climate. ... [T]he sites and the faculty in those sites were going to promote you and not let that discriminatory attitude exist in their programs [31].

One reason the program was able to attract such a variety of talented applicants was the scholar salary and perks. The salary was set to match that of the RWJF Scholars in Health Policy Research program [73], ensuring that financial concerns would not prevent someone from applying to one program over the other or prevent individuals from better-paying fields (e.g., medicine, law, economics) from applying. In HSS’s first year, 2003, the salary was $65,000 [62]. By contrast, the National Institutes of Health (NIH) National Resource Service Award baseline stipend level in 2003 was $34,200 for a first-year postdoc. Over the course of the program, HSS stipend levels approached $90,000. In addition, unlike many postdoctoral programs, HSS offered faculty-level benefits, as well as research and travel funds, access to seed grant support, and a relocation reimbursement.

In short, the NPO put much effort into getting the word out about the program, and the prestige and benefits of the program made attracting applicants relatively easy. Even so, it seemed that almost everyone involved would have been happier with even more variety. At the close of the program, the Wisconsin site, for example, expressed a desire that the pool of eligible applicants had been more disciplinarily diverse [74]. Early in the program, several sites requested recruitment aimed at clinicians (MD/PhDs and MD/MPHs), and for a number of years the NPO consistently targeted recruiting efforts to applicants with nursing backgrounds [75]. Finding applicants with both clinical expertise and the requisite level of research training proved challenging. In addition, Jason Block (Cohort 5, Harvard) notes that the timing of the application process was difficult for physicians; to participate, young doctors typically needed to be accepted a full year ahead of time rather than that
spring before starting, which was the program’s standard timeline. A desire for more applicants from anthropology and public policy was also expressed by some sites [76,77].

“Maybe a little bit of surprise was the relatively small number of biological scientists who were attracted to the program,” observes Fineberg [71]. “I thought there might be some more of them.” This feeling was echoed by McGinnis [28] and some of the sites [76,77]. Ana Diez Roux (Site Director, Michigan) remembers:

Sometimes I did have the feeling that, when we were recruiting scholars, there was a lot of influence of sociology and psychology in the program. Sometimes that was kind of moving the program in a direction which was more about social sciences applied to health as opposed to a really broad health program in which we were talking to the biomedical world and practitioners and public health in the way that really had the capacity to transform—as opposed to a very sophisticated research-oriented, social science and health kind of program. That was a little bit tricky, I think [78].

The smaller number of applicants with biology backgrounds likely reflected the makeup of the site directors and core faculty, which tended toward the social sciences and public health (see section below on Site Director/Core Faculty Program Leadership). McGinnis notes that it took extra effort to involve researchers from biological and mathematical backgrounds [28]. As was stated at an early planning meeting, “There is not a lot to tempt a well-established biological scientist away from the paradigm. Only a small number of people have the curiosity to cross over to the social sciences” [24].

■ Selection Process

The NPO ran the initial eligibility assessment of applications for every cohort. Then, NPO and NAC members met to review candidates and select a list of finalists eligible for interviews [62]. For example, in the Cohort 11 round, 253 applications were received and the NPO/NAC selected 129 for review by the sites. Of the semifinalists selected by the NPO/NAC, Russo says, “there was a latitude and a range because they were really trying to get people to think out of the box, to change the questions asked” [31]. The sites then selected the applicants that they were interested in meeting (45 for Cohort 11), using on-site interviews to rank the interviewees that they would most like to become scholars. The interviewees, in turn, ranked the sites in order of preference, and the NPO and NAC finalized the matches [62]. Three scholars were assigned to each of the six sites every year.6

The role of the sites in selecting the scholars for each cohort was an important part of what made the program work. By seeing how applicants responded when interviewed by multiple people from different disciplines, sites could gauge potential “synergies and

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6. Except for two years (2011–2012, Cohorts 9 and 10) in which two scholars were assigned to each site because of budget cutbacks. The program then reverted back to three scholars per site per year for Cohorts 11 and 12.
matchings” for a given cohort [79]. Interviews also allowed faculty to identify “smart people who could survive in a program without coursework, go-getters, and people with interesting and novel perspectives.” Interestingly, the UCSFB site reported that they tended to select scholars who were not everyone’s first pick; faculty noted that the trajectory of the one person whom all the faculty liked was not changed by the program [80]. In addition, Dave Kindig (Site Director, Wisconsin) noted of his site, “We think it’s important to hand-select nice people, as well as smart people. Particularly in a model like ours, where we spend a lot of time together, it can make a huge difference” [34].

The onsite interviews also proved an excellent opportunity for applicants to network with other researchers interested in population health, whether or not they became scholars. Adler recalls:

> At the end of the first day, we’d always have a dinner at my house. There were two applicants, neither one of whom ended up being selected by the program, but they hit it off over dinner and developed a collaboration that went on despite the fact that they went to different places and were never in the program [81].

The interview process also helped foster cross-site relationships, as many future scholars got a chance to meet and talk with one another about their work.

How wide to cast the net was always a tension. On the one hand, the NPO/NAC made it a point to foster new and innovative thinking by including “wild cards,” scholars who were doing interesting and unusual research [31]. On the other hand, looking back, the Harvard site said, “Our biggest mistake can be summed up as ‘disciplinary overreach’” [82]. Asking scholars to stretch was one of the major goals of the program, but sites also had to ensure that scholars had enough in common with the faculty and other scholars to be able to successfully engage with them and obtain appropriate mentorship. Lisa Berkman (Site Director, Harvard) says:

> The composition of any one cohort was really important. People had to be different from each other, but if they were too different, it didn’t work. ... There was one year when we had both a historian and a molecular biologist. That just left too big of a gap. ... Having a cohort where people can actually relate to each other in terms of their disciplines, even though they’re different, is really important [83].

Thus, the sites had to carefully gauge which scholars could get the most out of the program while also enhancing the experience of the other scholars.

Determining whether a scholar could be successfully integrated into the program was not always an easy task. Although the stated goal of the program was to create population health scientists, not all scholars considered themselves scientists, for example. Some of the anthropologists in the program did not feel their research fell under the umbrella of population health science. In addition, the sites came to realize that the training horizon for certain disciplines, such as the lab sciences, was substantially longer; the difficulty of finding mentors for biologists and providing training in 2 (and in special circumstances, 3) years probably made some site directors wary of accepting scholars from these disciplines [74,82]. Sites also reported that clinicians without PhDs or MPHs were unprepared to conduct the level of research expected [82]. Fortunately, the selection process allowed sites
to use the knowledge they had accumulated over the years to select the scholars that would fit best, given their expectations and the constraints present.

Reflecting these tensions, the makeup of the scholars and alumni included an impressive array of disciplines, although a few core disciplines—sociology, public health/epidemiology, and psychology, in particular—were especially well represented (Figure 2).

Figure 2. Disciplines of the RWJF Health & Society Scholars.

Role of the National Advisory Committee

The NAC aided in scholar recruitment and selection, attended the program’s annual meeting, and played an advisory role to the program, visiting sites as part of the evaluation teams. Its most important function was to advise HSS and RWJF on how to make the program effective. McGinnis chose the first members of the NAC strategically, to increase RWJF’s confidence in what some at the Foundation saw as a risky new project:

The courage of the board—despite some internal doubts about the potential payoff for dealing with something that was engaging issues across society—was real. One of my strategies to counter that, to give them a higher level of comfort, and in fact to secure the position of the program, was to invite Harvey Fineberg to chair the NAC. He was a superb chair, former provost of Harvard, president of the IOM [Institute of Medicine], clearly lent credibility and intellectual guidance, intellectual heft to the potential of this newly birthed enterprise. Harold Shapiro, who was the president of Princeton University, I also invited to serve as a member of the NAC, again because of the prestige and credibility he brought [27].

These criteria—a combination of stature in the field and a willingness to roll up their sleeves and become part of the enterprise—were used to pick NAC members throughout the program. Boufford explains:
The NAC was selected as an interdisciplinary group at the top of their game. They have to represent people who are internationally recognized scholars in their fields or policy leaders in their fields or, in some instances, leaders of major philanthropic organizations or academic health centers, because the message that they give by associating with the program is that this is a space to watch, what these folks are doing is important, what these young scholars are learning is going to change the face of health and health care policy and programming nationally [55].

She observes that no one that the Foundation has approached to serve on the committee has ever turned down the opportunity. “These are incredibly busy people who have made a space for this program because they see it as really important to the future of our understanding of health.”

The NAC was most recently chaired by Jonathan Samet (Professor and Flora L. Thornton Chair for the Department of Preventive Medicine, University of Southern California), and through the years the NAC included many talented population health professionals, including individuals from RWJF (Table 1).

Of his decision to become the first NAC chair, Fineberg says:

I got a phone call from Risa Lavizzo-Mourey at RWJF and she explained about this new program that they were funding. First, I’m kind of a sucker for new things, so I loved that feature. Second, I really believed that the purpose of preparing a cadre of new leaders for health and society was a very laudable and important purpose [71].

Many of the other NAC members were similarly enthusiastic. Alonzo Plough, who was on the NAC for 8 years before moving to RWJF, remembers:

I really enjoyed it. I had started out my career as a university faculty member and moved into public health practice, and this was an opportunity to work with young scholars and mentor and fill that gap I missed from teaching and interacting with young minds. So it was always really a great opportunity to play that mentoring role and play a small part in the development of these great young minds [84].
James, a NAC member and former site director, says of his involvement with the program:

“It has put me in contact with kindred spirits who are younger than I am but who think about things in the way that I think about things, who want to break out of the silos and engage in conversation across disciplines. I’ve always wanted to have those kinds of conversations. So what this program has done, it has validated me in terms of “I’m not so different after all. There are other people out there who want to do this kind of work in the way that I want to do it.” It’s been wonderful in that way [9].

By identifying NAC members whose interests aligned closely with those of the program, HSS was able to benefit from their long-term commitment to share their expertise and enthusiasm.

Table 1. National Advisory Committee members of the RWJF Health & Society Scholars Program

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<th>Name</th>
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<td>Professor Emeritus of Epidemiology</td>
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<td>University of Washington</td>
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<td>Christine Bachrach</td>
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<td>Maryland Population Research Center</td>
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<td>Martha Bruce</td>
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<td>Weill Cornell Medical College</td>
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<td>P. Lindsay Chase-Lansdale</td>
<td>Frances Willard Professor of Human Development and Social Policy</td>
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<td>Northwestern University</td>
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<td>Robert Croyle</td>
<td>Director, Division of Cancer Control and Population Studies</td>
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<td>University of California, Los Angeles</td>
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<td>Harvey Fineberg (Chair 2003–2010)</td>
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<td>Gordon and Betty Moore Foundation</td>
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<td>Research Professor, Epidemiology and African American Studies</td>
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<td>Ruth Katz</td>
<td>Director, Health, Medicine and Society Program</td>
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<td>Vice President, Research-Evaluation-Learning</td>
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<td>Amelie Ramirez</td>
<td>Director, Institute for Health Promotion Research</td>
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<td>The University of Texas Health Science Center at San Antonio</td>
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<td>Jonathan M. Samet</td>
<td>Distinguished Professor and Flora L. Thornton Chair, Department of Preventive Medicine</td>
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<td>(Chair 2010–2016)</td>
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Over the course of the program, the role of NAC members expanded beyond strategic steering and applicant selection; members of the committee began to seek more involvement in mentoring scholars as well. The NPO sought to facilitate relationships that could work, given the constraints of NAC members’ busy schedules and the fact that they were often in different locations than their mentees [85,86]. Starting in fall 2013, the NPO decided, with the NAC’s input, to shift emphasis from individualized mentorship to attendance at the annual meeting. This provided a variety of opportunities for scholars and NAC members to meet, get acquainted, and—if both were interested and able—develop one-on-one relationships. Bachrach, Co-Director of the NPO at the time, explains:

*We emphasized NAC members attending the annual meeting and engaging with the scholars. We started the luncheon roundtables, and I think it made the NAC members more accessible [54].*
With these changes, NAC members had a much higher profile at the meetings, and it became easier for scholars to get to know them (For more on the luncheon roundtables, see the Annual Meeting section below).

Role of Annual Meetings and Scholars-Only Meetings

- **Annual Meeting**

   Every spring, HSS held an annual meeting at a different location. The purpose was to create cross-program esprit de corps and give scholars a forum to showcase their work [62]. It also provided an excellent forum for scholars, alumni, and faculty to network with other population health researchers. In addition, didactic programming on topics such as negotiation and communicating with the media was sometimes offered to help meet the needs of the scholars. Finally, the annual meeting was where each new cohort of scholars was initiated into the program before joining their site.

   One of the most important functions of the meeting was ensuring that scholars received feedback on their work, both from their peers and from senior scientists. Each year, the first-year scholars shared ongoing or planned research and received constructive criticism about how to improve their projects, and the second-year scholars made more formal presentations of developed work. “The first-year scholar sessions were always more informal, around a table, kind of like working sessions, and the ones for second-years were more plenary-like, so they could get more experience doing that,” says Lebeda, who planned the meetings [75]. The program also experimented with having second-year scholars present posters, but this option seemed unpopular, especially among scholars with a humanities orientation [65]. In particular, scholars were concerned that poster presenters
received less meaningful feedback than podium presenters, despite each poster being assigned to two faculty members not from the presenter’s site.

The content of the meeting also changed frequently, often in response to requests from the scholars and faculty. In some years, faculty and alumni gave presentations on their research; in other years, not. Meeting the needs of the continually changing group of scholars required frequent readjustment for different backgrounds and interests. For example, one year the scholars complained that the annual meeting focused too much on finding a job [87]. The next year, scholars requested that the meeting include more sessions on job hunting and expressed interest in information about careers outside academia [88].

Guest speakers and local participants were invited to the meetings to expose the scholars to groundbreaking work and views from outside the program. “These keynote and plenary speakers were also selected to provide networking opportunities for the attendees and become future contacts and collaborators. Careful consideration was made to vary the topics from year to year,” says Lebeda [75].

Throughout the program, scholars expressed a desire for more cross-site interaction [89]. The annual meeting was the venue at which much of this interaction happened. At dinner, tables were often assigned based on shared interests; this brought scholars, site directors, and faculty from different sites together, as well as NAC and NPO members. Dedicated networking time was also built into each meeting, to allow everyone to connect with each other in a nonformal setting. Finally, there was a scholars-only breakfast, which allowed

Examples of Annual Meeting Programming

- Luncheon roundtables on topics such as Engaging the Public, Becoming a Good Mentor, Gender and Minority Status in the Academy, Getting Tenure as an Interdisciplinary Scientist, Influencing Policy from Academia, Nonacademic Careers, Politics and Population Health, What Do Real Health Care Operating Environments Want from Research, and Work-Life Balance
- Professional development sessions, such as Population Health Funding at the NIH, Smoothing the Path to Publication—Perspectives of Two Journal Editors, Navigating Your Career When You Don’t Fit the Usual Mold, Media Training, Negotiation Skills, Introduction to General Leadership Skills, How to Make the Most of Your Next 2 Years, How to Be a Strong Research Mentor
- Policy-relevant sessions, such as How to Make Research Evidence Move Policy and Health Care Reform: Why It Matters to Population Health Research and Policy
- Scholars-only lunch and dinner with Sir Michael Marmot
- Presentation of scholar documentaries; an interview with Larry Adelman, Creator and Executive Producer of the documentary Unnatural Causes … Is Inequality Making Us Sick?
- Research-relevant sessions, such as Children’s Longitudinal Health Study Update
- Trips to local sites of interest: NIH, White House, Duke Lemur Center, National Museum of the American Indian
scholars from across the sites to meet together privately to discuss issues of common concern.

The location of the meetings changed every year, often in response to specific goals or concerns. For example, in 2010, the meeting was held in Washington, D.C., with the goal of fostering connections between scholars’ work and policy [59]. Vlahov, Co-Director of the NPO, remembers, “We had a visit to the White House. So we were talking about the science, but interweaving that with the policy arena, going back and forth on that. How do we bring science to policy and how does policy help shape some of the questions that we do?” [59]. At that meeting, White House officials gave talks on A National Urban Strategy, the Sustainable Communities Partnership presented by HUD, and The Let’s Move Initiative of the First Lady.

I’m always so excited to come to this meeting. It’s such an honor to be around such greatness in one place.

–Courtney Cogburn, Cohort 10, Harvard

Seeing the research that recent scholars are doing at the annual meeting, I just see the boundaries continue to be pushed. It’s really exciting.

–Allison Aiello, Cohort 1, Michigan

I always come away from the annual meeting filled with hope. What could be more hopeful than exciting, brilliant young minds working on cutting-edge issues?

–Alonzo Plough, RWJF and former NAC member

I’ve been to all but two of the annual meetings—one before I was part of the program, and one I missed because Wisconsin had their own meeting that year.

–Rich Carpiano, Cohort 2, Wisconsin

The annual meeting is very unique because there is so much exchange and discussion. It’s not just short presentations. ... You see a lot of questions and debate and not everyone agrees on everything, which is good, because it promotes critical thinking and new thinking about these problems we’re grappling with.

–Ana Diez Roux, Site Director, Michigan

This is one of my favorite meetings of the entire year. I really look forward to it, not just because it’s an opportunity to be exposed to cutting-edge population health research, but also because of the community. The ties and the networks that have developed so far will definitely continue.

–Meredith Barrett, Cohort 9, UCSFB

This is my intellectual recharge for the year. The network that has been created and my ability to network with scholars and faculty and the NAC has been tremendous. These are the smartest people I know.

–Pamela Russo, Senior Program Officer, RWJF

This last talk was presented by Valerie Jarrett, Senior Advisor to the President, who also gave the closing remarks. In addition, some sessions were held at the NIH, in collaboration with the National Institute on Minority Health and Health Disparities. In this way, meetings were used to create ties between the program (and the scholars) and local institutions and researchers.
Over the years, scholars consistently expressed a desire to connect with program alumni to seek advice about careers and performing interdisciplinary research in a disciplinary world [90,91]. Michelle Frisco (Cohort 1, Wisconsin) explains, “Enough of us got far enough along in our career that we could give tenure advice and talk about what it’s like to be in an interdisciplinary department” [92]. The NPO responded by bringing more alumni to the annual meeting. By covering travel and lodging costs, the program ensured that many alumni were able to remain active in the program over the years, moderating scholar presentations, offering feedback on their work, and participating in working sessions and breakout groups. Their presence meant stronger ties with both the current scholars and one another. A total of 55 alumni made the time to come to the 2015 annual meeting, signaling the value they assign this yearly gathering.

### Scholars-Only Meeting

The Scholars-Only meeting was a once-yearly gathering organized by the scholars themselves. This meeting served as a place for the scholars to collaborate and iron out problems, as well as a venue to obtain mentorship from other interdisciplinary scholars grappling with the same issues [93]. The impetus for this meeting came completely from the scholars.

I think the idea came early during our first month or so as scholars, following one of the weekly seminars. There was a sense that there would be interaction between the scholars, but the only mechanism for face-to-face connection was the annual meeting. ... The site directors were supportive of us pursuing the idea of a Scholars-Only meeting and using Wisconsin as a site,

recalls Dorothy Daley (Cohort 1, Wisconsin) [94]. Getting the other scholars on board was easy, she explains:

At the first annual meeting—with 18 scholars and all of the NAC members and site directors—it became apparent that we were guinea pigs. Would we be too unusual for disciplines to hire? My sense is that people thought that was a possible outcome. ... All of the scholars recognized quickly that we had to invest in our network. Moreover, it was obvious from the annual meeting that interesting colleagues were at the other sites. We wanted to get to know each other free from the pressure of senior colleagues present.

Frisco, who also organized that first meeting, explains, “You meet so many cool people when you interview, and you want to stay in touch with those people, but they end up at
other sites. So that was part of the impetus too” [92]. Although scholars could not use Foundation funds to hold the meeting, travel funds could be used to attend. And traditionally, responsibility for planning the meetings rotated among the sites.

These meetings included a diverse array of activities tailored to the interests of each cohort’s scholars. Although much of the meeting tended to center around collaboration and skill building, other important conversations arose in an environment in which scholars felt comfortable. At the second Scholars-Only meeting, for example, a conversation about diversity within the program started and continued at the annual meeting [95]. In this way, scholars were able to make their concerns known to one another and to the program, and to develop solutions together. Scholars also mentored one another, with those further along in their career path providing invaluable advice to more junior scholars. Molly Martin (Cohort 1, Columbia) recalls,

> When I started the program, I had finished my PhD weeks before. I knew nothing. One thing that might sometimes get overlooked is the value of scholars to other scholars in creating networks, giving advice about becoming a cross-disciplinary professional. I learned a lot just by being around senior scholars [96].

One drawback of the Scholars-Only meeting was the immense amount of scholars’ time that organizing it took [88]. Depending on a site’s enthusiasm for the meeting, more or less administrative support was provided to assist in planning. For this reason, scholars thought infrastructure support, perhaps from the NPO, would have been helpful. The responsibility of planning the meeting was often mentioned as an opportunity to develop and demonstrate leadership skills, however. In addition, the utility of the meeting was greater for scholars from popular disciplines; scholars from outlier disciplines had fewer opportunities to find collaborators and mentors, and tended to find the meetings less helpful. Thus, although the meetings allowed many scholars to cultivate relationships with colleagues in other disciplines, especially disciplines within the social sciences, it proved more difficult to build bridges between more distant disciplines.

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**Examples of Scholars-Only Meeting Programming**

- “Speed dating” to identify potential collaborators
- Research discussions: *Health Over the Life Course, Inequality and Stratification, Cultural Influences and Individual Decision-Making*
- Professional development sessions: *Myers-Briggs Exercise, Crossing Disciplinary Boundaries and Negotiation, Early Career Grant Writing, Nurturing RWJF Network Connections*
- Panels on *Research and Collaboration and Career Strategies*
- Discussions of gender, race, class, and disciplinary diversity in the program
- Visits from helpful alumni
- Group receptions and meals for networking

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The Scholars-Only meeting was an important component of the strong HSS alumni network that developed. “The scholars really became a social network, amazingly working
a lot together even when they weren’t at the same university. That whole notion of the interplay of the scholars across sites was something that we hadn’t thought of,” says Knickman [33].

Program Sites

Program Location in the University

Initially, a lively debate ensued about where to house the program. One participant in an early planning meeting advocated siting the program in schools of public health because “the social sciences don’t consider health a legitimate outcome” [24]. Another said:

Do not put this program in schools of public health! Probably some kind of population health center within the university is the best strategy. Or better yet, create “Schools of Health” à la Kerr White, like the Rockefeller Foundation created schools of public health.

Some participants questioned situating the program in a university setting at all:

The university is dysfunctional and cannot adequately support such an endeavor. The model of free-standing collections of investigators collected around large population health questions (e.g., the Canadian Institute of Advanced Research or the MacArthur network model) is the only way to do this.

Ultimately, of course, the sites were placed within universities, but some of these initial concerns were addressed by the novel way in which the sites were planned.

All of the sites spanned multiple departments in their universities, but some also bridged schools or even institutions. For example, the Columbia site encompassed both the uptown Public Health campus and the downtown School of Arts and Sciences. This was a groundbreaking development, because traditionally the two campuses operated almost independently. Diez Roux, who was a faculty member at Columbia before becoming a site director at Michigan, explains:

To me, the program at Columbia was an incredible opportunity to bring together all these things that I was interested in and that hadn’t really come together at Columbia before: partnerships with the social science folks at the downtown campus and the public health people and the medical people. That was really exciting [97].

The program “had these people who were separated by a couple subway stops, but it really brought them together, and it brought all of us together, around our common interests,” agrees Patrick Sharkey (Cohort 5, Columbia). Although half of the scholars had offices uptown and half had offices downtown, there were few complaints about site cohesiveness once the program was underway.

The Harvard site also spanned two campuses (Longwood and Cambridge) and four schools: the T.H. Chan School of Public Health, the Kennedy School of Government, the Medical School, and the Faculty of Arts and Sciences [98]. Seminar series alternated between the two campuses to encourage participation from both sites [74]. Although the participation of faculty from both campuses was unquestionably beneficial, scholars at
Harvard did note logistic and bureaucratic obstacles at times. Originally, their offices were located on the Longwood campus, and they found it inconvenient not to have a place to call “home” at the Cambridge campus, where they spent a lot of time meeting with faculty and conducting research [99]. The program responded by providing a new home for them in the Center for Population and Development Studies on the Cambridge campus [100].

The UCSFB site spanned two entire universities. Adler, one of the site directors, remembers the genesis of the site application:

The School of Public Health is over at Berkeley on an arts and sciences campus. So there’s been a lot of discussion over the years of “How can we best work together? Should we try and merge? What should we do about the fact that UCSF really should have a school of public health?” This seemed like a good opportunity to do something jointly. So all those things converged to pique our interest in going for this [81].

In the end, UCSFB believed the dual-university setup was the most important feature of their program, exposing scholars to the cultures of both an arts and sciences campus and a graduate health sciences campus [74]. Initially, they feared that it would be easy for scholars to disappear in this arrangement, so there were strict rules about scholar presence and mentoring. Eventually the site directors found these rules to be largely unnecessary and made them less rigid. For many years, scholars did complain about administrative problems that resulted from the split between the two universities [101], which illustrates the effort needed to overcome bureaucratic issues associated with novel combinations such as this one. Nevertheless, some of the inconveniences associated with the cross-school arrangement may have actually contributed to participants’ commitment. Adler notes:

We have a particular challenge because of the bridge. Berkeley is not a hop, skip, and a jump—it’s a ways to get there. The biggest problem really was keeping the level of excitement and engagement. It really had to be compelling enough that people were willing to drive over the bridge—that’s the bottom line. And it was. Partly because of personal relationships, partly because of intellectual challenges that were exciting to us [81].

The other sites, although they did not physically span different campuses, drew core faculty from many different locations within their universities. Thus, one universal challenge was ensuring that scholars had office space together and plenty of opportunity to spend time together. In addition to the formal interactions that took place in program activities, informal interactions both inside and outside of work helped scholars develop the comfort
level to cross disciplinary bounds [102]. “The cohort effect of both having other scholars working with me, but more important the faculty involved, was really important. The ability to see them in person on a regular basis [and] to also see them weave this work into their work,” was key, says Doug Jutte (Cohort 1, UCSFB). Meredith Barrett (Cohort 9, UCSFB) credits this proximity for a collaboration that has endured to the present day:

I think it was the fifth day of the program in our office at Berkeley, and Olivier Humblet and I sat down in our little office and said, “Well, it is the spirit of the program to work together across disciplines, so we should do that.” And since then, we’ve been able to develop a really great collaborative relationship. He’s an environmental epidemiologist and I’m an ecologist, so we’ve been able to bring together our different methods and experience and tackle these data and problems from many different angles [103].

Adler observes, “Our scholars were very affected by each other, and one of the things that I am proudest of is not only the individual scholars but the teams of scholars who are still working together years after they completed the fellowship” [66].

### Site Director/Core Faculty Program Leadership

The site directors (Table 2) were essential to the success of HSS. Each site had multiple directors, and the site directors’ skills and training tended to be complementary, modeling interdisciplinary collaboration. In addition, site directors tended to be senior faculty members who already occupied leadership roles at their universities, roles that usually emphasized interdisciplinary work. This ensured that the connections needed to keep the program running smoothly were in place. David Asch (Site Director, Penn) explains:

At the time [of the program], I was director of the Leonard Davis Institute of Health Economics at Penn, which is very centrally located at the university, geographically but also intellectually. It was basically an institute about the organization, delivery, financing, management, health care, and social forces that affect health. ... That entity already existed to help facilitate connections of the very kind that we would need for the HSS program [104].

Similarly, Kindig remembers, “Given the fact that we were in our Department of Population Health Sciences, right there physically we had epidemiology and economics and health services” [34]. To make sure that site directors were truly invested in the program, at least one was required to spend 30% effort or more on HSS, or two were required to spend at least 25% effort each [62].
Although there was some turnover among site directors, the site leadership was remarkably stable. This was in large part because the site directors were passionate about the goals of the program and valued working with others with the same interests. As Berkman says:

> It was really fulfilling. I never thought about stopping. ... As time has gone on, of course, this has grown to be an activity that encompasses not only the fellows, who are the most amazing, fabulous, creative, innovative people who come from far and wide to work in this area, but it’s also permeated our work and pushed it further and introduced us to a set of colleagues whom we work with to this day [10].

Indeed, it allowed many site directors to pursue an agenda that had long been close to their own hearts. Adler says:

> The program itself was doing all the right things, the things that I’ve advocated for many years. So it was a vehicle for advancing that. Particularly at UCSF, which is a highly biomedical environment, it provided much more focus on the social and behavioral issues [81].

Site directors also found that participation in the program helped them grow as scholars. Asch says:

> I got a lot out of it because I don’t think by anybody’s stretch of the imagination I was an expert in the social determinants of health. I did mostly health services research beforehand. It was like a 10-year sabbatical for me. It was incredibly mind expanding. I learned a ton and helped redefine myself [104].

Although the financial support that RWJF offered site directors was very important, giving them the time and freedom to fully participate in the program, the alignment of their goals with those of the program allowed them to remain fully invested for years without feeling burnt out.
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<th><strong>Table 2. Site directors of the RWJF Health &amp; Society Scholars program</strong></th>
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<td><strong>Columbia</strong></td>
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<td>Peter Bearman</td>
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<td>Julien Teitler</td>
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<td><strong>Harvard</strong></td>
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<td>Lisa Berkman</td>
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<td>Ichiro Kawachi</td>
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<td><strong>Michigan</strong></td>
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<td>Ana Diez Roux</td>
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### Penn

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<td>Robert Aronowitz</td>
<td>Professor and Chair of History and Sociology of Science Professor of Family Medicine and Community Health</td>
</tr>
<tr>
<td>David Asch</td>
<td>John Morgan Professor Professor of Medicine Professor of Medical Ethics and Health Policy Professor of Health Care Management Professor of Operations, Information and Decisions</td>
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<tr>
<td>Jason Schnittker</td>
<td>Professor of Sociology</td>
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### UCSFB

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<tr>
<td>Nancy Adler</td>
<td>Professor of Psychiatry, UCSF</td>
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<tr>
<td>Ralph Catalano</td>
<td>Professor of Public Health, Berkeley</td>
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<tr>
<td>Robert A. Hiatt</td>
<td>Professor and Chair of Epidemiology and Biostatistics, UCSF</td>
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<tr>
<td>Barbara Laraia</td>
<td>Professor of Community Health Sciences, Berkeley</td>
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<tr>
<td>W. Thomas Boyce</td>
<td>Professor of Pediatrics and Psychiatry, UCSF</td>
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### Wisconsin

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<tr>
<td>David Kindig</td>
<td>Emeritus Professor of Population Health Sciences, Emeritus Vice-Chancellor for Health Sciences</td>
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<tr>
<td>John Mullahy</td>
<td>Professor of Health Economics in the Department of Population Health Sciences Affiliate Professor at the La Follette School of Public Affairs</td>
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<tr>
<td>Stephanie Robert</td>
<td>Professor and Director, School of Social Work</td>
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The disciplines represented by all site directors can be seen in Figure 3. Sociology, public health/epidemiology, and psychology were the best-represented disciplines, as was true for the scholars. However, other disciplines, such as policy, history, and social work were also included. “I like to think that my being slightly outside of the field probably added some intellectual diversity to the program, but I got at least as much out of it,” says Asch, whose background was in medicine [104].

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7. Assigning disciplines to HSS site directors and core faculty members was often inexact, as their work frequently crossed disciplinary boundaries. Here, each individual’s primary discipline was analyzed.
Figure 3. Disciplines of the HSS site directors, 2015.

In addition to the site directors, the core faculty at each site played an important role in shaping the program. The Harvard site, for example, believed that its success owed a great deal to the outstanding individuals recruited to serve as program faculty; these faculty represented social policy, history, and economics, among other disciplines [74]. The distribution of disciplines among both the site directors and the core faculty at each site can be seen in Figure 4. Wisconsin was unique in not having a strong public health/epidemiology focus (instead focusing on health policy and economics), and UCSFB was unique in not having a strong sociology focus. Psychology was a common thread at all sites. As is evident from the charts, although the research-to-policy pipeline was an important focus of the program, individuals with backgrounds primarily in policy were relatively rare among the site directors and core faculty.
The site directors reported that recruiting core faculty for the program was a relatively easy process. At UCSFB, Adler reports:

We had sort of a mini-retreat of faculty from UCSF and Berkeley at the faculty club at Berkeley. And we said, all right, let’s take a problem that would really require input from a wide range of disciplines that would underlie a population health approach. We hit upon the problem of obesity, which is multidetermined and a critical problem, and what was interesting to us was that we all got excited about this and realized that there was not a single person sitting around the table who actually did work on obesity. ... We came up with this idea that we’ve got bookends. We’ve got public health as one bookend and academic medicine as the other bookend. How would we fill in the volumes on population health in between? That was an intellectual challenge to all of us. That was the basis of this ongoing series of meetings, and we recruited the core faculty really by who showed up for those meetings and was excited by the challenge [81].

Once the program was underway, one strategy to attract new participants was to engage faculty in HSS-related activities, such as asking them to attend program seminars as a guest.
for a year, join a working group, or review applications and interview applicants. The competition for seed funds (see section below on Research and Training Funds) was also a draw to the program. However, directors universally agreed that the scholars were the best way to draw in new faculty. Adler explains:

> Once the program got started, the way we attracted new faculty were the scholars. Because they were so spectacular that if they had an interest that was outside the core faculty or even the extended faculty, if they would go meet with somebody and ended up doing work with them, we then would end up saying “Hey, you’re part of our faculty.” We expanded that way [81].

The relationships between faculty members that were forged by jointly mentoring scholars were durable ones. Asch says:

> The best way to connect established faculty from different disciplines is not to have them work together but to have someone like a scholar who is working with both of them. Because scholars are incredible connectors... [t]hey move projects forward, they bring out nurturing instincts that faculty members want to have. ... That’s what creates lasting relationships between someone from economics and someone from sociology [104].

Conversely, it sometimes proved difficult for the program to maintain ties with faculty who did not mentor scholars. Berkman observes, “People who had fellows, where they were mentors and it was really clear this was a productive relationship, they did really well. People who never had fellows, that became harder” [83].

Some sites found that junior faculty were easier to engage than more senior faculty. Columbia regretted initially recruiting senior professors as faculty collaborators. They found that they “were too busy to engage fully, less likely to be open to new ways of thinking, and less excited by the benefits that the program could provide” [74]. Similarly, Harvard found that approaching junior members of the Faculty of Arts and Sciences worked better than trying to engage senior faculty who did not have the time to commit to a core role [105].

Notably, HSS succeeded in attracting a number of leaders in the field of social epidemiology to the program, as both site directors and faculty. Not surprisingly, scholars
and faculty made important contributions to this field. However, because many of the site directors’ interests gravitated toward the social determinants of health, it was important for the Foundation and the NPO to emphasize the other determinants of health.

A lot of [the site directors] were inclined to the social sciences, but I kept emphasizing that it needs to be balanced, the social and medical and biological and physical sciences. It started off with a little more focus on the social sciences than I had initially envisioned. The importance was not downplaying the social sciences but making sure the biological and physical sciences got enough emphasis,

explains McGinnis [28]. The Wisconsin and Penn sites were exceptional in their emphasis on the nonsocial determinants of health, such as medical care.

The lack of biologists among site directors and core faculty was also striking, given the importance of biology as one of the core domains in population health. Mark Wilson (Site Director, Michigan) was the only site director or core faculty member with a biological sciences background. Over the years, site visitors brought up the weakness of the biology domain and suggested that sites add biology faculty to steering committees or form new connections to strengthen this area [106]. They believed that Harvard and UCSFB did the best job at integrating biology with the other determinants of health [90,107]. The Harvard site, for example, made special efforts to collaborate with medical school faculty [91].

- Faculty: Disciplines, Engagement of Non-Core Faculty

Over time, all of the sites made concerted efforts to reach out to faculty in different disciplines and schools, and their efforts were rewarded (Figure 5). At each site, dense networks connecting departments, schools, and even institutions sprang up. Harvard, for example, formed relationships with the Business School, the Law School, and the Graduate School of Design [74]. UCSFB did an excellent job of reaching beyond the university to enlist research partners such as Kaiser Permanente and the Rand Corporation, government health agencies, and local nongovernmental organizations [86]. Wisconsin forged links with numerous practice partners, including the Dane County public health department, the Wisconsin Department of Health Services, and the City of Milwaukee. Indeed, by 2013, approximately 470 members were involved with the six sites, with each site encompassing from 28 to 127 faculty [25].

Although each site worked hard to expand the disciplines represented, scholars sometimes requested a greater emphasis on integrating faculty from less-represented disciplines. At Michigan, for example, scholars noted one year that all core faculty were involved in social epidemiology [63], despite the wide range of faculty connected to the program in a less-involved capacity [108]. Scholars at Harvard noted at one site visit that they would have liked to see more connection to the law school [100]. Sites typically tried to respond to scholars’ needs and interests by attracting new faculty into the program. For example, when one cohort of scholars at Columbia included two medical anthropologists who felt a bit isolated, the site directors invited an anthropologist, Kim Hopper, to join the seminar, and took care to invite speakers from this discipline. Given the sites’ success in building new connections over the length of the program, it seems probable that even more interdisciplinary relationships would have formed given enough time.
Figure 5. Expansion of HSS networks between 2002 and 2016 at two representative sites.

Mentoring

The HSS program was developed because the current academic training did not prepare or reward scientists for conducting research that integrated “traditional biological understanding of health and disease with a wide range of disciplinary perspectives, constructs, and methods” [24]. Interdisciplinary training was seen as risky, however, especially for scholars who intended to remain in academia. One individual at a planning meeting opined, “I would never encourage a promising graduate student to go into this area, even in the policy zone” [24]. Therefore, mentorship on how to navigate the challenges of this new field was a core component of the program.

In addition, an important goal of the program was to develop independent researchers. Thus, the HSS model of mentorship differed dramatically from the traditional postdoc model, in which mentees gain experience by serving as extra hands to carry out their research. 

We created an intellectual context that allowed risk taking, demanded rigor, and was fun and funny. It was a great mix.

—Bruce Link
mentors’ research agenda. The challenge, then, was to find mentors dedicated to both nurturing a junior scholar’s career in a new and challenging area of research and strengthening that scholar’s independence.

The primary role of mentors was to ensure that scholars were able to use their time productively, to stretch to try out new approaches and methodologies in population health, and to remain appealing enough to future employers that they could find a job in which they could put their talents to use. In service to these goals, each site planned for every scholar to have at least two mentors [73]. James explains:

*We at Michigan wanted each scholar to have two mentors, one in the scholar’s own discipline, and then a mentor outside of the area of training. We set that up quite strategically so that each scholar would come away with a working knowledge of another discipline, because of intense intellectual engagement with a more senior individual outside the discipline in which that person was trained. I think that that was really very successful [9].*

Indeed, this thinking motivated most of the sites’ mentorship policies. UCSFB asked each scholar to identify two faculty members—one research mentor and one career mentor—from the program faculty list; scholars could also bring in outside faculty as mentors, as long as at least one RWJF affiliate faculty was a mentor [109]. Having a separate career mentor helped avoid the potential conflicts of interest that might arise from relying on a research mentor who must simultaneously protect their own research interests and advise trainees. Similarly, Columbia relied on a system in which mentoring took place primarily through “collaboration on shared projects such as working groups or research studies,” supplemented with guidance from the site directors on career and research development issues, such as how to negotiate the job market [110].

*Having strong mentorship can make a difference in not only exposing mentees to appropriate resources, knowledge, and models of success, but also in helping mentees develop a strong sense of research self-efficacy, confidence in their abilities, and desire to develop others to move a field forward.*

—Stephanie Robert

Wisconsin originally planned for every scholar to have both a research mentor and a practice mentor, but the site quickly abandoned the practice mentor requirement when it became clear that it was not helpful for all scholars. “That just wasn’t appropriate for everybody, and that wasn’t a problem. We adapted to that,” says Kindig [34]. Instead, the site directors focused on helping scholars determine how to balance old projects with new ones, which faculty to approach to expand the scope of their research, and which resources on campus would be helpful [111]. Facilitating exposure to policymakers, and supporting knowledge exchange projects for scholars with special interests in policy and practice, were also important parts of the mentoring provided there, however, and practice mentors were assigned to scholars interested in the translation of research to policy.

Having multiple mentors was a critical part of producing interdisciplinary scholars, but it also presented a challenge. With multiple mentors, who is incentivized to be responsible for a trainee [102]? Especially when mentors may not directly benefit from having scholars work on their projects, as in the traditional model of mentorship, this question becomes
important. Over the years, the NPO pushed for more formal mentoring policies at the sites, focusing on the need for good communication between mentors [73]. They emphasized that, given the multiple mentors for each scholar, a coordinated team approach was necessary.

Considering the scholars’ intense desire for mentoring, this concern was probably well placed. At some site visits, scholars said that they would like to have had more formal meetings with site directors to discuss career plans, rather than having such meetings rely on the scholars’ initiative [88]. Over the course of the program, several sites responded by adding more structure to the mentoring process. For example, UCSFB employed a learning contract that became more explicit as the years went by. Scholars there were told not to make any research commitments during their first 3 months in the program, to ensure that they had time to learn about the resources available [86]. They then submitted all project ideas to their career mentor for initial review and together mapped out projects to determine their feasibility [85]. Mentors used conversations about the contract to make sure that scholars were stretching while prioritizing their goals [112]. The site directors also asked scholars to meet the following benchmarks: submitting at least one paper for publication based on new research, being involved in one or more jointly authored papers, presenting at professional meetings of both the scholar’s own discipline and an outside discipline, and developing a grant proposal to be submitted for funding [109]. Harvard also moved toward employing more structure in the mentoring process. “There were some people who weren’t being as productive as they might. They were having a hard time finishing projects, that kind of thing,” says Berkman [83]. “I think people really needed some help—saying ‘This is our expectation for you the first year, to write these papers or some set of papers, and in the second year, let’s think about this’—and not give them quite so much open space.”

As discussed, ensuring that scholars were able to obtain jobs was a major concern from the beginning of the program [31]. Early on, there seemed to be broad consensus that the demand in academia for interdisciplinary scientists who had not maintained strong ties to their home disciplines was virtually nonexistent [24]. UCSFB explains the problem:

The organization of universities creates difficulties for interdisciplinary scholars to find positions upon completing the program. We worried a good deal about “ruining” an outstanding scholar in their field who might look odd to departments in their discipline [74].

Bob Kaplan (Director, Office of Behavioral and Social Sciences Research, NIH) likens this to a situation in which “you can’t win a dog show with a mutt,” despite all the evidence that mutts are better dogs [113], and notes that in the Survey of Earned Doctorates, students graduating from interdisciplinary programs had the lowest salaries of any social scientists. In addition, some researchers believe that a discipline is needed to ensure proper evaluation of appointments and promotions [114], although this may be less true as time goes on and interdisciplinary research becomes increasingly accepted. One approach to ensuring...
employability was mentorship that protected and strengthened disciplinary ties while simultaneously encouraging interdisciplinary scholarship. One participant at a planning meeting said, “The aim of the HSS program should be to enrich scholars’ abilities within their own discipline by learning two ‘second languages’ well enough to converse in those languages and to serve as translators from one discipline to another” [24]. In this model, scholars are trained to bring back a population health approach to their own discipline [115].

The sites approached the problem of employability in different ways. Harvard, sensitive to the “real constraints in academia as it is currently structured,” tried to help scholars remain appealing to their home disciplines [74], while at the same time telling them “the idea is to be a different person when you leave” [105]. It described its approach to mentoring this way:

We strive to match each scholar with at least two mentors—one from [his or her] home discipline, and a second from a stretch discipline who will help them to achieve the consilience of theories and methods across different disciplines, which is the hallmark of our training philosophy. To give a concrete example from a recent cohort, when a scholar trained in epidemiology/public health (Summer Hawkins) was matched to an economist from the Harvard Kennedy School (Amitabh Chandra), she learned to arbitrage the techniques of econometrics (e.g., difference-in-difference estimation, instrumental variables analysis) to interrogate her data. The result was a novel and hybrid type of research that brings new insight to old questions [98].

Similarly, the role of the home discipline mentor assigned at the Michigan site was to help scholars navigate the “challenges associated with building an interdisciplinary career” [73]. Of this strategy, James observes:

Many of the scholars will hold on to their professional identity for the discipline in which they were trained, and depending upon where they are, they will call themselves economists, or sociologists, or psychologists. But then in other kinds of venues, when they really need to be thinking in broader terms and engaging in conversations with other disciplines, I think they will have a facility to engage in a conversation that they would not have had before [9].

Columbia, an outlier on this subject, advised scholars: “Don’t think about tenure—take risks. Do exciting things, branch out, learn new things” [79].

For their part, site evaluators expressed concern about scholars whose work they felt covered too much ground, indicating a lack of focus and a need for better mentoring [116]. And the concern of site directors, scholars, and site visitors seems to have been warranted: Some scholars who stretched too far (between basic biology and population health science, for example) experienced trouble obtaining employment later [105].
Not surprisingly, there was continuing tension around how far scholars should stretch, especially in a 2-year program [31]. To help address the problem of time, the program offered a competitive 1-year extension to several cohorts. However, many scholars remained reluctant to stray too far from their home disciplines, which concerned RWJF given the stated goals of the program. For example, after a visit to one site in 2004, evaluators stated, “It is unclear how much the scholars are really stretching themselves—[they] seem hesitant to take risks because of career uncertainty” [117]. At another site, they had similar concerns about the scholars, who were working with people very close to their original discipline and interests and “expressed significant concerns with career development issues and how they will do on the job market with their credential in population health” [118]. The situation at a third site was very similar:

Site directors perceived that scholars further along in their careers seemed less anxious about employment and were thus more free to explore other disciplines [119].

Given the importance of mentorship in this program, it quickly became clear that finding the right mentor was essential to a scholar’s success [9]. In particular, when available faculty and trainees had completely different backgrounds, it could pose a problem [102]. Looking back, Harvard observed:

Sites were sometimes unable to offer scholars mentors from their home disciplines when those disciplines were not well represented in the program. This challenge arose for scholars with training in biology, anthropology, economics, history, and even psychology [91,93,105,120]. For example, scholars reported that mentorship on getting ahead in biological disciplines was “a struggle” [121]. James observes:

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*This is very hands on. It’s as intense as overseeing the development of a doctoral student—it is that intense. One shouldn’t enter into this without knowing that it’s going to require a real time commitment and a quality time commitment.*

—Sherman James

*The scholars do not seem to be branching out very much in terms of disciplines. Each scholar has a primary mentor who is from his or her discipline and seems to be doing research similar to what they have done in the past. ... The scholars are clearly concerned about career development [89].*

*As time has gone by, we have honed our capabilities at matching candidates to mentors. We now know that if we can’t make an excellent match between a candidate and a mentor, then we shouldn’t select the candidate. We also learned the importance of ensuring that every scholar had a core faculty member as a mentor [74].*

*Being paired with a mentor who understands the language and the assumptions of what biological science is about but who also understands what population-level work is, taking into account biological factors... having the right mentor in that circumstance is really, really important [9].*
Site visitors noted that the lack of a mentor in the home discipline could handicap scholars in terms of disciplinary professional socialization [105]. This suggests that a good strategy for scholars with special mentoring requirements, such as those in the biological sciences, is to choose a site primarily for the presence of suitable mentors [86,122].

Given the program’s reliance on intensive mentoring, it was essential that faculty received adequate, long-term support for this role. Stephanie Robert (Site Director, Wisconsin) says, “Strong human capital programs cannot skimp on providing mentors who have time and desire to mentor” [123]. Indeed, UCSFB emphasizes that the mentoring process continues long after scholars leave the program [74]. Interdisciplinary scholars have reported that the transition to a faculty position is not always smooth and that with so many interests, it may not be clear what their trajectory is [124]. The directors at the Penn site report that alumni have returned for mentoring on subjects such as time management skills, getting writing done, job negotiation, and even retirement planning and personal finance [125]. The strong and lasting bonds forged at the sites were exemplified by a 2010 reunion held for Wisconsin alumni—all but two former scholars, who had prior engagements, came at their own expense [126].

- Program Structure at the Sites

Each of the six sites shared both an overarching goal—training future leaders in population health—and core program elements, including a seminar in population health and a focus on population health research. However, over time, each site developed unique aims and, as a result, different approaches to support those aims. The sites were also generally very responsive to scholar input, especially toward the beginning of the program. Martin remembers that when the scholars suggested changes to the Columbia program’s structure, the site directors “never acted at all offended or begrudged the work they had put into it. It was: ‘Let’s make this better, we want you to learn more, how can we get there? You figure it out, but we support you wanting to learn and have a more interesting experience. Let’s keep going, let’s keep improving’” [96].

- Orientation

Every year, new scholars were welcomed to the program with an orientation at the annual meeting. They were inducted at the beginning of the meeting and could then spend the rest of the time getting to know the faculty and scholars at their own sites and at other sites. In addition, the opportunity to see scholar presentations helped introduce them to the types of research being conducted in the program and the resources available.

In addition, the Wisconsin site had its own formal orientation program. Each new year at this site began with a 2-day HSS boot camp for all site directors and scholars, allowing everyone to introduce themselves, their backgrounds, and their interests to one another [74]. Different outside faculty were also invited to participate in every boot camp. Each

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*We designed every aspect of our program to facilitate scholars’ ability to enact their creative ideas—the seminars, working groups, short courses, newsletter—everything was designed to support projects that came from scholars’ ideas.*

—Bruce Link
participant was asked to bring in a “great article” on population health and an example of their own population health work [120]. This orientation consisted of 8-hour days of presentations and discussions [120], and the site felt that it was “an enormously successful vehicle for making new scholars feel comfortable as part of our HSS community” [74].

Although other sites did not provide this type of formal orientation, faculty were often in contact with scholars before their arrival, especially as the program matured, ensuring that scholars would be able to “hit the ground running” [126].

### Curriculum

From the early planning stages, most of the site directors and program advisors felt that didactic classroom coursework in the program should be kept to a minimum. Essentially, a seminar would provide the curriculum at most sites, broadening scholars’ intellectual perspectives and improving their ability to communicate with colleagues from other disciplines [62]. All sites reported using seminars to learn to speak a common language [74] and to nurture the collaborative skills needed to conduct interdisciplinary research.

What the curriculum should entail was a matter of debate, however. Researchers weighing in on this subject at one of the first planning meetings questioned whether a core set of skills in population health even existed [24]; possible subject matter included human ecology, social history, networks, the history of science, social epidemiology, sociology, economics, and political science [24]. At a later meeting, the core subject areas were identified as (a) social and environmental approaches, (b) behavioral approaches, (c) biological approaches, (d) developmental life course approaches, and (e) intervention sciences [73]. In addition, a detailed list of core readings in population health was compiled. Other debates included whether a theme-based approach was more desirable than learning a set of predefined skills, whether structured coursework was more helpful than mentoring relationships with senior scientists, and how much emphasis the ends of the population health continuum (e.g., basic research and applied research) should receive [24].

In the end, the sites developed their own curricula with the support of the NPO, the NAC, and one another, and the results differed dramatically. With regard to formal coursework, Michigan occupied one end of the continuum, with the most well-developed, time-intensive curriculum. Its *Foundations of Population Health* course focused on three areas: the social determinants of health, the biomedical determinants of health, and intervention
and application translation [127]. Although some Michigan scholars initially had reservations about the amount of coursework required, they reported to site visitors that the diversity of backgrounds represented by the trainees (including some from outside HSS) contributed to a comprehensive and common grounding in population health [76]. Nevertheless, over time the site directors cut back on some of the readings to reduce the amount of time that scholars needed to spend on the course [63].

Some of the more recent topics covered in the 13-week course included:

- *The Nature and Theory of Intervention and Policy*
- *Biological Pathways and Mechanisms Linking Psychosocial Factors to Health and Disease*
- *Introduction to Constructing Population Health Problems and Policy Prescriptions*
- *Community-based Interventions for Population Health*
- *Physical-Chemical-Biological Environments and Population Health*
- *Social and Health Policy and Populations* [127]

One drawback of a set curriculum is that it is difficult to adjust to the needs of a continually changing group of scholars. In this case, site visitors and scholars noted that the curriculum tended to focus on social epidemiology, which potentially limited the participation of scholars from backgrounds such as psychology, anthropology, economics, political science, and public policy [63,108].

The course was supplemented with a salon to foster discussion about population health. The salon was open only to scholars and core faculty, and it was held several times a year. At each salon, a major book or a set of papers or chapters on an important or controversial topic in population health would be discussed. In addition, every other week the directors would meet with the scholars as a group to discuss their research progress. These meetings also included the discussion of seminal or recent articles in the field and sessions on professional development, career support, grant writing, institutional review board protocol applications, scholarship ethics, and more [87].

Michigan also had an active outside seminar program, which focused on population health practice and policy. Sample seminars from recent years included:

- *Successes and Failures of Health Policy in Different European Countries* (Johan Mackenbach)
- *Epidemiology, Epigenetics, and the “Gloomy Prospect”: Embracing Randomness in Population Health Research and Practice* (George Davey Smith)
- *Extending Gene-Environment Interactions into Policy Domains: The Case of Tobacco Taxation* (Jason Fletcher, Cohort 8, Columbia)
- *The Effects of Violence on Urban Life* (Patrick Sharkey)
• Medicaid and Health Reform in the Aftermath of the Supreme Court (Benjamin Sommer) [127]

One outstanding feature of the Michigan site was its dedication to putting these seminars on YouTube for a larger audience. This site also held a number of symposia, including Population Health: Past, Present, and Future (2014), Mass Incarceration and Its Effects on Population Health and Health Disparities (2013), and Social Determinants of Child Health (2011). The mass incarceration symposium was organized primarily by scholars, and it generated several new projects involving scholars and alumni from various sites. In general, inviting outside speakers was an excellent way for scholars to get to know researchers with whom they were interested in collaborating. In addition, organizing an outside seminar or a conference, including the attendant lunches, dinners, and meetings with local faculty, represented a practical leadership opportunity and raised the visibility of scholars in the academic community.

At the other end of the continuum, Columbia essentially had no set curriculum. Initially, the site directors developed a seminar series based on a population health curriculum. However, the Cohort 1 scholars rebelled against it, and the site was forced to develop a new approach [74]. The site directors came to believe that by using the seminar to focus on new, substantive topics in population health each week, important lessons about the field as a whole would emerge. Thus, the curriculum was in continual flux and followed the interests of the scholars, who chose an overarching theme for the year (e.g., The Mind) and then led related seminars (e.g., Poverty Mindset, Minds in Control) [65]. Before each seminar, the scholar leading the discussion would disseminate a memo that described a hole in their understanding and listed pertinent readings; they could invite outside participants to take part in the seminar as well [128]. Thus, seminar material was always fresh and scholars were exposed to important problems and approaches in other disciplines. “Just as I learned from the psychologists and neuroscientists, I think people from the School of Public Health really understood and appreciated the perspective of a social scientist, and we kind of pushed them just as much as they pushed us,” says Sharkey. Martin notes of those seminars,

> We were like little superheroes on a team. Everyone had their different thing, and our goal was to figure something out that hadn’t been thought through well before. You didn’t have to all be Aquaman—you shouldn’t be, that would be stupid—but you should stay in the room and figure it out. It was important to have people with different views.

–Molly Martin

Like Michigan, Columbia had an active outside speaker program. Some of the invitees included:

- Robert Sapolsky (Stress, Personality, and Health: Studies of Wild Baboons)
- Loïc Wacquant (Hyperincarceration and Public Health)
- Amanda Cox (*Graphics Editor, New York Times*)
- Susan Watkins (*AIDS Altruism in Action in Africa*)
- Tom Boyce (*Social Stratification and Health: Is There a Developmental Biology of Misfortune?*)
- James Wood (*Rethinking the Black Death: Excursions into Historical Epidemiology*) [110]

A novel element of Columbia’s curriculum was the short course. Short courses were brief workshop-style classes taught by luminaries in the field. Open to RWJF Health & Society Scholars and HSS faculty and, if space allowed, people from outside the program, short courses were typically methods oriented. Offerings included *Social Network Analysis*, *Epigenetics*, *Cost Benefit Analysis and Health*, *Biomarkers*, *Psychometrics*, and *Geographic Information Systems in Population Health*. These courses were extremely popular, often filling up within hours, and scholars from other sites sometimes attended [128,129]. One researcher joined the site’s faculty after teaching a short course [130], and these in-demand classes raised the program’s profile around the university.

Columbia also supported working groups, which immersed scholars in interdisciplinary collaborations. These groups reflected the current interests of scholars and faculty and thus changed over time, and they typically centered around the completion of a project. The *Genetics and Social Structure* group produced a special issue of the *American Journal of Sociology*; the group on *Physical Activity, Obesity, and the Built Environment* developed active collaborations with the city government and local nonprofit agencies; and the *Gene x Environment Interaction* group hosted a series of outside talks and symposia [65]. The directors at the Columbia site observe, “The working groups really worked to bring people from different schools together around a joint project” [74]. In some cases, the scholars organized the groups. Thus, working groups offered many opportunities for practical leadership in addition to fostering fruitful collaborations and experience working as part of an interdisciplinary team.

Most sites took an approach that fell midway between the intensely structured curriculum of the Michigan site and the scholar-led seminars of the Columbia site. Harvard, for example, used its biweekly seminar series to develop the following competencies: (a) knowledge of theories, research, and analytical tools that integrate environmental, behavioral, and biological conditions to address the determinants of population health;
(b) collaborative competence, or the ability to use and apply shared language, methods, and techniques to conduct transdisciplinary research; (c) ability to plan effective interventions to improve population health, ranging from public policy approaches to community-based interventions; and (d) understanding life course approaches to population health research [98]. The site described its seminar series as “a forum for transdisciplinary analysis and discussion of major issues in population health,” and it consisted of presentations by faculty and postdoctoral researchers from both within and outside the university [98], making it larger than the seminar series at other sites. In a formative early seminar series, the concept of causality in different disciplines was discussed:

We all grappled with developing a mutual understanding of how an epidemiologist views causality (e.g., Bradford Hill criteria) compared to how an economist understands causality (e.g., by econometric identification strategies), or how a historian approaches causality (e.g., through complex and often competing narratives of events) [74].

Later on, however, seminar topics were less thematic and included topics such as:

- Conceptualizing Stress in Diverse Mothers and Infants; Can We Capture the Intergenerational Transmission of Risk through the Perinatal Period?
- Structural Stigma and the Health of Lesbian, Gay, and Bisexual Populations
- Population Approaches to Addressing the Obesity Epidemic
- Menu Labeling, Taxes, and More
- Race, Class, Genes, Exposure, and Health: Parsing Out Susceptibility

Many seminars were led by HSS alumni.

Penn, like Michigan, relied primarily on a course to expose scholars to a population health curriculum. Its Fundamentals of Health Policy course, taught by Asch and David Grande (Cohort 3, Penn), focused on research to policy translation and was offered to both first-year RWJF Health & Society Scholars and RWJF Clinical Scholars, creating an opportunity for individuals from the two programs to interact [64]. The major goal of the course was to provide scholars with an understanding of the political context in which U.S. health policy emerges, and it covered topics such as the U.S. health care system, the economics of the public sector, and the nature of persuasion. It also allowed scholars to
interact with important individuals from outside of the academy, including Karl Stark, the Health and Science Editor from the *Philadelphia Inquirer*, who came to discuss Op-Eds, and Giridhar Mallya, Director of Policy and Planning for the Philadelphia Department of Public Health [131]. Health & Society Scholars found the interaction with the Clinical Scholars a valuable component of the curriculum. Dawn Alley (Cohort 4, Penn; Acting Deputy Director of the Preventive and Population Health Models Group at the Center for Medicaid and Medicare Innovation) observes, “I learned a tremendous amount from them. I think that interaction with all of us in the HSS program who were sociologists, epidemiologists, and gerontologists working with clinicians was an amazing preparation for the work I’m doing now” [41].

In addition, Penn held two regular seminars: a Tuesday *Research in Progress* series that was limited to the scholars and the site directors, and a Thursday outside-speaker series, in which topics ranged from scientific presentations to career mentoring. “With an extremely diverse program where you don’t know what kind of scholars you’re going to get—one year you’ve got all sociologists, one year you’ve got two physicians and a historian—it’s very hard to sustain any kind of fixed approach,” notes Asch [104]. Therefore, the seminars ensured that the program could remain flexible and meet the scholars’ needs.

At Wisconsin, site visitors found the weekly *Perspectives in Population Health* seminar a hybrid between a course on population health and a traditional research seminar [89]. In Wisconsin’s curriculum, knowledge exchange (see section below on Knowledge Exchange and Translation), medical care, and economic analysis were core subjects [74]. “We emphasized economics quite a bit, and that can be a difficult journey for many people. I mean the number of sociologists or epidemiologists who came to understand economics under John’s tutoring, I think, was not an insignificant contribution,” says Kindig [34]. He adds, “We emphasized how medical care was a determinant of health and how economics was a legitimate discipline,” providing a unique slant on the population health curriculum.

At Wisconsin, seminars were small. “Our model was such that with our seminars, we have only the three of us, the scholars, and we would invite in for a year or two at a time other people from around the campus for different expertise,” says Kindig [34]. In 2014, for example, Paul Kelleher (*Assistant Professor, Department of Medical History and Bioethics*) was the guest [111]. The program leadership believed that small size and consistent participants ensured fruitful, in-depth dialogue. Each year, the beginning of the seminar was spent in organized sessions that allowed participants to get to know one another’s disciplines and perspectives. For example, the first seminars in the fall semester were devoted to foundational topics such as *What Is Population Health?*, *Health Disparities*, *The Social Determinants of Health*, *The Health Care System*, *Health Behaviors*, and *Biological Pathways*. Later seminars tended to reflect the interests of group members. Topics in spring 2014 included *Age and End of Life; Trauma and Resilience; Gender, Workplaces, and Health*; and *Race and Genetics*. 

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*Dave Kindig*
In addition to the weekly topical seminars, the Wisconsin site held weekly professional development seminars [74]. These seminars were intended to (a) introduce scholars to nonacademic practice and policy professionals and organizations, (b) develop knowledge of how to conduct knowledge exchange and develop leadership skills, (c) address professional issues, such as work/life balance and diversity challenges, and (d) provide a venue in which scholars could present research and receive feedback [111]. Some of the topics in fall 2012 included Indoctrination, Job Market Issues, Data Visualization, Challenges of Securing Tenure When Your Work is Interdisciplinary, and Preparing a K Award [132].

Wisconsin, like Columbia, used working groups to solidify multidisciplinary, cross-campus collaborations between scholars and other university members. Meetings every other week drew faculty, postdoctoral fellows, and graduate students from a diverse array of disciplines, including sociology, demography, economics, psychology, statistics, anthropology, and more [133]. Like a seminar series, each meeting was devoted to a different topic. For example, the Health Econometrics group considered Multiple Imputation, Socioeconomic Status and Mortality, Structural Equation Models and Causal Inference, and the Effects of Bullying in Elementary School at various meetings. The Health and Mortality group provided a forum for individuals to solicit feedback on research proposals from interdisciplinary colleagues with interests in population health. And meetings of the Comparative Effectiveness group led to a chapter in the Elgar Companion to Health Economics entitled “Moving beyond mean-based evaluation of health care,” by David Vanness and John Mullahy (Site Director, Wisconsin).

Finally, UCSFB’s curriculum centered on a triad of complementary approaches to understanding development: context, behavior, and biology. The goal was to have each scholar become an expert in one area, strong in another, and able to understand issues in a third [44]. In the RWJF Health & Society Scholars research seminars, faculty would discuss their disciplinary perspective and explain what would be helpful, in their discipline, for understanding the determinants of health; each seminar was linked to the site’s overarching conceptual model of behavior, context, and biology. To strengthen ties between the two campuses, seminars moved between UCSF and Berkeley [109]. Like Harvard, UCSFB incorporated a number of outside speakers into their core seminar, capitalizing on the wealth of knowledge in the Bay Area. Seminars were also used to introduce the scholars to partner institutions, including the Public Policy Institute of California, the San Francisco Department of Public Health, and the Kaiser Permanente Division of Research [74].
In 2014, sample topics included:
- *Health and Community Development*
- *The Microbiome and Obesity*
- *Epigenetic Effects of Early Childhood Adversity and Psychosocial Stress*

Creating a seminar in which scholars and faculty were comfortable and engaged was not always easy. UCSFB reported that in the early years of the program, the faculty dominated discussion. The site thus instituted a rule that faculty had to leave for the last 30 minutes of the seminar, to ensure that scholars engaged with the speaker and fully participated in debates and questioning [134].

In addition to its seminar series, UCSFB offered a Scholars Workshop, in which fellows presented works-in-progress, such as articles, grant applications, or presentations, and received input from other scholars and faculty [109]. A one-quarter *Responsible Conduct of Research* course was also required, which addressed publication practices, data management, authorship, intellectual property, and other relevant topics.

Working groups were a central part of the scholar experience at UCSFB, although they worked quite differently there than at the other sites. Most scholars participated in one of three working groups [135], and as described in detail below, these working groups were used to channel funding to priority areas of research as well as to foster collaborations and encourage new ways of thinking about population health problems. As at other sites, working groups were a mechanism by which researchers from different disciplines could pursue a common goal, apply for funding, plan meetings, and receive feedback on their work.

At several sites, evaluators expressed concern that biology was not being integrated into the curriculum in a compelling way, despite being one of the core subject areas identified at the beginning of the program [116,117,136]. Given the difficulty that the sites encountered in integrating biology into the curriculum, the idea of a 6-week crash course in biology for nonbiologists, potentially run by the NPO, was discussed [63,136]. It was not pursued, however, and sites dealt with the challenge individually.

### Crosscutting Areas of Emphasis

Leadership development and knowledge translation were two crosscutting areas emphasized by the Foundation. Although some basic common elements relating to these areas were established across the sites, as for the curriculum, each site developed its own approach.
Leadership Development

A major goal of the HSS program was to produce leaders in the field of population health. However, determining how best to provide leadership training proved challenging [31].

Improving communication skills was one focus of leadership training. The NPO made media training available to all scholars. From 2005 to 2008, Burness Communications, of Bethesda, Maryland, conducted media workshops at individual program sites, and in 2009, IQ Solutions, of Rockville, Maryland, took over this responsibility. Starting in 2010, IQ Solutions began conducting this training at the annual meeting instead. This media training addressed issues such as how to adapt messages for essays and print/broadcast interviews, what editors are looking for in an Op-Ed, and how to appear authoritative on camera [137]. This training was very popular with scholars [105], and it allowed the Foundation to ensure that these important topics were covered.

Although communications skills were clearly seen as one element in scholars bringing their work to public attention, how best to develop other leadership skills was unclear. In the planning stage, the program experimented with various types of classical leadership training [31]. The site directors felt that training from the Wharton Leadership Center was not geared to academics. Leadership training based on the team learning approach also fell flat. In the end, the program decided to let sites decide for themselves how to handle leadership training and report the approach that they were taking in their annual self-evaluations.

At the Penn site, scholars attended formal leadership courses during some years, but they had mixed opinions on their utility [138]. In addition, negotiation workshops were offered, and leaders were brought in regularly to meet with scholars through seminars and events at the Leonard Davis Institute of Health Economics [131]. When distinguished speakers came to give talks, scholars were encouraged to arrange private meetings with them, which was one way to learn from leaders [125].

Columbia instituted a program called “leadership lunches.” Guests included Lauren Smith (Medical Director, Massachusetts Department of Public Health), Luis Uniñas (Former President, Ford Foundation), David Kupfer (Chair, DSM-V Task Force), Susan Rabiner (Author and Editor), Jack Rowe (Former CEO, Aetna), and Aryeh Neier (Founder, Human Rights Watch) [110]. These informal lunches provided scholars with a chance to hear how these leaders arrived at their positions, as well as their thoughts on leadership. However, finding leaders who were willing and able to participate in these programs was sometimes difficult [105]. In addition, the effort expended on these lunches

The program brought in scholars who had the potential for great leadership. But the experience of being in the program has also enabled scholars to recognize their leadership capabilities and, in many cases, practice their leadership capabilities.

–Christine Bachrach

For scholars, it’s important to recognize that, doing multidisciplinary work, you’re very likely to end up leading a team.

–Jonathan Samet
varied from year to year: In 2011 and 2012, the only speakers at Columbia were the site directors, while in other years, four or five events took place [110].

Similarly, Harvard instituted a “power lunch” series in which scholars met individuals directly engaged in policy and practice [105]. This gave them the opportunity to hear firsthand about the relevance of research in real-world settings. In 2013, for example, Ryan Brown (Cohort 4, UCSF; Scientist, RAND Corporation) met with scholars to discuss transitioning from a postdoctoral position in academia to an industry job, careers in a nonacademic environment, and his experience working with policymakers [139]. In addition, core faculty member Chandra (Professor of Public Policy, Director of Health Policy Research, Harvard Kennedy School of Government) met with scholars to discuss their research and share insights into working with policymakers.

At Michigan, site directors felt that scholars benefited from exposure to leaders in the field, including the University of Michigan professors who shared their expertise and personal histories in the required Population Health and Its Determinants course, and the speakers who gave outside seminars [140].

UCSFB also primarily relied on exposure to seminar speakers for leadership development. Specifically, each seminar was divided into three parts: In the first, the speakers gave an overview of their career path, to give insight into how different people achieve distinguished positions; in the second, the speakers gave a traditional seminar; and in the third, the speaker met alone with the scholars, so they could ask more personal and direct questions [141].

At Wisconsin, leadership was addressed in the Professional Development seminar. Once every 2 years, scholars would take the Myers-Briggs personality evaluation and then discuss related strengths and weaknesses in collaborative and leadership settings and how to use this knowledge [132]. In addition, leaders from academia and the policy world were invited to speak about their experiences and views of leadership. Recent speakers included Gary Sandefur (Dean of Letters and Science at Wisconsin), who talked about academic leadership, and members of the Campus Advisory Board, who each directed interdisciplinary centers on campus. Finally, scholars were asked to imagine their own future leadership roles and to identify the knowledge and skills that they would need in those roles.

It was common for the sites to focus on practical academic leadership experience. For example, Columbia expected scholars to lead by organizing seminars, forming research collaborations, developing working groups, and publishing special issues of journals [74]. Penn considered the lessons from site directors and faculty on grantsmanship, working collaboratively, the job search, and negotiating a job offer important components of leadership training [138]. Michigan noted that organizing the Scholars-Only meeting offered substantial leadership opportunities, as did organizing a symposium on

I define leadership as an ability to produce the kinds of outcomes that you have a vision to produce, to change systems, to convince people, to lead by following—to be not just someone who’s out there in front, telling people what to do, but to really change people’s minds and win hearts on behalf of a cause that you feel passionate about.

—Christine Bachrach
Incarceration and Public Health, which attracted so much interest that registration had to close within 4 hours of opening [93]. Wisconsin also emphasized the leadership opportunity represented by the Scholars-Only meeting [142].

It is important to note, however, that the Foundation’s goal was not only to promote academic leadership per se [31]. It was also interested in training leaders who could bridge the worlds of research and policy, to ensure that population health research was translated into real-world results. Some scholars who were interested in leadership outside of academia did not see their interests reflected in the program [85]. To address this apparent gap, the NPO convened a meeting of site directors in 2012 to develop a shared framework for leadership development. In this meeting, the directors agreed on key skills in three leadership domains (interdisciplinary collaboration skills, career skills, leadership skills), as well as examples of how each site could help scholars develop these skills. The framework was intended to foster a more consistent training experience for scholars, although each site developed its own approach to carrying forward leadership development. Robert, site director of the Wisconsin site, said, “Having this framework helped us think through our professional development curriculum more deeply, making sure we explicitly covered important topics in each of these areas with each cohort” [123].

Most sites felt that they were successful in the domains of interdisciplinary and career leadership development, but providing exposure to general leadership skills proved more challenging.

The program observed that many alumni had a greater interest in leadership skills as they became more established in their careers, had gained tenure, or were more senior in nonacademic organizations. The NPO responded by engaging professional leadership development experts and offering two leadership workshops for alumni. One was held in summer 2015 for alumni in the first five cohorts, and the other was held in June 2016 for any interested alumni who had not attended the first workshop. More than 40 alumni attended the two events, which included sessions such as Leadership Styles, Managing People, Mentoring, Time Management, Leading Difficult Conversations, and Challenges in Advancing Your Career in Population Health. Daley says of the 2015 workshop, “The leadership training was really targeted to meet our needs based on survey responses, and it was hands-down probably the best professional development that I’ve done.”
Knowledge Exchange and Translation

From the very beginning of the program, there was tension surrounding how much emphasis the program should place on translating research findings into practice and policy recommendations. On the one hand, RWJF envisioned a program whose findings would benefit health and society. On the other hand, some researchers were afraid that the field was too young to generate practice- or policy-relevant findings and that any appearance of advocacy would threaten its credibility. This debate continued as the sites for the program were chosen: Reviewers wondered to what extent the potential to make change outside the walls of the academy should be a criterion for choosing sites [29]. Should scholars be interacting with the community and developing community leadership and partnerships? Should stakeholders include political and community leaders?

The tension surrounding knowledge exchange and translation continued for the life of the program. Of the sites chosen, all initially considered translating research into practice or interventions as one of their core domains [62]. (Other shared domains included biological mediators, social determinants/social epidemiology, and research methods.) The extent to which a focus on translation was actually implemented varied, however. At the end of the program, UCSFB reflected that more academically oriented faculty had resisted devoting time to research translation, fearing that it would dilute the focus on science [74]. By contrast, faculty with stronger ties to medicine and public health believed research translation was important. Thus, the site did offer some knowledge exchange–related activities, such as a course on writing Op-Eds, but did not make research translation a major focus [85]. Even so, UCSFB did partner with a number of institutions to promote policy and practice work, including the San Francisco Department of Public Health, the Manitoba Centre for Health Policy, and the Public Policy Institute of California [109]. These partners would prove an important part of the scholar experience. Jutte, who investigated the impact of teen motherhood on children, explains:

"I worked with the Manitoba Center for Health Policy. I used their database to look at a whole population over many years. I was able to look at a cohort of tens of thousands of children followed from birth to age 25, and I was able to look at their educational outcomes, their medical outcomes, and their social welfare outcomes [143]."

Columbia initially planned on conducting a seminar on population-based interventions that would “introduce scholars to health promotion interventions that consider multiple levels of influence plus innovative evaluation methodologies responding to [the] complexities of multilevel interventions” [62]. In addition, Columbia site directors imagined a series of

Comments on Science and Policy from an Early Planning Meeting

There is a fine line between the science and advocacy sides. Once you are seen as an advocate, the science is undermined.

You come across as a bad guy if you question the research on social inequities. This policy stuff makes for bad science.

I don’t worry about the advocacy charge leveled at this field. Doing things for normative ends means that values come into play. This need not distract us from what we are doing.
1-day workshops on the legislative and judicial processes of policymaking, the role of the news media in health policy, and key policy actors, as well as forums on important health issues; they intended to enlist presenters from the School of International and Public Affairs, the School of Journalism, and local policy centers [73]. In practice, however, the site’s connections to intervention work and knowledge exchange and translation took place primarily through less formal, bottom-up routes. For example, Gina Lovasi (Cohort 4, Columbia) became involved with the City of New York in developing Active Living Guidelines, and a scholar-led seminar led to a Health Affairs article that called for a population health perspective in the Diagnostic and Statistical Manual of Mental Disorders (DSM) V revisions [121]. In 2013, scholars reported that the site did not really focus on policy and practice except to the degree that guest speakers had policy experience [122].

Harvard saw media training, as well as the opportunity to practice communication skills in seminars, as important components of their knowledge exchange and transfer offerings [139]. However, the site directors observed:

_In hindsight, we did not put enough effort into translational training. Other sites were more focused on this from the start, but we were rather late in realizing how valuable it would be for our scholars. Our research training has always been robust, but we could have paid more attention to training our scholars to turn that research into policy_ [74].

Given more time, and as the field matured, it is possible that the practice and policy offerings at Harvard and the other sites would have expanded.

Site directors from the Michigan site also acknowledged that they struggled with interacting with the world outside the university [87]. Although they acknowledged the importance of the policy link, even becoming involved in a PBS series on the social determinants of health (Unnatural Causes... Is Inequality Making Us Sick?), site visitors in some years felt that the site offered little structure for scholars to interact with an audience outside of academia. Site directors were concerned that knowledge transfer is not rewarded by academia (and maybe somewhat discouraged) and that such projects could be time drains for scholars who will not work in this area later on [44]. However, in the later years of the program, scholars from Michigan reported that they were immersed in discussions of policy and continually encouraged to think about the policy applications of their work [93].

The course at Penn on health policy was the site’s primary mechanism for integrating policy considerations into the program; it provided hands-on experience with writing policy briefs and Op-Eds [64]. In addition, the course included a session led by Hoag Levins and Zach Meisel of the Leonard David Institute on Communicating with Policymakers and the Public through the Media.
The one site that stood out for its continuous commitment to knowledge exchange and translation was Wisconsin. Indeed, the site felt “the distinguishing feature of the scholar’s research experience… at the University of Wisconsin is its blending of academic and practice elements, designed to provide the scholars with solid and innovative training in research on the health of populations” [111]. Although scholars were always encouraged to participate in knowledge exchange, in the last few years of the program, scholars were required to participate in a yearly knowledge exchange project of their own design [144]. The site tapped Karen Timberlake (Director of the Population Health Institute at Wisconsin, Former State Health Secretary) to provide input on their knowledge exchange focus, and she was an invaluable resource to scholars seeking to make connections outside the university [145]. Looking back at its experience, the site reflected that engaging high-level practice partners was an essential part of ensuring quality experiences of knowledge exchange [74]. Examples of practice settings included the Wisconsin Department of Health Services, the City of Milwaukee Health Department, the Rural Wisconsin Health Cooperative, the Wisconsin Hospital Association, and MetaStar [111]. Kindig notes that although some scholars only “dipped their toe” in knowledge exchange, for others it became a big part of their work [34]. In a series of interviews with current and former scholars, the projects were universally seen as beneficial. In particular, many scholars expressed that knowledge exchange work was no longer something to be afraid of, and they now knew how to get such projects started. Many Wisconsin alumni are now actively involved in shaping population health policy (see section below on Perceived Impact of the Program On the Field of Population Health).

In 2014, the NPO completed a Research to Policy and Practice framework, created after a meeting of the site directors. The goal was to ensure that all scholars gain basic exposure to the policy process, learn how best to communicate their research to a variety of audiences, and be prepared to translate their research to policy and practice as appropriate [58]. Proposed core elements of the framework included building awareness of HSS goals in this area, as well as policy and practice opportunities, strengthening communication skills, and helping scholars develop relationships with the media and policymakers. A list of preferred learning methods to accomplish each element was compiled as well. However, by 2014 the program was winding down, so there was little time to put this framework to use across the sites.

Scholars often expressed regret that the practice and policy link was missing at so many sites. At Penn, scholars said they would have liked more access to people who actually implement policy—in particular, they would like to learn how to use evidence under the pressure of politics [146]. At Harvard, scholars said they wanted “more permission” to think about action, not just research [91]. At Columbia, scholars said getting in-depth
information about “bridging [the] academic world to policy” was difficult and that more support in this area would be helpful [122].

Whether this lack of focus on practice and policy was problematic for the program at this stage is unclear. Looking back, Russo says:

The program could have been much more about translation. Wisconsin always did it from that mindset. Some of the other programs began to do that more. ... If we had focused completely on translation to policy, we wouldn’t have had the methodologists who do breakthrough methodologies; we might not have had the physiology aspects of things, the mechanisms aspects of things. This program really allowed for exploration in a broad way around many different facets [31].

James agrees, saying that he was not disappointed by the underrepresentation of scholars focusing on policy:

I think what happens to traditionally trained academics is that as you live out your career, one becomes less and less interested in the fine technical points of your discipline. You become much more interested in the history—How did we get here?—and you become more interested in answering bigger questions and in synthesizing and thinking about the meaning of the work and the impact of the work. I think that’s just sort of a natural evolution for most academics. ... I’m sanguine about the idea that 15, 20 years from now the young scholars who are now just beginning their careers, when they are midcareer or late-midcareer, they’re going to be writing more and more about policy impact [9].

Knickman has almost identical views:
I think that with the set of people we’re recruiting, the right career course is to be a cutting-edge researcher, learn those skills, and get the status you need to be a leader in those areas—and then you branch out to do more and more policy stuff, and become more of an advisor, get involved in IOM, things like that [33].

Thus, scholars’ inherent interest in bridging the worlds of science and policy may lead them to enter the practice and policy arena as they mature in their roles as researchers.

- Research

Strengthening population health science research was a central goal of the program. Thus, the program supported scholars in developing rigorous population health research agendas and becoming strong interdisciplinary researchers who would seed this new field. In addition, the program awarded research and training funds to each site and gave the site directors considerable latitude in how to use them. Although a significant portion of these funds was typically used to support scholar research, the sites used them in different ways to advance population health research more broadly at their universities.

- Scholar Research Projects

The HSS program was designed to train scholars in “rigorous research employing designs that allow causal inference and vigorous research addressing questions of significance to society reflecting the complexities of real-world problems” [62]. Not surprisingly, for virtually all scholars, interdisciplinary research projects accounted for most of their time in HSS. Typically, the projects that scholars initiated while in the program integrated a new approach. At Harvard, scholars designed work plans that incorporated the tension between research continuity and stretch: “Our scholars’ work plans have always included both ‘comfort zone projects’ and ‘stretch projects.’ This allows scholars to segue into new areas of research without having to completely abandon what they know they do well,” said the site directors [74]. Ideally, research projects at all sites immersed scholars in interdisciplinary research, providing them face-to-face time with a mentor, a high dose of population health exposure, and numerous formal and informal interactions that shaped their understanding of the research process [102]. Such work was expected to simultaneously deepen their expertise and expand their focus [44].

The extent to which the scholars were able to integrate an entirely new approach into their research in 2 (and sometimes 3) years was striking. With no prior background in stress reactivity, for example, Courtney Cogburn (Cohort 10, Harvard) completed a project that investigated black and white stress responses to racism in the media. “I was really interested in pushing our assessment of racism forward in the health setting. … What I was particularly interested in is whether those types of exposures, through media, actually trigger stress responses that could be problematic for health over time,” says Cogburn. Conversely, Aiello used her time in the program to add social context to her

I really appreciate that I had the time, resources, and leeway, as well as all the support that I wanted in terms of mentorship, to try something out that was just very different for me. All of us did that. That to me is the hallmark of the program.

–Rich Carpiano

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epidemiological findings, “I was able to do what I set out to do as a postdoc, which was understand these infectious diseases and biological processes in a social framework. In the end, it provided excellent training in terms of interdisciplinary studies” [69].

As the program progressed, some sites found it useful to add more structure to the research project component of the program [74,135]. The site directors at Harvard observed, “We originally left our scholars to come up with their own projects, and this occasionally caused them to flounder. Beginning about Cohort 4, more guidance was given to scholars on their work plans” [74]. Similarly, the site directors at UCSFB felt that added structure helped scholars become more productive earlier [135]. At Columbia, however, a more hands-off approach was taken: “Scholars typically work on multiple projects and with multiple mentors, and take an independent role in planning and carrying out their research” [110].

Given the 2-year time frame, sites struggled with the best approach to research projects. Michigan, for example, wanted scholars to get experience with both primary data generation and secondary data analysis [62]. However, collecting primary data in such a short period was difficult. One option was for the scholar to enter the program with a research plan already in place. However, “this limits the potential impact of the program’s new ways of thinking about population health.” Another possibility was collaborating with other researchers on projects already in place. However, this raised the “risk of [the] scholar’s own independent interests becoming secondary to the principal

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A Sampling of Scholar Research Topics

*The spread of violence through high-risk social networks in Chicago* (Andrew Papachristos, Cohort 8, Harvard)

*The link between soil lead levels and violence* (Sammy Zahran, Cohort 10, Columbia)

*Epigenetic effects of early life stress* (Amy Non, Cohort 8, Harvard)

*Variation in health outcomes for children residing in different forms of urban public housing* (Doug Jutte, Cohort 1, UCSFB)

*Socioeconomic position and the cell-mediated immune response* (Allison Aiello, Cohort 1, Michigan)

*Methods for analyzing corporate document “data dumps” for environmental health lawsuits* (Merlin Chowkwanyun, Cohort 11, Wisconsin)

*All of Us: a documentary on HIV research* (Mehret Mandefro, Cohort 5, Penn)

*The addictiveness of slot machines* (Natasha Dow Schüll, Cohort 1, Columbia)
investigator’s primary concern for the project.” It seems that many scholars found collecting primary data in 2 years too difficult; in 2009, five of the six scholars at Michigan used only secondary sources for their research and reported no experience with collecting primary data [77]. Indeed, Boufford came to believe that the 2 years of the fellowship was simply not enough time to engage with the community and conduct qualitative research [147]. There were also ethical considerations related to community involvement when the scholars would disappear after only 2 years [44].

The scope of research projects in the program was also at times a concern for the Foundation and the scholars. From the beginning, some faculty and planners found the Foundation’s lack of support for international work limiting [62, 73]. The Foundation’s focus was on domestic issues; however, many scholars and site faculty were interested in international issues. Some scholars felt that the domestic focus hampered their ability to continue existing international work and institute new work abroad, even if it was in the best interests of their career. In addition, the NPO/NAC had concerns about the breadth of some scholars’ work. Two of the scholars at Penn, for example, became deeply involved in film projects, one of which was rooted in advocacy. Although the scholars and site faculty were satisfied with the work, site evaluators requested that the site directors and mentors use a firmer hand in ensuring the consistency of scholar research with the goals of the HSS program, which demanded the production of science [146]. Thus, both the sites and the NPO had to grapple with how wide the umbrella of population health research was.

Throughout the program, scholars whose work involved biology seemed to report greater frustration in carrying out their research. For example, Alley found it difficult to gain access to biomarker data in her work on developmental issues across the life course [138]. Lab-based scholars at Harvard reported feeling “a little alone” [100]. Other scholars had difficulty being accepted into labs when they were not contributing to the core work of the principal investigator but instead focusing on their own projects [122]. Finally, primary data collection was necessary for most lab-based scholars; this could slow their productivity relative to scholars who could analyze existing data.

- Research and Training Funds

Each year, the HSS sites were awarded money to use as they saw fit for research and training (R&T). The sites used the funds to support research by scholars and faculty, but they also used them to attract new participants from around the university and to raise the
visibility of population health [77]. As Harvard says, “Our seed grant program helped us to engage faculty across the university and thus bring new individuals into the program” [74]. Similarly, a faculty member at Penn commented that R&T funds were the “glue that keeps people together” [129].

Each site had a unique way of dispersing funds. Columbia and Penn directed a large amount of R&T funds to scholars, helping them to branch out and attract people to work with [79,118]. Of seven seed grants awarded in 2007 at Penn, for example, five involved scholars. Other sites, such as Harvard, funneled less money to scholars in some years [90,119,138] but still provided them substantial support. Indeed, internal research support that could be rapidly dispersed was often essential for scholars planning on completing interdisciplinary projects that might be perceived as risky by outside funders within a 2-year time frame.

Whereas Columbia almost always limited seed funds to HSS-affiliated faculty and scholars to ensure that their research was funded appropriately [148], Michigan and Penn publicized a request for applications to the entire university, stimulating a very broad interest in population health research. In 2004, Michigan received 21 seed-fund applications and funded 5 [116] and Penn received 14 applications and funded 7 [118]. By 2008, Michigan had awarded seed grants to investigators from more than 30 individual disciplines [87], although the site noted that it would have liked to receive more applications from the biological sciences [63]. Harvard also advertised the availability of seed funds to attract a wider circle of faculty and researchers to HSS and population health [100]. One practice that helped unify the recipients of seed grants was a forum for presenting the results to one another. At Michigan, the results of each grant were presented in an annual symposium, which was a high-profile event on campus [87]. Similarly, Wisconsin featured presentations of work supported by R&T grants at an annual program open to the entire university [126].

In addition to using the grants to spread the HSS program’s influence and to promote interdisciplinary work, Harvard channeled funds to projects that might be too risky to win support from a traditional funder, such as the NIH [105,149]. These funds allowed investigators to gather pilot data essential for winning larger grants, such as K awards. Of the R&T funds at Harvard, alumna Cogburn says:

*The seed grants that I received as a fellow have really set me up for work that I’m doing now in my faculty position. I’ve used that data to strengthen a grant proposal to the NSF and say, “Look, we’re finding all this cool interesting data. We need to understand this more and dig into this more.”*

Some of the sites developed novel approaches to awarding seed grants. For example, in 2011, Michigan began asking scholars to prepare a proposal in January of their first year; they were awarded the funds only after critique by the faculty and the resulting revisions [150]. In addition, the site set aside R&T funds to support collaborations between the HSS
program and RWJF Clinical Scholars and Scholars in Health Policy Research programs; all of the programs involved contributed funds to this effort [150]. To respond quickly to the need for small amounts of money (<$3,500), Columbia offered microgrants, which were reviewed on a rolling basis—usually within 2 weeks—by the site directors [110].

At some sites, scholars expressed concern about the timing of seed fund applications. At Penn, for example, scholars disliked the November application deadline because it required them to know the focus of their research so early in the fellowship [129,146]. Conversely, scholars at Michigan complained that the application date came too late in the year [77], although faculty felt that the timing allowed fellows to broaden their perspectives before submitting proposals. Given the short length of the program, determining the optimal application deadline proved difficult, and any decision was bound to have both pros and cons.

UCSFB funneled all research funds through its working groups [85,134], which made working groups at this site quite different than those elsewhere. Adler says:

> It partially came out of that original meeting where we had obesity as the theme. I thought if we’re just going to fund random things, we really won’t build our own capacity and our own collaborations, so we focused around the issue of obesity, because there wasn’t a structure there, and around health disparities, which was a common focus for much of the work [81].

She explains of the groups:

> One was on obesity, one was on health disparities, and one was on life course development, and we used the seed funds for projects that came out of those working groups. Although the scholars got precedence, the funding went to a large number of people, and we used it as bait to bring them into the program. We ended up supporting a lot of research for people outside the program who now have a much broader understanding of the issues that they’ve been dealing with [81].

The longstanding Health Disparities group, for example, funded more than 50 pilot projects over the life of the program, many of which were proposed by or involved scholars [141].

> What we did was we put some strings attached to the funds, and one was that you had to present to the working group and you had to be open to collaboration. ... There were a couple where we did mandate collaboration, where somebody came in with much too narrow a vision, and I think we did a real service in adding a collaborator to it,
says Adler [81]. Many of these pilot projects led to successful grant proposals: Based on her work as a scholar, for example, Nicole Bush (Cohort 7) was awarded an R01 for Preventing Intergenerational Transmission of Obesity and Cardiometabolic Risk. The groups also contributed to the creation of enduring new research networks, such as the Berkeley Behavior Change Research Network and the Berkeley Population Center [141].

Wisconsin used R&T funds to provide support for curriculum development grants related to population health issues. In the 2012-2013 academic year, the site awarded grants to faculty in anthropology, communication arts, and philosophy [132]. This funding either provided awardees the leverage that they needed to introduce a new population health–related course in their department or gave them the time and resources needed to overhaul a course by adding population health components. Some of the courses supported in the 2012-2013 academic year included Principles of Biological Anthropology; Heredity, Environment and Human Populations; Rhetoric of Health; and Food Ethics. One of the supported professors, anthropologist John Hawks, teaches classes that are wildly popular; his Human Evolution: Past and Future class on Coursera reached more than 30,000 learners [151]. This highlights the potential that curriculum support for individual professors has for increasing the visibility of population health among students.

In addition, Wisconsin developed a campus-wide prize for the best paper in health and society research [144]. After accepting submissions, an interdisciplinary review board would award the best paper or papers a $1,000 prize. Previous winners include Jason Fletcher (Cohort 8, Columbia, Economics) for “The effects of childhood ADHD on adult labor market outcomes,” Barbara Wolfe (Professor, Economics) for “The income and health effects of tribal casino gaming on American Indians,” and Christina Ewig (Professor, Women’s Studies), for “Inequality and the politics of social policy implementation: gender, age, and Chile’s 2004 health reforms” [111].

Wisconsin also provided support for dissertations related to population health, typically in the range of $5,000 to $6,000. The supported graduate students came from a wide array of disciplines, including sociology, psychology, engineering, economics, public affairs, and, of course, population health sciences.

In the 2012-2013 academic year, some of the titles of the dissertations that benefited included:

- The Feasibility, Validity, and Efficacy of Smartphone-captured Influenza-related Health Information in a University Student Population
- Behavioral Health Safety-Net Programs, Service Utilization, and Outcomes in Poor and Near-Poor Adults with Mental Illness
- Primary Care Providers and Health Care Utilization
- The Role of Testosterone and Androgen Receptors in Challenge and Threat Responses

The sites developed a number of other uses for R&T funds as well. Funds were used to support workshops, the taping and distribution of talks and workshops, research assistants, short courses, and seminars [63,88]. Columbia used R&T funds to support a newsletter that highlighted scholar and faculty work and interests [88]. Michigan funded symposia: A symposium on complex systems led to a network that has been funded by the NIH’s Office of Behavioral and Social Sciences Research for several years [93]. Finally, with the...
knowledge that the program was ending, UCSFB used R&T funds to develop an NIH T32 training grant proposal that would replicate the partnerships and practices used in the HSS program [86].

Over the years, the NPO/NAC frequently noted that it was difficult to determine the impact of R&T funds and that better metrics and analysis would be helpful [63,87]. In particular, Fineberg challenged site directors to use data to identify success factors [88]. Harvard took steps to develop a “brokerage score” to identify the individuals creating the greatest number of links between different parts of the university [100], and other sites also seemed interested in trying to quantify the best uses of the funds. Given extra time, the sites probably would have developed more systematic measures to evaluate promising uses of R&T funds. Knickman observes, “Frankly, I think that the sites that used [R&T funds] just to fund some of the internal faculty leaders seemed to be the least productive. So there was some effort to change how sites used that money. And I think we learned as we went along” [33].

On the whole, R&T funds were perceived as an extremely effective means of recruiting new faculty into the HSS orbit and raising the profile of population health. In fact, after observing the success of R&T funds in the HSS program, the RWJF Scholars in Health Policy Research program adopted the model [152].

The relatively small pots of money we put in those sites for research really were leveraged and really enticed different faculty in social work, and education, and engineering to say, “Oh, I have some things I’m doing related to healthy choices or healthy lifestyles or healthy living.” And they got pulled into the fray.

The program created a cadre of truly interdisciplinary leaders who understand how to ask questions related to the health of the population that span the genome to the environment and everything in between. It really pulled together social scientists, basic researchers, and people who had a clinical orientation into asking some fundamental questions about the underpinnings of population health.

—Risa Lavizzo-Mourey
Perceived Impact

On Scholars and Alumni

Upon its ending in 2016, the RWJF Health & Society Scholars (HSS) program accumulated almost 200 alumni. Alumni use terms like “life changing” and “game changing” to describe the impact of HSS on their research and career trajectories [68,153]. “It completely changed my trajectory,” says Courtney Cogburn (Cohort 10, Harvard), who trained in psychology and education and integrated biology into her research to investigate how racism gets under the skin [153]. “I was able to blend and grapple with the complexities of interdisciplinary research.” Similarly, Allison Aiello (Cohort 1, Michigan) observes,

Oftentimes there are opportunities where researchers may go off into a postdoc in a slightly new area, but this was really my time to create and develop a whole new area of research I’ve been conducting ever since. I started off with this really clinical, biological aspect of my research, but now I’m leading the social epidemiology program at the University of North Carolina [69].

Historically, interdisciplinary scholars have found it difficult to navigate hiring and promotion in academia, which is dominated by traditional departments and schools. Indeed, during the creation of the program, interdisciplinary training was seen as riskiest for individuals intending to remain in academia. Pamela Russo (Senior Program Officer, RWJF) says:

Our question was whether our scholars would be able to find positions. The answer was yes. ... The vast majority found themselves in positions where they could bring a population health conduit to schools that were focusing more on thinking that way and teaching that way [11].

Effects of the Program

My entire career since has just been like a love song to the HSS program. To say that it’s been the foundation for everything that came afterward is a gross understatement. ... The program gave me an opportunity to interact with so many different types of scholars. I have been heavily influenced by the focus on upstream determinants, on the population perspective.

–Dawn Alley, Cohort 4, Penn

The population health focus changed my research much more dramatically to the social determinants of health and away from my medical background. I really now believe as a physician that the most critical long-term factor for health is education.

–Doug Jutte, Cohort 1, UCSFB

The whole experience of being a scholar for 2 years was eye-opening. It was an experience that I wouldn’t have had if I stayed at my institution. By that I mean access to so many resources allowed me to learn from people in different fields, take some ideas that I had that needed more work, be able to get constructive criticism on what I was doing, and being able to take those ideas to the next level.

–José Pagán, Cohort 1, Penn

“To me it wasn’t a postdoc at all. It was a very different sort of fellowship that we had, a very different sort of experience. Postdocs are a dime a dozen. This was so unique in the way it was run, it denigrates it to call it that,” says Rich Carpiano (Cohort 2, Wisconsin).
Indeed, most scholars have done exceptionally well on this front, going on to pursue careers in academia (Figure 6). At last count, alumni were employed at nearly 60 universities across the nation, including Ivy League schools such as Harvard, Yale, and Princeton; large state schools, such as University of California, San Francisco (UCSF), University of Kansas, University of Washington, University of Wisconsin, University of North Carolina at Chapel Hill, Auburn University, and Pennsylvania State University; and small liberal arts schools, such as Smith College.

It’s been a lot of fun to see how these individuals, the early cohorts, have moved on to really wonderful positions, and now some of them are tenured faculty members; some of them actually have faculty positions, even tenure, in disciplines in which they were not formally trained. I think that’s very solid evidence of the success of the multidisciplinary focus of the project. Others, of course, have returned to their home disciplines and are thinking, we would hope, in somewhat different terms as a result of their time in the program,
says Sherman James (NAC Member) [9]. “So many of the graduates of the program are going into academic positions of importance at multiple institutions around the country and are going to be in a position to train the next generation of interdisciplinary scholars,” observes Jo Ivey Boufford (Co-Director, NPO) [55].

The number of academics the program has turned out was surprising to some in the program.

The academic focus was a little heavier than I anticipated. I wasn’t concerned about that because my view is the fundamental aim was to build the field, and to build the field you have to have the science. I was interested that so many of the graduates, the alumni, were first and foremost interested in academic careers,
says Mike McGinnis (Program Founder) [28]. However, based on the trajectories of the more established alumni (see below), it seems likely that more former scholars will assume practice and policy roles as they are granted tenure.

Figure 6. Alumni careers as of 3-10-2014.
Although most scholars pursue academic careers, others have taken positions in the government, think tanks, and contract research organizations. Kevin Haninger (Cohort 5, Penn) is a Science & Technology Policy fellow of the American Association for the Advancement of Science at the Environmental Protection Agency, Julian Jamison (Cohort 2, UCSFB) is a senior economist at the Consumer Financial Protection Bureau, Kim Montgomery (Cohort 5, Columbia) is on staff in the U.S. House of Representatives, Catlainn Sionéan (Cohort 1, Wisconsin) is a behavioral scientist at the U.S. Centers for Disease Control and Prevention, Vivian Santiago (Cohort 7, Wisconsin) is a project evaluator at Bronx Teens Connection, and James Broesch (Cohort 8, Wisconsin) is Regional Leader of Population and Public Health Research and Knowledge Exchange at Vancouver Coastal Health. In addition, Ryan Brown (Cohort 4, UCSFB) and Margaret Weden (Cohort 2, Wisconsin) are social scientists at the RAND Corporation, Lindsey Leininger (Cohort 6, Wisconsin) is on staff at Mathematica Policy Research, and Annice Kim (Cohort 3, Penn) is a senior social scientist at RTI International.

A number of scholars have also gone on to work at foundations and nonprofits. José Pagán (Cohort 1, Penn) is Director of Health Innovation at The New York Academy of Medicine, Kristi Pullen (Cohort 4, Harvard) is a staff scientist at the Natural Resources Defense Council, Janxin Leu (Cohort 2, UCSFB) is Director of Product Innovation at the HopeLab Foundation, Elizabeth Wildsmith (Cohort 3, Penn) is a senior research scientist at Child Trends, and Dominick Frosch (Cohort 1, Penn) was recently a patient care fellow at the Gordon and Betty Moore Foundation. Mehret Mandefro (Cohort 5, Penn) is founder and executive director of a nonprofit production company called Truth Aid, which received a pilot grant from the Robert Wood Johnson Foundation (RWJF) when she was a scholar. Its film Difret, released in 2014, premiered at the Sundance Film Festival and won the World Cinematic Dramatic Audience Award. Set in Ethiopia, it chronicles the court case that outlawed the kidnapping of child brides in that nation.

Some scholars have entered the private sector and even started their own businesses. For example, Michelle McMurry (Cohort 2, UCSFB) is Worldwide Vice President of Regulatory Affairs for Medical Devices and Diagnostics at Johnson & Johnson. David Van Sickle (Cohort 4, Wisconsin) started a company called Propeller Health, aided by a seed grant from the HSS program. Propeller Health uses sensors on inhalers to gather information on when people with asthma and other respiratory disorders need to use rescue medication.

We collect data on the location, timing, and frequency of asthma medication use. And when you look at that across the population, you can start to find temporal and geographic patterns of asthma activity that allow you to understand what environmental or social drivers might be impacting the burden of respiratory disease in a community.
explains Meredith Barrett (*Cohort 9, UCSFB*), who joined Van Sickle at Propeller Health as Vice President of Science Research [103]. Olivier Humblet (*Cohort 9, UCSFB*) also worked at Propeller Health, as Vice President of Data prior to joining Apple as a Fitness Data Scientist. Currently, thousands of people are using the sensors, and the company has recently partnered with the city of Louisville, Ky. Barrett explains:

One of our major goals is to work directly with the people making the decisions—the mayor, the chief of civic innovation, and other agencies in the area—to really help answer the questions they need and provide the data so they can make decisions in terms of targeting interventions to reduce the burden of asthma in their community. It’s really exciting to be a part of this [103].

Of the support offered by HSS for his nascent company, Van Sickle says,

The creative and intellectual support from the program was amazing. The site leaders and national team showed steady enthusiasm to let me run down my path, even when it might not have been the most obvious career direction for a scholar in the program. ... It proved to be a powerful 2 years of self-discovery. I’m grateful for that [154].

One marker of the program’s success in creating interdisciplinary scholars is the number of joint publications between scholars, alumni, and faculty at different sites and from different disciplines. These publications are too numerous to list, but a few examples are provided here to illustrate the types of interdisciplinary research conducted. Jennifer Beam Dowd (*Cohort 4, Michigan, Demography*), Allison Aiello (*Cohort 1, Michigan, Epidemiology*), and Dawn Alley (*Cohort 4, Penn, Gerontology*) published an article on socioeconomic gradients in the seroprevalence of cytomegalovirus in the United States [155]. Margaret Sheridan (*Cohort 5, Harvard, Neuroscience*), Doug Jutte (*Cohort 1, UCSFB, Pediatrics*), and Tom Boyce (*Site Director, UCSFB, Pediatrics*) published an article on the impact of social disparity on prefrontal function in childhood [156]. Mark Hatzenbuehler (*Cohort 8, Columbia, Psychology*), Katherine Keyes (*Faculty, Columbia, Epidemiology*), and Katie McLaughlin (*Cohort 6, Harvard, Psychology*) published an article on factors that protect against psychiatric morbidity in lesbian, gay, and bisexual populations [157].

The cohort that was prepared over a decade will continue to pay dividends for the investment that was made at a critical time of their career.

–Harvey Fineberg
It should be acknowledged that rigorous assessment of the program’s effect on the scholars is difficult because, at present, there is no comparison cohort \[31\]. Scholars were chosen because they already exhibited extraordinary research and leadership qualities and a strong interest in interdisciplinary work. Therefore, it is difficult to quantify the effect of the program simply by collecting metrics. However, the degree to which scholars became enmeshed in interdisciplinary work, the leadership roles they have played as scholars and alumni, and the quality of their research strongly suggests that the program offered them the support they needed to succeed in the field of population health. Indeed, in a survey of HSS alumni conducted in 2009 by the New York University Wagner Research Center for Leadership in Action, 45% of alumni said that they were pursuing new research paradigms as a result of the program \[158\]. Only 2% said that it had no impact on their work.

Many of the scholars from the first cohorts have only recently become full professors and moved into senior leadership roles. Aiello notes that although interdisciplinary work is sometimes discouraged at the junior professor level because of competing demands and the need to build a focused research portfolio early on, it is often rewarded at the professor level, where the ability to contribute to many areas is considered a strength \[159\]. Many other alumni have echoed the sentiment that they feel new opportunities for leadership and interdisciplinary work will open up after receiving tenure. Thus, the full impact of this program on the lives and careers of the scholars will become clearer with time. As McGinnis says, “You don’t step out of a postdoc program and become the head of an agency” \[28\].

**On Faculty**

Program site directors are unanimous about the positive effects that the program has had on their research and careers. Many were already leaders in the field of population health, and as site directors, they went on performing groundbreaking research and heading up new initiatives. However, site directors reported that the opportunity to engage with other

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8. A quantitative and qualitative evaluation of the program’s effect on scholars and alumni, in which a comparison group will be employed, is underway.
leaders in the field of population health had a major effect on their work. David Asch (Site Director, Penn) says:

My relationship with the directors of the other sites turned out to be one of the most valuable things for me. I learned a ton from them. I felt very welcomed into a club that I might not otherwise have been invited to. I grew a lot professionally by their leadership. … I think that we think of these programs as serving the scholars, which of course they do, or we think of these programs as serving the institutions, in terms of developing intellectual infrastructure and collegiality and the like, but in a very selfish way, I got a lot out of being a director of the program [104].

Similarly, Dave Kindig (Site Director, Wisconsin) reports of his relationships with the other site directors at Wisconsin, “It was really careful and deliberate, and those relationships just grew over time to be intellectual as well as personal friendships. I value those personal relationships as much as any that I have here” [34]. James observes, “One person said, in talking about what the program meant to her, she has found her tribe. She has found her community. That is what I would say too. This is my community as well” [9].

The support the program provided for population health research also helped site directors take on national leadership roles in the field. For example, Kindig is Co-Chair of the Institute of Medicine (IOM) Roundtable of Population Health Improvement, alongside National Advisory Committee (NAC) member George Isham. To date, this group has held 16 meetings that bring together experts, practitioners, and stakeholders to engage in dialogue about what is needed to improve population health, with an eye toward action [160]. Topics covered include Business Engagement in Achieving Population Health, Opportunities for Progress at the Interface of Health and Education, and Metrics that Matter for Population Health Action. Lisa Berkman (Site Director, Harvard) has appeared before Congress multiple times to discuss her research findings. In 2013, she testified at a hearing before the Senate Committee on Health, Education, Labor, and Pensions chaired by Bernie Sanders. It was entitled Dying Young: Why Your Social and Economic Status May Be a Death Sentence in America. In 2015, she participated in a congressional briefing entitled The Vow Factor: Marriage, Divorce, and Family Formation and Their Impact on Health and Well-Being.

A number of site directors used their time in the program to explore new disciplines. For example, James House (Professor of Sociology, Michigan) took an increasingly visible role in public policy. In addition to joining Michigan’s Gerald R. Ford School of Public Policy in 2008, he co-authored the book Making Americans Healthier: Social and Economic Policy as Health Policy (along with Michigan site director,
George Kaplan) [161]. He also recently wrote the book *Beyond Obamacare: Life, Death, and Social Policy* [162]. In it, House highlights the paradox that the United States spends more on health care than other high-income nations but has a less healthy population. He argues that most of the causes of our nation’s poor health lie outside hospital doors—so if we want to improve population health in a cost-effective manner, spending should be redirected to policies that focus on improving education, income support, civil rights, housing, and neighborhoods. Nancy Adler (Site Director, UCSFB), whose background is in medical psychology, also charted a new course. She began investigating the biological basis of the link between socioeconomic status and health by measuring the length of telomeres, the caps on the ends of our chromosomes that keep our DNA from fraying. This work has resulted in many important articles, some of which demonstrate that educational attainment protects against telomere shortening [163], that racial discrimination [164] and life stress [165] exacerbate it, and that exercise can help buffer the effects of stress on telomere length [166].

Similarly, site directors were able to leverage their time in the program to obtain substantial outside support for interdisciplinary research. Peter Bearman (Professor of Social Science, Columbia) was awarded a $2.5 million National Institutes of Health (NIH) Pioneer award in 2007 to study the recent rise in the number of autism diagnoses. This work was inherently interdisciplinary, requiring expertise in clinical medicine, epidemiology, environmental health science, and genetics, as well as sociology. It resulted in a series of groundbreaking articles that showed, among other things, that autism diagnoses are socially influenced, occurring more frequently when a child who lives nearby has been diagnosed [167]; that changes in diagnostic practice account for roughly one-fourth of the increase in autism cases in California between 1992 and 2005 [168]; that children in high-income families are diagnosed earlier [169]; and that autism is associated with closely spaced pregnancies [170] and assisted reproductive technology [171], the latter primarily because of adverse prenatal and perinatal outcomes and multiple births.

Core faculty members also benefited from their involvement in the program. Three core faculty members from different disciplines were awarded tenure at Harvard. Site visitors noted, “The involvement of these faculty members with the HSS program was cited by the provost’s office as being an important contributor to their success. This points to the fact that the program is on the radar of tenure committees across the university, which is a sign of our success” [74]. Similarly, at Columbia, Valerie Purdie-Vaughns, a psychologist and core faculty member, became involved in an HSS working group that broadened her research agenda and, as she testified, “got her tenure” [172].

**On the Universities**

When the HSS program started, the structure and practices of universities were seen as major impediments to the success of interdisciplinary population health scientists. Planners wondered if there would be any demand for interdisciplinary scholars from an academy dominated by traditional departments, and they questioned whether universities, characterized by silos, were truly capable of hosting interdisciplinary work. The six HSS sites were chosen because their institutions displayed an unusual interest in and commitment to interdisciplinary work. However, even at these sites, the challenge of
creating a program that spanned departments, schools, and even entire universities was formidable.

Although all of the universities were supportive of interdisciplinary collaboration in principle, they had very different cultures. At some, interdisciplinary research was a university-wide priority from the start. For example, by 1995, Chancellor David Ward of Wisconsin had obtained state and philanthropic funding to recruit interdisciplinary faculty [173]. Similarly, the University of Michigan changed its budget models in the 1998–1999 academic year to support interdisciplinary work, giving the provost and president more discretion to allocate resources across units within the university [174]; its 2000 self-study report for institutional re accreditation, entitled New Openings for the Research University: Advancing Collaborative, Integrative, and Interdisciplinary Research and Learning, emphasized making its campus a place conducive to interdisciplinary research and learning [175]. Finally, the site directors at the University of Pennsylvania (Penn) reported that pressure to support interdisciplinary research came directly from the president of the university [106], ensuring that the HSS program received the resources it needed to get set up, such as desirable office space.

The framework to support interdisciplinary research at some of the other universities was less developed at the outset. In these cases, the program’s policy of involving senior-level university officials at every site visit helped ensure that the strengths of this interdisciplinary research program were visible. Witnessing the success of the HSS sites often helped marshal these officials’ support for interdisciplinary research in general. At Harvard, site visitors initially questioned whether the institutional leadership fully understood and supported the HSS program [176]. Within a year, however, site visitors described strong support from the provost, the dean of the School of Public Health, and the associate dean of the Faculty of Arts and Sciences [119]. By 2015, the provost saw the HSS site as a “jewel in the crown” of cross-faculty linkages, and the dean of academic affairs reported that HSS was a flagship program for the president’s “One Harvard” vision [82]. Similarly, the success of the Columbia site, which brought together the School of Arts and Sciences and the School of Public Health, and of the UCSFB site, which brought together a medical campus and a school of public health on an arts and sciences campus, broke new ground at their host universities by demonstrating that cross-campus programs were both feasible and valuable. Thus, although some universities started with less commitment to interdisciplinary research, HSS helped create a culture more amenable to collaborations that spanned departments, schools, and even campuses.

Russo views the impact of the program on sites and their host universities as “tremendous” [31]. For example, two universities with HSS sites (Columbia and Harvard) got new
population centers focusing on population health–related work, which was an unexpected development [31]. Of the center at Harvard, Berkman says:

My initial reaction was we were not going to have any effect on Harvard. ... I’m now director of the Harvard Center for Population and Development Studies. That center has up until now really functioned as a center within the School of Public Health, even though it’s a university-wide center. But now it functions truly as a university center, the provost is really aware of it, and it has had an impact on the Kennedy School of Government, it has had an impact on the people in Arts and Sciences, and it spills over [10].

Of note, there are now population centers at all six host universities.

The HSS sites also played an integral role in helping their home universities develop new degrees in and courses on population health. At Columbia, Gina Lovasi (Cohort 4, Columbia) helped start and co-directed the Epidemiology and Population Health Summer Institute. Sample offerings include Designing Healthy Cities to Reverse Obesity and Noncommunicable Disease (NCD) Epidemics, Agent-Based Models for Population Health, and Identifying and Analyzing Publicly Available Data. In 2016, Harvard launched a new PhD program in population health science that spans five departments: Environmental Health, Epidemiology, Global Health and Population, Nutrition, and Social and Behavioral Sciences. Berkman says, “It’s the biggest PhD program in the university. This year we are accepting 39 people, and we’ll soon have about 50.” At Penn, five new health and society courses led by medical school faculty have been developed, as well as a new course on the social determinants of health [177]. Meanwhile, the undergraduate Health & Societies program has grown to more than 100 current majors [49], and a master’s program in health policy research was developed by Asch and Katrina Armstrong (Penn Steering Committee). Stemming from a collaboration between the UCSFB site and external partner Kaiser Permanente, UCSFB is developing a postdoctoral program in population health policy [178]. Finally, in addition to the numerous population health–related curricula that the Wisconsin site supported through R&T funds, exposure to HSS practices convinced the organizer of the pre-doctoral traineeship at the Center for Demography and Ecology to start including knowledge transfer training in the program [142].

The sites also helped lay the groundwork for new centers and divisions at their universities. The Penn site believes it was instrumental in establishing the Center for Public Health Initiatives [64]. And in 2009, the Berkeley School of Public Health received a $15 million gift from the Bixby Foundation to support a new Center for Population, Health, and Sustainability. In addition, the HSS program had a major impact on the formation of a new division in the Berkeley School of Public Health: the Community Health Sciences division [49].

The cross-campus and cross-university collaborations instituted by HSS have formed a template for other programs interested in creating similar programs. Columbia reported that the HSS program modeled a successful interdisciplinary program with caché, which had an impact on other faculty [79]. In addition, by bridging the arts and sciences and medical sciences campuses [65], it established the nuts and bolts of facilitating collaboration between the two, including how to share indirect costs and handle grant management. This information can now be used by other programs. In fact, the HSS
program was credited with facilitating the relationships and the logistics that led to the university’s NIH-funded Columbia Population Research Center [121]. HSS was also used as a model for a new training program linked to one of Columbia’s major initiatives, the new Zuckerman Mind Brain Behavior Institute, which had initially been proceeding along disciplinary lines [172]. The UCSFB site, which had an even greater gulf to span, had a similar impact. HSS “has really brought the School of Public Health and UCSF much closer together and is serving as a model internally for how such collaborations can happen,” says Adler [66].

Importantly, the number of people that came into the HSS orbit was far greater than the number of scholars or core faculty. Jutte explains:

Our site at UCSFB had a transformative effect on a lot of people around us as well. ... There has been a big impact on the graduate students who were training beside us, or who we met along the way, or faculty who were involved in the program even peripherally. That kind of thinking was new in many cases [143].

Adler agrees:

The program has had ripple effects on others. I run a T32 training program funded by NIH that is housed next to HSS. Our scholars from that program sit in on the seminars, and it has broadened their understanding of social context and determinants. Also, we used the seed funds for the programs to encourage work on health disparities, and that pulled in a lot of postdocs and faculty from across the campus. So many more people have been affected by the existence of the program [66].

No doubt the same scenario played out at other sites, allowing the population health approach to ripple out much further than the relatively small circle of scholars and faculty formally involved with the program.

Many population health researchers have noted that university structures, including tenure processes, will have to change if interdisciplinary work is to be nurtured [31]. The HSS program contributed to making this happen at the universities that hosted sites. Russo remembers:

When we went on the site visits, we wanted them to bring in top administration people at the university, chancellors, provosts. And they would tell us about the structural changes they were making. And if they didn’t bring it up, the site visitors would always ask them, “How is this affecting the tenure process for people” [31]?

Bearman chaired the university-wide promotions and tenure committee at Columbia with great success [122]. He was chosen for his strong leadership within HSS and his championship of interdisciplinary scholarship [172]. Although RWJF was not interested in explicitly funding institutional change, this was something that site directors and the National Program Office (NPO) desired, and change did occur to some extent [31].

The Columbia site noted that time was chief among the challenges still facing interdisciplinary population health: Changing the culture of an institution with respect to collaboration across schools does not happen quickly [179]. The Harvard site agreed, noting that the sprawling, decentralized nature of major research institutions means that “it
can take many years for a new program to become well-established, well-known, and credible” [179]. In addition, UCSFB has noted that when resources are uncertain, higher education may have a greater tendency to protect the core disciplines and departments [179], requiring greater effort on the part of those promoting interdisciplinary science. Therefore, the experience of the program suggests that time and resources will be key to breaking down the remaining barriers to interdisciplinary population health science at universities.

Although the HSS program’s effects on the host universities exceeded everyone’s expectations, support for some of these programs may wane as RWJF support is withdrawn. At Penn, for example, scholars noticed that the clout of the program diminished as soon as its closure was announced, manifesting in reduced allocation of space, for example [64]. To consolidate the gains made during the 15 years of HSS, it will be important to identify new funding sources that reward interdisciplinary population health research and the universities that host it. In the meantime, many in the HSS community plan to continue interdisciplinary activities in population health at their universities. For example, Bearman will help plan a new interdisciplinary initiative in personalized medicine at Columbia [172], the site directors and core faculty at Harvard are exploring funding arrangements that could continue to support their work together [149], and the site directors at Wisconsin are exploring numerous options for sustaining the progress that HSS has made, including using the Population Health Institute there to link diverse researchers both to one another and to networks outside academia [180].

On the Field of Population Health

The simple fact that RWJF, the largest health foundation in the country, created a program devoted to population health raised the profile of the field substantially [28]. James says the program is “exactly what the field needed in 2000,” having created a critical mass of young investigators [9]. “I think it’s majorly helped build the field,” agrees Adler [81]. “When you look at the leading lights, it’s either faculty or increasingly former scholars.”

The scholars, alumni, and faculty of HSS have acted as “ambassadors of population health,” raising its profile in the greater community [80]. Many alumni have taken an interdisciplinary population health approach back to their home disciplines. Adler recalls one alumna who took a position at a sociology department:

There’s a tremendous amount of lip service given to making people take interdisciplinary research seriously, but it takes time to put people together in weird configurations and make it worth their while.
–Dorothy Daley

A lot of people think about population health now in many social science disciplines, and I don’t think that would have really happened without RWJF.
–Lisa Berkman
When she first got there, she was a little taken aback because she was told in sociology you just do single-authored publications and that doing these multi-authored publications was problematic. And yet you can’t do population health on your own. It’s inherently collaborative. I think because she is so good, she has probably moved them to understanding why this other model, not just the solo sociologist, is important [81].

Similarly, Tiffany Green (Cohort 5, Wisconsin) says her experience in the program has influenced the way she teaches:

I teach an Economics of Health Disparities class. ... I start with these economics models and I say OK, what can economics tell us about health disparities and where are the gaps? If [students] come with me, they’re going to study immigrants, and if they study immigrants, they’re going to have to by default study sociology and demography [181].

Special Issues Edited by Scholars and Faculty

The Use of Genetic Information within Biodemographic Studies in Biodemography and Social Biology (Jason Fletcher)

Gender and Health: Relational, Intersectional, and Biosocial Approaches in Social Science & Medicine (Kristen Springer, Lisa Bates)

Social Networks, Health and Mental Health in Social Science & Medicine (Alexander Tsai, Andrew Papachristos)

Ethnography of Health for Social Change in Social Science & Medicine (Helena Hansen, Seth Holmes)

Social Determinants of Child Health in Social Science & Medicine (Kristin Turney, Hedwig Lee, Neil Mehta)

Structural Stigma and Population Health in Social Science & Medicine (Mark Hatzenbuehler, Bruce Link)

Exploring Genetics and Social Structure in American Journal of Sociology (Molly Martin, Sara Shostak, Peter Bearman)

Capturing Context: Integrating Spatial and Social Network Analyses in Social Networks (jimi adams, Gina Lovasi)

As the number of alumni and their effect on trainees and peers at their universities grow, so will the reach of the program.

Scholars, alumni, and faculty have also raised the visibility of population health through publications seen by the wider academic community. Their articles have been published in top journals with diverse readerships, including The New England Journal of Medicine, Proceedings of the National Academy of Sciences, The Lancet, The American Journal of Public Health, Health Affairs, and Annals of Internal Medicine. The sheer breadth of this research has demonstrated how a population health approach can be applied to many problems across many fields. HSS participants have also produced numerous special issues devoted to population health themes that have reached a wide audience. And Berkman and Ichiro Kawachi recently published the second edition of Social Epidemiology, this time joined by Maria Glymour (Cohort 4, Columbia); this textbook will introduce a whole new generation of students to the social
determinants of health. Finally, Kindig’s blog *Improving Population Health* (www.improvingpopulationhealth.org/) features contributions from a wide array of population health researchers and practitioners, making current thinking in policy, practice, and research accessible to a wide audience.

The work of scholars and faculty has also been very visible outside of the academy. It has garnered attention from all of the major news outlets; in the first half of July 2015 alone, findings were covered by *National Public Radio*, *The Wall Street Journal*, *Time*, *The Boston Globe*, *The Atlantic*, and *Vice*. In addition, HSS members participated in documentaries intended for nonacademic audiences. The 2009 PBS documentary *Unnatural Causes... Is Inequality Making Us Sick?* was funded in part by RWJF, and its scholarly advisors included HSS faculty Adler, Kawachi, and Len Syme. Another documentary, *Buffet: All You Can Eat*, by Natasha Dow Schüll (*Cohort 1, Columbia*), was shown at numerous film festivals and won a prize for Best Short from the Society for Visual Anthropology.

Sabrina McCormick (*Cohort 5, Penn*) co-produced an Emmy-winning documentary series called *The Years of Living Dangerously* that explores the effects of climate change, including on health. The first season aired on the Showtime® network and the second is scheduled to air on the National Geographic™ channel. *All of Us*, which documented the work of Mandefro on HIV in the South Bronx, was shown on Showtime. Finally, the photodocumentation work of Carolyn Cannuscio (*Cohort 3, Penn*), which focuses on health and place, has been displayed prominently in Philadelphia. Two of her larger projects include the *Health of Philadelphia Photodocumentation Project* and *A Place to Call Home*, both of which engage citizens and students to capture the health consequences of problems such as homelessness and food insecurity.

Many scholars and faculty have demonstrated their commitment to providing policymakers with evidence relevant to population health problems. For example, Aiello has presented her research to the Food and Drug Administration and has been involved as a litigation consultant in a case that may end up influencing policy on how certain antimicrobial products are regulated [69]. Carey McAndrews (*Cohort 8, Wisconsin*) serves on the Transportation Research Board at the National Academy of Science to develop innovative transportation solutions [182]. Rachel Kimbro (*Cohort 3, Wisconsin*) consults for Children At Risk, a nonprofit that lobbies the Texas legislature and governor on behalf of children, works with the Kinder Institute for Urban Research on legislative briefings, and consults with a food bank in Houston to identify families at risk for food insecurity and to implement policies through the school system [183]. In this way, population health science becomes population health action.

> A lot of the young researchers who have come through the program are now becoming influential in their field, and their work is starting to define how people think about the new questions and the solutions to some of the thorny issues facing population health. The impact of the program has been to produce leaders who are now influencing and shaping the ways in which we as a nation think about this field.
> —Risa Lavizzo-Mourey
Indeed, policy translation has become a central part of the work of some scholars. Alumnus Jutte, for example, works with the Federal Reserve Bank System to promote housing policies that nurture health.

The community development sector has about $200 billion a year they invest in low-income communities. ... They have not traditionally measured health as an outcome of their work, so the way we have framed it is that they are leaving a return on investment unmeasured. That really gets their attention, because they see value in that. What we’d like to do is basically nudge that $200 billion a year into work that is more closely aligned with the upstream social determinants we’re all interested in,

he says [143]. As a result, he created the Build Healthy Places Network. “The Build Healthy Places Network started last year with RWJF funding, and our mission is to support and catalyze work at the intersection of community development and health. This is nonprofit community development that invests in low-income communities, trying to make them better, safer places to live,” he explains.

Indeed, the HSS program, which focused on population health science, helped lay the foundation for RWJF’s new Culture of Health programs, which focuses on translating that science into action [11]. “Culture of Health is a framework that the Foundation is using to really put an action element and a national movement-building element around the kind of great research that has come out of population health science championed by this program for years,” says Alonzo Plough (Vice President of Research-Evaluation-Learning and Chief Science Officer at the Foundation) [84]. “The Culture of Health perspective recognizes that the characteristics of where you live, learn, work, and play are really going to drive health. We spend an infinitesimally small amount of time in a doctor’s office or hopefully a hospital, so what shapes health are all those other interactions in all those other places.” In particular, these new programs aim to cultivate a shared vision of what a Culture of Health is, build demand for it among all Americans, and discover and invest in solutions [184]. HSS’s contribution to the Culture of Health will be ongoing. Plough observes, “I’m now working on the NAC for our new Culture of Health investigator award with three people I knew as scholars who are now faculty members at UCSF.” “The community of population health scientists that has been created with the support of the Foundation can now become an incredible resource to the Foundation as it seeks to move into this new phase,” points out James [9].

Finally, work by the scholars, faculty, and other members of the HSS program is helping to bridge the worlds of population health science and clinical medicine. Attendees of the 2012 HSS strategic planning meeting observed, “We are at a critical point where the conversation about the health of the population and its determinants is converging with the goals of health care reform” [185]. They emphasized that population health researchers
should ensure that population health markers and measurements are integrated into the new data systems supported by the Affordable Care Act (ACA), and that those both inside and outside the field must understand how the population health approach can attract ACA dollars to fund research, programs, and policy agendas. James Marks (Executive Vice President, RWJF) and Russo have also emphasized the importance of focusing on the interface between population health science and medicine [185], noting that “funding and policy relevance going forward will require linking population health research as much as possible to providing evidence that improves the value and controls the cost of health care,” and urging the program to “take the explosion of interest in the broader determinants [of health] and convert it to pathways to the health care cost issue.” Key to this effort, of course, is translation—population health scientists must demonstrate how they can add value to the health care debate, and in particular, how their work on the nonclinical factors that influence health links to the work of individuals who focus on clinical factors.

The program’s emphasis on translation and interdisciplinary communication has paid off in this area: RWJF Health & Society Scholars and HSS faculty have made substantial contributions to the interface between population health science and medicine. Examples are scattered throughout this document, but a few of the most impressive are reiterated here. As acting deputy director of the Preventive and Population Health Care Models Group at the Centers for Medicare and Medicaid Services, alumna Alley is at the forefront of bridging population health science and clinical care. “We are testing ways systems can improve population health in Medicaid and Medicare beneficiaries, who make up about a third of the U.S. population,” she says. “This is a tremendous opportunity to expand the role of population health by leveraging the health care delivery side” [41]. Site director Kindig’s work on the County Health Rankings & Roadmaps has provided policymakers with the tools they need to zero in on the health issues most relevant to their constituents, and to identify evidence-based strategies, both clinical and nonclinical, that will help address these issues [50]. Finally, alumnus Pagán now runs the Center for Health Innovation at The New York Academy of Medicine. In response to the Triple Aim of reducing cost, increasing quality, and improving population health, this center “designs, tests, and evaluates financially sustainable innovations in health care delivery systems that recognize the multiple behavioral, social, and economic determinants of health” [186].

Policymakers know the problems they are facing. Start early conversations with them, steer the research to help them. They have tough decisions to make. I think they will be very receptive and supportive of these kinds of collaborations.

–Jo Ivey Boufford
How do we pay for interventions connected to these ideas of population health and prevention? ... How do you pay for things that happen way into the future? How do you explain to an insurance provider that if they pay money now, they will see benefits later on?

asks Pagán [68], explaining that these are the issues with which the Center for Health Innovation grapples.

Much of scholars’ best work in this arena probably has yet to come. In the years ahead, these scholars will design and carry out new projects with the ACA in mind and form new collaborations to bridge the worlds of research and practice. HSS participants may be more aware than most health researchers of the gap that often arises between the health-related knowledge produced by academics and the health-related knowledge desired by clinicians, policymakers, and communities. They may also be more attuned to the need to speak in terms that their collaborators in the world of health care can understand and appreciate; if scientists want their findings to be used, framing their research in terms of this audience’s concerns and goals is essential. Physician Jason Block (Cohort 4, Harvard) notes that creating a welcoming space for clinicians in population health research is important, as they may find it difficult to join research groups entirely composed of social scientists. It will be interesting to see what collaborations result from the efforts of Penn and Michigan to bring together Health & Society Scholars and Clinical Scholars; the bonds formed between scholars from the RWJF human capital programs are likely to bear fruit in the coming years. As Boufford says, “There is room for us all to come together. Dialogue is starting” [55].

Now that the HSS program is ending, options for continuing population health training are being explored. Recently, a meeting entitled Training in Interdisciplinary Population Health Science: A Vision for the Future was hosted by the IOM Roundtable on Population Health Improvement. Led by Christine Bachrach (Co-Director, NPO), Stephanie Robert (Site Director, Wisconsin), and Yonette Thomas (Miller School of Medicine, University of Miami), it drew numerous important figures in the field. Many were connected to the HSS program, but many were not. Attendees represented institutions such as the National Heart, Lung, and Blood Institute, the Office of Behavioral and Social Sciences Research, the National Institute of Nursing Research, the National Institute on Minority Health and Health Disparities, the National

The IAPHS meetings will provide an opportunity to broaden the scope of the Health & Society Scholars’ thumbprint, to bring in policymakers, practitioners, a range of people into the important conversation about how we move the needle on population health.

–Dorothy Daley
Cancer Institute, the Brookings Institution, the Agency for Health Care Research and Quality, the National Institute on Drug Abuse, the National Institutes of Mental Health, ReThink Health, IBM, and numerous universities. New ideas and best practices for producing a robust pipeline of interdisciplinary population health scientists were discussed there; much useful information was distilled from the HSS program, and many novel ideas were contributed by individuals from outside the program. Based on their research and the ideas presented at the meeting, Bachrach, Robert, and Thomas created a document that defines the essentials of training in population health and makes recommendations for new training programs [187].

Many HSS participants have been involved in developing a new scientific organization, the Interdisciplinary Association for Population Health Science (IAPHS). Like HSS, IAPHS is dedicated to an integrative understanding of the multiple determinants of health—biological, behavioral, and social—and translating this understanding into efforts to improve population health and reduce health disparities. The association will support conferences and web-based resources that foster communication and collaboration among scientists from diverse backgrounds and among scientists, policymakers, and practitioners. It will disseminate information on population health science and provide mentoring, workshops, and other professional development activities. [188]. IAPHS grew out of the HSS program’s strategic planning meetings and its planning was led by a Board composed largely of former scholars, faculty, NAC members and directors. However, it is designed to engage a broad community of population health scientists beyond those involved in the program. Its Senior Advisory Council, chaired by Mike McGinnis, reflects this goal as do its initial conferences. The Association’s first conference, Connecting Population Health Scientists: Building Bridges to Improve Population Health, was held in September 2015 in Washington, DC [189] and its second, Persistent and Emerging Issues
in Population Health Science, in September 2016 at Pennsylvania State University. Dorothy Daley and Michelle Frisco (both Cohort 1, Wisconsin) co-chaired conference planning committees composed entirely of HSS alumni and faculty, but the conference programs predominantly featured scientists, practitioners, and policy-makers unconnected with the program. After several years of planning, IAPHS launched as a membership organization in September 2016.

Conclusion

Over the life of the program, RWJF will have spent over $100 million on the HSS program [25]. It is natural to ask whether that money was well spent. A 2002–2007 Précis presented by program staff to the Foundation stated that “over the long term, this program would be considered successful if its graduates discover and document important connections between determinants that affect health, design effective new approaches to health improvement based upon these insights, and provide effective national leadership for better health” [30]. Virtually everyone interviewed agreed that it is much too early to judge the program’s effect on the field. However, person after person involved in the program said that its rapid success, by these metrics and others, had surprised them [9,28]. “I think HSS is just a spectacular program. It has exceeded certainly my expectations, and my impression is that the program has exceeded those of just about everyone who has been involved in it,” says James [9].

It will be important to consolidate the gains that the HSS program has made to keep the field of population health moving forward.

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*We’re trying to build a field, and a field isn’t populated by 200 people. A field is populated by 2,000 or 2,000,000 or even more. We’re talking about not only developing an army of individuals who are helping to move the frontiers of the intellectual endeavor and of society’s progress, but we’re talking about those who can set the stage for progress that is sustained over the very long term,*

says McGinnis [27]. “It is very important that the fellowship that has been developing by virtue of this program continues and grows and is stewarded along the way.”

Varied strategies will be needed to maintain and extend the population health network created by the program. Continued meetings are seen as a key support for alumni [82]. In addition, many see involvement by the NIH as crucial to the future of population health; the Harvard site directors note that, currently, it is challenging to obtain funding for population health projects and that study sections are often unprepared to handle interdisciplinary research [82]. Finally, the work to put in place a strong external linkage structure—a robust network through which population health scientists can obtain funding, employment, and collaborators—is
essential and ongoing [28]. Virtual programs that link researchers could help HSS alumni and faculty, as well as other population health researchers, maintain and strengthen ties. McGinnis says, “You have to have a very solid network that is supporting you, supporting your perspective, so that you don’t feel that you’re the solo operator, the lone wolf in the forest” [28].

In addition, efforts to create an academic environment that is receptive to interdisciplinary scholars must continue.

What is the demand for the population health scientist? For people who actually leave the program and go to an academic organization where they can act on this new way of thinking, this new approach they’ve learned, and be rewarded for that, then it works well. But if they go back to their home discipline, they might find themselves a fish out of water, says James [9]. He continues:

For HSS alumni who go back to their parent discipline, unless they’re going to be in an environment where the senior faculty—the people who are going to vote on their tenure and promotion prospects—understand how they want to approach things and make room for them to use this new knowledge or this new way of asking questions and pursuing them, it’s going to be incredibly frustrating. It’s going to thwart the accomplishment of the mission the program set out to achieve. So I just hope there will be enough opportunities, enough venues for the alumni of this program to really flourish, to act on these new skills, to use this new language, and to continue to network and to build this field.

Although there has been progress in getting universities to recognize the promise of interdisciplinary research, many challenges on this front remain. Over the coming years, it will be important for HSS alumni and faculty to continue to champion interdisciplinary scholarship. Sharing the knowledge gained during the HSS program about how to overcome institutional challenges will be key. Risa Lavizzo-Mourey says:

One of the key parts of this program’s success has been the degree to which people have learned how to collaborate, break down some of those barriers and silos, and ask questions and do research that is truly interdisciplinary. There needs to be a real emphasis on understanding the structural changes that were made in order to facilitate that collaboration and interprofessional work. It’s going to be really important for people in institutions that have not worked across schools or disciplines and don’t have that tradition to learn from HSS that it’s possible, and some of the ways to facilitate that [190].

Finally, an important step will be for those involved in the HSS program to unite with non-HSS researchers and practitioners interested in population health science to formulate a way forward for the field. Ana Diez Roux notes:
One thing to be careful with is that we’re not just talking to each other, that the program has not developed a culture of its own in which it does not question itself as much as it potentially should and take things as a given. That makes it less transformative [78].

At a recent IOM meeting focused on interdisciplinary population health training, scientists, educators, and practitioners—many from outside HSS—emphasized the promise of novel directions [187]. They discussed the importance of engaging with the community to ensure that the research questions being pursued were viewed as valuable and that potential solutions were acceptable. Practice partnerships were also mentioned as one way to increase the value ascribed to population health research. In addition, given the challenging funding climate faced by all researchers, participants emphasized the importance of leveraging existing resources, including interested faculty, available data, and projects underway, and of exploring funding sources outside of academia. The importance of continuing to incentivize institutions to value and reward interdisciplinary research, in academia as well as in other settings such as business, health care, and the community, was mentioned again and again. A center-based model, in which trainees could be immersed in an interdisciplinary environment for an extended period of time, was seen as essential. This vision of the future thus includes successful components of the HSS program as well as many exciting innovations.

James bids farewell to the program on a note of hope: “There is enough momentum now, enough commitment on the part of this cadre of young people, who have come into this thing that is still in the process of defining itself, that they will find a way to carry on” [9].

HSS gives me hope because we have now trained a number of cohorts of people who understand the ways in which health is produced over a lifetime. None of these people are giving up. They’re energized, out there, well trained, and will continue to do the work long after the program ends.

—Lisa Berkman
Future Challenges in the Field of Population Health

Balancing the emphasis on personalized medicine with a population health perspective. The largest determinants of population health aren’t addressed by personalized medicine. –Lisa Berkman

Becoming integrated into the biomedical world; attracting trainees that are mathematically astute and employing complex dynamical models to learn about human behavior. –Bill Riley

Strengthening institutional supports. –Christine Bachrach

Training population health scientists who are increasingly unlikely to work in academia. –Bob Kaplan

Training good mentors. In a survey of HSS alumni, 99% said they expected to mentor someone not in their discipline. –Stephanie Robert

What will be the incentive for provosts to invest in population health training when it goes against all the big, cross-cutting trends (reducing face-to-face time, reducing costs, distance learning)? –Thomas LaVeist

Most population health scholars are studying groups they are not a part of. How do we address this diversity problem, broadly defined, and how do we leverage diversity to better address population health questions? –Tiffany Green

How can population health better incorporate biology and biologists without being overtaken by the biomedical model?

I don’t think we are going to get much traction on this visibility issue until there is an organizational framework and until there are vehicles through which intellectual products can be disseminated, and not just disseminated to other academics but disseminated to a more diverse audience, including audiences in the transportation arena, social actors in those arenas of life that really constitute the drivers of population health. … We have an alumni placement problem. Until we populate these other arenas with people who come out of this program or with students trained by people who come out of this program, we’re not going to get very far. –Sherman James

To really impact complex determinants, we have to understand how they work at the individual level as well as the social level. Integrating more understanding of the individual determinants along with the social will be very helpful, and it will also align us more with what’s being done in population health management in the more biomedical environment. –Nancy Adler

Being very clear on the important questions that we’re tackling. Making sure that our questions are aligned to the big issues and that we’re not letting our methods and our jargon take us away from the really important stuff. –Ana Diez Roux
Over its 15 years of existence, as it grew from a mere idea to an established program that included hundreds of researchers, the RWJF Health & Society Scholars (HSS) program accumulated knowledge that may prove helpful to individuals planning future training programs. A few factors were consistently mentioned as being essential to the HSS program’s success. These factors included the following:

**Cohorts of Scholars.** The opportunity to interact with other scholars who had similar interests but different backgrounds was brought up again and again as being one of the program’s greatest strengths. Such interaction changed the way that many scholars and faculty approached familiar problems. The everyday proximity “was important for cross-fertilization, for mutual support and growth,” says David Vlahov (Co-Director, NPO) [59]. The size and composition of these cohorts warrants careful thought. Harvey Fineberg (NAC Chair) explains:

> There is a critical mass at a given site. Although you gain a lot by having a variety of sites, because each site brings distinctive strengths, you also need to ensure that there are enough fellows at each site. So I would have said that at a time when there was a thought of maybe going down to two per site, that four is a lot better than two. Three is kind of at the minimus, and five, if it could be managed by the site, would be even better and certainly more economical, because there is expense associated with a full site as well [71].

David Asch (Site Director, Penn) also emphasizes the importance of numbers:

> Even at our maximum, we only had six scholars, and there were times that we had two, like our last year. So the idea of having a program that was that small was a bit of a challenge. At one point, we had more directors than we had scholars. ... I now direct the RWJF Clinical Scholars program again, and we have 15 at a time. It’s just much bigger. Then you’ve got a real family there and you can have some heft and scale and people can do things together [104].

The fact that the program was site based is absolutely critical, because it provided the environment in which to immerse people in interdisciplinary teams, in interdisciplinary networks, in interdisciplinary mentoring. It really provided the foundation for creating interdisciplinary scholars: People who could talk across the disciplines and understand the contribution of different disciplines to population health issues.

—Christine Bachrach
because it’s more time consuming” [81]. Frequent and easy contact among faculty and between faculty and scholars is essential.

**Mentorship.** Although universities are slowly changing, the decision to pursue an interdisciplinary career is still a risky one. Intensive mentorship from senior researchers who have successfully navigated this problem is invaluable for young scholars. This type of intense mentorship requires financial support. Adler observes, “Another reason I think we had people who were really willing to help out is we could cover their time. In a soft money environment, that’s really important” [81]. Christine Bachrach (Co-Director, NPO) agrees:

> What happens in a lot of training programs is the faculty, who have their own agendas, get their benefit by acquiring research assistants. Whereas in this program, we were not just duplicating the strengths of the mentors, we were creating new strengths by helping trainees achieve much broader interdisciplinary reach, helping them take risks, helping them achieve their own career trajectories in ways that probably can’t happen unless you invest in that faculty mentoring [54].

If programs are to avoid the model in which trainees are groomed to become their mentors, identifying a source of funds to incentivize older scholars to shepherd younger scholars through the process of becoming interdisciplinary researchers will be an important challenge.

**Curriculum.** The program recognized the need to provide scholars with a common grounding in population health and interdisciplinary research, but decided to let each site develop its own approach to such a curriculum. There were common elements across sites: All agreed to keep didactic classroom work to a minimum to avoid distracting scholars from research, and each site organized a population health seminar that allowed scholars and core faculty to explore key topics in the field from multiple disciplinary perspectives. In addition to the seminar, each site mixed and matched additional elements—including traditional courses, short (2-day) courses, working groups, symposia, and salons—to meet the needs of its scholars. Tailoring the curriculum to scholars’ interests proved an effective way to develop population health knowledge and interdisciplinary communication skills.

**Research and Training Funds.** The financial resources that the Robert Wood Johnson Foundation (RWJF) supplied the HSS program with were substantial, but the research and training (R&T) funds were regarded as especially helpful. These funds were used to support the research of current faculty, to incentivize their involvement in the program; to support the scholars, to make them more attractive research partners; and often to support the work of faculty outside the program, to increase their engagement with population health. In addition, creative uses of the funds—for working groups, curriculum support, and population health prizes—raised the visibility of population health research at the host universities considerably. Relative to the amount spent on other expenses, such as salaries, the R&T funds cost little and accomplished much.

> We must capitalize on strengths. We must be entrepreneurial in the context in which we operate.
>  
>  
> –Mark Hayward
**Flexibility.** In looking back at the program, James Knickman (former Co-Director, NPO) cites flexibility in response to scholar and faculty input as one of its greatest strengths:

> The people who are going to run programs and sort of live day in and day out implementing the ideas should be at the table in designing them, especially when they’re really smart people in a field. That was an important lesson: Design collaboratively rather than hierarchically. A second lesson is to give the scholars some flexibility and to give them a voice and some power. The fact that we let them do their own conference and shape some of the details about what the training would be, what the educational part of it would be, was a good lesson. They were very responsible, very creative, and I think designed things that a number of us were skeptical were good ideas, but we let them try them and they really worked [33].

Indeed, Dorothy Daley (*Cohort 1, Wisconsin*) remembers Foundation staff actively soliciting scholar input, “Early on, especially when the meetings were small, folks would come up to us and ask for frank assessments, and I think we gave them frank assessments.” Serious consideration of faculty and scholar opinions continued over the life of the program, especially through the site visits. Such a collaborative arrangement is extremely unusual, but the design ensured that all participants felt invested in the program.

**University Culture and Structure.** During the site selection process, the Foundation was careful to assess whether each university would provide a supportive environment for an interdisciplinary program such as HSS. Such support proved essential, as the sites’ work across departments and even campuses often required universities to create new financial and administrative systems. From ensuring that the scholars and site directors had offices that facilitated daily interaction, to providing the administrative support to keep sites running smoothly, to encouraging faculty to participate in a program that might otherwise be viewed as unproven and risky, the cooperation and enthusiasm of senior university officials was vital. The National Program Office (NPO)’s insistence on regular contact with these officials proved a good strategy for maintaining this support. This type of practical assistance aided sites as they worked to further build a culture within their universities in which interdisciplinary research was valued and performed regularly.

Interestingly, one factor was cited as a strength by some interviewees and a weakness by others:

**Stipend.** The stipend level of the HSS program was extraordinarily high by postdoctoral standards. This allowed the program to attract candidates who otherwise might not have applied, including junior faculty, physicians, lawyers, and applicants who were also eligible for other RWJF fellowships. Some involved with the program thought the high stipend level was indispensable for attracting highly qualified candidates. Peter Bearman (*Site Director, Columbia*) believes trying to replicate this program with National Institutes of Health–level stipends would not work, observing, “You need to pay for talent” [79]. Bachrach agrees that the stipends were important in attracting talented scholars, “I’m sure it played a role. It wasn’t the only thing, because the program developed a fabulous
reputation, which also attracted really good people, but it sure helped” [54]. However, Adler believes the high stipends may have been a liability:

*The stipends were almost unnaturally high, and I think that created problems because, for some people, their first job was offering less than the stipend. I don’t think it was necessary to pay that high a level to get the scholars, and I think it did create problems. So I would have freed up that money for other things [81].*

Thus, the subject of stipend levels in future programs deserves careful consideration.

One potential improvement was mentioned over and over, by site directors at each of the sites in the program:

**Program Length.** Both site directors and scholars felt that creating interdisciplinary population health scholars in 2 years was a tall order. Says Adler:

*I think for some scholars, especially for those who are making a real shift in their field, 2 years is not long enough. Because they are basically on the job market a year after they get there. If you’re trying to do something new, you haven’t had time to show that you’re going to be able to do it. I think having the option of a third year would have been very beneficial [81].*

Lisa Berkman (*Site Director, Harvard*) agrees, “I think a 3-year instead of a 2-year program would have been good for many, many people. Not all, but many needed a third year to really launch” [83]. Once the program realized the benefits of a third year, it attempted to make this option available to some scholars; however, funding was not sufficient to sustain the competitive third-year award. In the future, potential programs may want to build this extra time into their training plan from the beginning.

There are several other issues that surfaced over the years that may prove informative to future programs that promote interdisciplinary scholarship:

**Disciplinary Diversity.** The interdisciplinary reach of the HSS sites expanded rapidly every year, and the program was extremely successful at attracting faculty with many different backgrounds. However, integrating scholars and faculty from the biological sciences and mathematics remained a persistent challenge. Mike McGinnis (*Program Founder*) notes:

*Developing interdisciplinary networks takes a tremendous amount of patience and persistence. I’m a public policy researcher, and when we talk about policy implementation, the baseline is usually a decade to see any kind of change. There’s not a cookbook where you’ll see, “I’ve just baked my interdisciplinary network and it’s ready!” It takes time.*

–Dorothy Daley

*There has to be an extra effort to involve those on the biological side or the physical folks. I would have loved to see more mathematicians. Fundamentally, population health dynamics are mathematical challenges. And the interface between genetics, for example, and behavioral or social issues are statistical [and] mathematical modeling challenges, so I think the potential is stunning [28].*
The experience of HSS suggests that to ensure that a discipline is incorporated in a program, it is helpful to start with site directors, core faculty, or both, in that discipline. Sociology, social epidemiology, and psychology were well represented among the site directors and core faculty, and scholars from these disciplines flocked to the program. Had the site directors and core faculty included leaders in the biological sciences and mathematics, it is likely that the program would have had an easier time attracting top scholars in those areas as well. Incorporating biological sciences faculty into an interdisciplinary training program is likely to present its own challenges; however, as a model in which a faculty member mentors a trainee doing his or her own work is dramatically opposed to the current biomedical training model, in which trainees carry out the work specified in a mentor’s grants. Therefore, new models of incentivizing faculty in the biological sciences to mentor independent, interdisciplinary trainees must be explored and will probably need to include substantial financial support for mentoring. Given the importance of biology and mathematics in the interdisciplinary vision of population health, finding a way to ensure that these disciplines are represented is crucial.

The same goes for policy and careers outside of academia. Although many involved in the program were not particularly upset by the lack of emphasis on policy and practice, one of the two official goals of the HSS program was to “develop, evaluate, and disseminate knowledge, interventions, and policies that integrate and act on these determinants to improve health” [25]. To realize this goal, it is likely that a training program would have to tweak the HSS structure. Sherman James (NAC Member) notes:

We’re in the business of reproducing ourselves. You locate the HSS program in prestigious universities—that have very clear ideas about the kind of young people they want to work with and the kind of academic credentials that are necessary in order to benefit from what the resident faculty have to offer—you’re going to end up producing a lot of academics. That’s just the nature of the beast [9].

Toward the end of the program, the program leadership developed a competency framework for preparing scholars to understand and engage in translating their research evidence, which helped focus attention on this issue. However, engaging policy and practice mentors to support scholars whose primary interest is in research translation may take special effort for programs housed in universities.

**Domestic Focus.** Another idea that future programs may want to revisit is the domestic focus of the HSS program. For certain scholars, the preference for domestic work inhibited participation in programs that might otherwise have been beneficial [88,90,120]. Exploring ways to integrate international work with some funders’ domestic interests may be worthwhile.
Sustainability and Spread. Finally, many involved in HSS emphasized the importance of a lasting commitment to this type of training program. RWJF supported the HSS program for 13 years, far fewer than many of its signature human capital programs. Many in the HSS program felt that a longer period of support could have been useful in achieving a critical mass of trained scholars. Future training programs may need to think carefully about how to create sustainable models for funding.

In the end, the HSS program’s impact will depend on its ability to sustain alumni engagement. The program trained fewer than 200 scholars, but those scholars will go on to mentor other young researchers, and those researchers will go on to train still other researchers. By ensuring that HSS alumni maintain a connection to population health and by supporting their connection to each other, the program can maximize its impact. In the final years of the program, the NPO has planned leadership development conferences to help alumni implement and disseminate the population health approach. Many alumni have also taken an active role in planning the Interdisciplinary Association for Population Health Science, which will provide a venue for former Health & Society Scholars to interact with one another, as well as with other scientists, clinicians, and policymakers interested in population health.

In conclusion, the experience of the HSS program highlights many practices that could be replicated in the future, as well as a few potential problem areas that similar programs are likely to encounter. With any luck, the future will be full of interdisciplinary training programs in population health that build on these lessons to become even more successful.
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