

# DRAFT

## Tackling the United States Health Disadvantage with Implementation Research

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## **Abstract**

Four decades ago, U.S. life expectancy was within the same range as other high-income countries. However, during the last couple decades, the U.S. has fared worse in several key health domains resulting in shorter life expectancy and poorer health. The National Heart, Lung, and Blood Institute (NHLBI) convened a panel of national and international health experts and stakeholders for a Think Tank meeting to explore the key drivers of the U.S. health disadvantage and to seek specific recommendations for implementation research opportunities - research focused on taking proven-effective interventions and studying optimal and sustainable implementation strategies – for heart, lung, blood, and sleep disorders. The origins of the U.S. health disadvantage are complex and span the nation’s entire demographic and socio-ecological spectrum with contributions from many sources. Transnational research efforts in Europe and Canada are already exploring variation across nations and health systems and provide valuable insights. Connecting with the research community at large and building upon ongoing research efforts will be an important strategy to address this research gap. Broad partnerships and collaboration across public and private sectors and with civil society will all be critical elements. Finally, there is a need to develop and sustain a robust workforce to conduct implementation research in the U.S. Reversing the U.S. health disadvantage is a national priority. Gaining a better understanding of the causes and developing the relevant knowledge to tackle those causes are necessary first steps for accomplishing the task.

*Today, not only are health problems global, but lessons, insights, and fresh solutions regarding such problems flow in all directions.<sup>1</sup>*

**Harvey V Fineberg**  
**Past President, Institute of Medicine**

## **Introduction**

Considerable variation in health outcomes and longevity exists across the U.S. and 16 comparable high-income, “peer” countries of similar wealth status from North America, Europe, and the Pacific Rim.<sup>2-4</sup> Over the last couple decades, the U.S. has fared worse, compared to these countries, in several key health domains. Now the U.S. cardiovascular death rate is the second highest among these peer countries and Americans who reach age 50 years had less favorable cardiovascular risk profiles; chronic lung disease is more prevalent and associated with higher mortality; obesity rates are the highest in every age group including children; and the adult diabetes prevalence is the highest.<sup>2,3</sup> This concerning and consistent pattern of higher mortality and morbidity is resulting in, on average, reduced longevity and poorer health in the U.S population and resulting in a “health disadvantage”. This disadvantage exists across all age and racial/ethnic groups, the poor and rich alike, such that when key health indicators are compared to their counterparts in peer countries, with rare exception, the U.S. population fares worse.<sup>2,5,6</sup> This has not always been the case. In fact, in the late 1970s and early 1980s, the U.S. had life expectancies within the same range as other peer countries.<sup>2,3</sup> Since this earlier time frame, non-communicable disease mortality rates, and specifically those for cardiovascular diseases, have declined in both the U.S. and in peer countries<sup>7</sup> but improvements in peer countries have out-paced those experienced within the U.S. – contributing to the U.S. disadvantage.

The root causes of this disadvantage are complex and multidimensional. The National Research Council and the Institute of Medicine study<sup>2</sup> *U.S. Health in International Perspective: Shorter Lives, Poorer Health* reported that this disadvantage “has multiple causes and involves some combination of inadequate healthcare, unhealthy behaviors, adverse economic and social conditions, and environmental factors, as well as public

policies and social values that shape those conditions". The study authors called for efforts to understand why shorter life expectancy and poorer health occurred more often in the United States.

Compounding this health disadvantage in the U.S. is the fact that, these unfavorable trends continue today<sup>8-11</sup> alongside large variation in longevity and health status across U.S. subpopulations – leaving some U.S. subgroups at an extreme disadvantage.<sup>5,12-14</sup> Future predictions also find that the U.S. life expectancy gains will remain among the lowest.<sup>15</sup>

### **NHLBI Think Tank On the U.S Health Disadvantage**

Considering the National Research Council and the Institute of Medicine study recommendations<sup>2</sup>, in April 2016, the National Heart, Lung, and Blood Institute (NHLBI) convened a panel of national and international health experts for a one-and-a-half day Think Tank meeting to examine the key drivers of the U.S. health disadvantage and explore key research strategies and opportunities for implementation research<sup>16</sup> – research focused on taking proven-effective interventions and studying optimal and sustainable implementation strategies for prevention and treatment of heart, lung, and blood diseases and sleep disorders. Implementation research aligns with the NHLBI Strategic Vision Goal 3 to advance translational research,<sup>17</sup> and is a means to moving investments in biomedical research, new discoveries, and knowledge, toward “real world” settings in an optimal and sustainable fashion, leading to population health benefits.<sup>16,18-21</sup> NHLBI’s Center for Translation Research and Implementation Science (CTRIS) is a focal point for advancing this research agenda.<sup>20,21</sup> The goal of this Think Tank was to identify robust strategies and platforms needed to organize, support, implement, and sustain studies that will determine factors associated with variation in longevity and health and to identify key implementation research opportunities that would positively modify them.

The Think Tank panel included members from NHLBI’s National Advisory Council and its Board of External Experts, 16 U.S. health experts, 11 international health experts from 8 peer high income countries,

NIH experts from other institutes including the National Cancer Institute, National Institute for Neurological Diseases and Stroke, National Institute of Mental Health, National Institute for Minority Health and Disparities, National Institute for Aging, and the Fogarty International Center, U.S. federal agency experts from the Agency for Healthcare Research and Quality, Centers for Disease Control and Prevention, and the Center for Medicare and Medicaid Services, the Organization for Economic Cooperation and Development, the World Health Organization, the NIH Foundation, the Canadian Institute for Health Research, the Clinton Foundation, and the Global Alliance for Chronic Diseases.

The Think Tank identified key challenges and recommendations for i) understanding the U.S. health disadvantage, ii) an innovative implementation research agenda for tackling it, and iii) partnerships, collaborations, and iv) training and capacity building strategies that will be needed to implement this research agenda.

### **Understanding the U.S. health disadvantage**

Several key challenges and opportunities were cited by the panel (Table 1A). A major driver of health status and outcomes in the U.S., and elsewhere, are social determinants across the lifespan including social position, wealth, education, gender, and geography (e.g. urban or rural residence).<sup>4,22-27</sup> For example, early child development not only has strong influences on health but also on lifetime opportunities – the latter driven by cognitive and behavioral skill development and education in early childhood, and, if lacking, can also lead to fewer lifetime opportunities along with morbidities such as obesity and heart disease in later life.<sup>24,28,29</sup> Other drivers include access and uptake of quality health care.<sup>30-33</sup> The variation in access to a physicians in the United States is very large, perhaps not surprisingly, given the diversity of the U.S. population.<sup>34</sup> However, access to physicians, compared to other peer countries, tends to be lower.<sup>35,36</sup>

Another major challenge is that the spectrum of health determinants is highly linked, complex, and operates at several levels of the social-ecological framework.<sup>37</sup> Social determinants and geography<sup>9,38</sup> (e.g.

urban/rural residence) are critical factors and, as noted, the origin of many health disparities have roots in early childhood. The mortality gap between the U.S. and other high income countries would be greatly reduced if the U.S. could reduce social differentials in mortality to levels observed in other high income countries.<sup>39</sup>

Understanding the reasons for differences in determinants of health across countries and their relationships between outcomes by socioeconomic group may lend insights. Compared to the U.S., other high income country populations tend to have better access – that is, availability and affordability - and use of the healthcare system more<sup>35,36</sup> while also spending comparatively more on social services, which is found associated with better population health in peer countries<sup>40</sup> – a trend also found within the U.S. subpopulations.<sup>41</sup> Thus, both “upstream” factors such as social determinants and “downstream” factors such as access to health care, need consideration. Conducting transnational health outcomes research is hampered by lack of harmonized data and often is limited in information on social determinants – vital elements to understand health outcomes. Finally, data quality, reliability, and confidentiality are challenges. The panel noted that much of the available data in the U.S. as well as in comparable high-income countries are underutilized.

Better data at the individual, health system and population levels can improve the precision with which we identify what interventions need to be implemented and sustained. The Panel identified key recommendations for population and clinical epidemiological research that would, if accomplished, improve the likelihood for impactful implementation research to follow. These included better understanding of geographic variation in U.S. health burden with assessment of age-specific causes of death. Longstanding cohort studies may lend insight to understand evolving social and health inequities and these studies may benefit from tapping administrative “big” data from sources such as the Center for Medicare and Medicaid Services – especially if electronic medical records can be expanded to include patient level socioeconomic data. Using mixed method analyses with both qualitative and quantitative approaches, rapid assessments methods used by business schools to understand policy shift impacts, and time series analyses can all be considered. One approach might be to

identify where the U.S. is doing better than other peer countries and determine why that is the case.<sup>42</sup> However, creating a data enterprise and collecting large amounts of new data, when currently much of the data in the U.S. are underused, will be challenging and should not be the main focus of efforts. In addition, institutions and physicians are heavily burdened with requests for information from CMS, insurers, and regulators. Rather than more data, greater access to existing data, including administrative data, could be pursued.

One priority study suggested by the Panel might be to explore why mortality rates are stagnating or increasing in disadvantaged U.S. populations while they continue to fall in several western European countries. The U.S. cardiovascular mortality rates declined 50% during 1980 to 2000, although these declines were countered by increases in obesity and the prevalence of diabetes.<sup>43</sup> More recent U.S. studies of cardiovascular mortality during the periods from 1979 to 2011<sup>44</sup> and 2000 to 2014<sup>45</sup> found a deceleration or stagnation compared to the earlier declines, with young women between 1990 and 1999 making no improvements. Among many factors, obesity is suspected to have played a role in these trends, as obesity rates in the U.S. have increased at a faster pace and to much higher levels than other peer high income countries.<sup>29</sup> Other studies of U.S. all-cause mortality have found, after decades of progress in declines, a reverse, with marked increases in mortality among U.S. middle-aged white non-Hispanic men and women.<sup>46,47</sup> Of the seven other peer countries included in this study, none had a reversal, and all have had continued declines in mortality across all age groups, although some subgroups were having slower declines.<sup>48</sup> These trends in the younger U.S. population were attributed primarily to drug and alcohol poisoning, suicide, and chronic liver diseases.<sup>46,49</sup> In addition, another U.S. study found higher all-cause mortality rates among middle-aged populations who resided in regions that experienced economic shock from declines in local manufacturing employment related to globalization and exogenous trade liberalization during the 2000s.<sup>50</sup> These findings and trends have led to a recent U.S. Surgeon General Report tackling drug and alcohol health issues.<sup>51</sup>



More detailed community-level data are becoming available. For example, the U.S.-based REGARD study, an observational study of risk factors for stroke in adults 45 years or older, with the purpose to understand why people in some parts of the country develop more strokes than people in other parts of the country, and why black populations develop more strokes than white populations.<sup>52</sup> These data might be sufficient to determine some of the key causes of cardiovascular disease and stroke across U.S. regions. Cross-sectional studies, and surveys might also be useful, but data quality along with harmonized exposure and outcomes measures are among the challenges.

Use of administrative “big data” and electronic medical records (EMRs) to understand health disadvantages may have large benefits. Analyzing the quality of service requires administrative data and if supplemented with data on race/ethnicity, language, social disadvantage (such as education), health care, and smoking habits could be very helpful. However, data quality, as noted above, will be a challenge.

Research groups are already undertaking trans-national comparative studies of health outcomes. One effort examined 30-day mortality after acute myocardial infarction in the UK and in Sweden - two countries with similar health care systems - and found similar health spending but more than a third higher mortality in the U.K. than Sweden – mainly attributed to less optimal delivery of standard evidence-based care.<sup>53</sup>

In addition, trans-national consortiums focused on understanding country variations have developed.<sup>39,54-56</sup> The European Health Care Outcomes, Performance and Efficiency (EuroHOPE) is a consortium of 7 western and eastern European countries driving efforts to evaluate the performance of the European healthcare systems in terms of outcomes, quality, use of resources, and costs.<sup>57-59</sup> EuroHOPE has developed more than 100 indicators at the national, regional, and hospital levels and created a database from national data, hospital data, and from mortality registries. Methods to measure costs during an entire cycle of care and the outcomes have been developed for five events: acute myocardial infarction, stroke, hip fracture, breast cancer, and very low-birth-weight infants. Health systems in seven countries (Finland, Hungary, Italy, the

Netherlands, Norway, Scotland, and Sweden) assessed care quality, use of resources, costs and outcomes for these five events.<sup>58</sup> Substantial variations in health outcomes between and within countries were found.

Hungary had the worst findings for most outcomes while Norway and Sweden tended to have lowest mortality overall, while Scotland fared best for very-low birthweight mortality.<sup>58</sup> These methods can also be applied to routine performance evaluation and monitoring and can be indicators published by the European Union.

More comparative research will lend better understanding to both the U.S. health disadvantage and what does and does not improve population health. Such research could focus on whether the health disadvantage is due to inadequate implementation of effective policies, for example. The panel suggested that calculating the effects of policy implementation across states and within each U.S. state – rather than for the entire country aggregate– will increase the number of observation units needed for explanatory research. Comprehensive person-level data are needed to analyze the impact of social determinates and health inequities and are rarely available in the U.S., yet some national surveys and large data systems might be adapted to accommodate some of these needs.<sup>60-64</sup> Understanding the social determinants of health inequities will require linking these diverse sources of data. Finally, established international cohort health studies that include transnational data on evolving changes such as expansions in educational attainment, alterations in economic structure, rapid changes in family structure, and social inequalities in health may help understand these complex relationships.<sup>65</sup>

### **Potential Solutions for the U.S. health disadvantage**

Key challenges and recommendations to tackle the U.S. health disadvantage, as compared to peer countries, are found in Table 1B. One major challenge is that a gradient of health exists throughout the entire U.S. population. Targeting interventions for the most disadvantaged U.S. population groups is a reasonable strategy, yet a substantial proportion of the total burden of health disadvantage may be missed – being found in larger more modestly disadvantaged groups. Thus, targeting the entire socioeconomic spectrum may avoid missing a substantial portion of the disadvantage burden.<sup>66,67</sup>

Another challenge is that health care systems may perceive their only role as care delivery, and not accountability for improving population health. Consequently, these system tend to provide much less effort outside the health sector. Thus, interventions should span the entire socioecological spectrum and health systems should be encouraged to engage in the non-health sectors focusing on both the key recommendations from the WHO Commission on the Social Determinants of Health (improving daily living conditions; tackling the inequitable distribution of power, money, and resources, and measuring and understanding the problem and assessing the impact of actions).<sup>24</sup> Optimal strategies for quality improvement of care delivery broadened from clinicians to the larger health care system and provider teams should be more successful. Expanded engagement for quality improvement is a current strategy used in Ontario, Canada, for coordinating chronic disease care<sup>68</sup> and similar approaches have been proposed for the U.S.<sup>69</sup>

Differences across peer country's health care organization, quality improvement, financing, provider incentives, and primary care access should lend insights towards solutions. Improving outcomes for disadvantaged populations will require keen understanding of the social, environmental, and policy domains. For implementation within complex systems, elements such as personal incentives, regulations, laws, self-efficacy, and culture must be recognized. Also, peer country comparisons on what is working are hampered by the lag time between developing and adopting policies and treatments, and their influences on secular behavior. The panel noted that new technologies tend to be adopted more readily in the more advantaged populations and could, in fact, exacerbate health disadvantaged populations if explicit uptake strategies to improve innovation diffusion equitably are lacking.

The second-line impact of interventions needs to be understood. The panel noted that socioeconomic factors and health factors profiles can have discordant directions. For example, more wealth may improve health, yet, may be paralleled with increased tobacco use, food overconsumption leading to obesity, and unhealthy lifestyle behaviors, resulting in higher cardiovascular risk. Globally, tobacco use was cited for having a major excess burden within disadvantaged populations. Thus, in addressing domestic health disadvantages

within indigenous populations in both New Zealand and Australia, along with tobacco, programs also targeted education, employment, and access to quality health care services to close the health gap – and in both countries resulted in life expectancy gap reductions between indigenous and non-indigenous groups.<sup>70-73</sup> Studies among European countries suggest similar trends.<sup>74,75</sup> While dimensions outside the health sector may not to be the primary focus of interventions- they may be where critical success factors are found.

Techniques and methods to assess proof of principle for medical interventions may not work for studying social change. Observational study designs that monitor local policy impact may lend insights and more sophisticated approaches such as time-series analysis, regression-discontinuity, and cluster randomized trials may be useful. Time-series analyses or multiple meta-analyses of small studies might be more powerful than single large studies - because their findings are more representative of the diverse populations. Use of mixed (qualitative and quantitative) methods in comparative effectiveness research to identify the active components of multicomponent strategies is recommended.

The Panel suggested establishing a small number of highly focused priority “moon shot” efforts. Many felt hypertension prevention and control should be considered for this approach because: 1) good data are available, 2) many proven-effective interventions exist, 3) controlling it has substantial health benefits, and 4) control rates are poor throughout the population. Large-scale programs in the U.S. have had remarkable success in improving blood pressure control rates within the entire population and have demonstrated what is possible to achieve.<sup>76,77</sup> Implementing these types of programs at local levels within the U.S. could potentially tackle geographic disadvantages and disparities.

Connecting with the larger research community and aligning effectiveness studies to include implementation outcomes into all clinical research - so that clinical outcome studies serve also as hybrid implementation studies – is a strategy for getting key studies with designs that will broaden and speed up uptake of effective interventions. In addition, success in reducing health inequalities will require substantive community engagement encouraging policymakers to act. Community Participatory Research can determine

which priority issues are of greatest concern to communities and the findings can be shared with communities for their consideration. A starting place is community needs assessments conducted by hospitals, public health agencies, and school districts to determine which problems are most important to members of the community. Common community concerns may include family cohesion, followed by issues related to housing quality, neighborhood safety, access to healthy food, mental health issues, drug abuse, and accessible employment opportunities. These are all key determinants of health, but some community members may not consider them health issues. Finally, the Panel made the important point that if efforts are too diffuse and progress is slow, momentum for change may fall. Even perfectly targeted resources may not be enough to ensure that effective interventions are implemented.

### **Building Partnerships and Collaborations**

Partnerships and collaborations are critical for advancing health research, and particularly, for developing and aligning impactful implementation research. Key challenges and recommendations from the Panel are in Table 1C. Three primary reasons why partnerships are critically important are: 1) effective implementation requires engagement and buy-in from those affected; 2) health is everyone's responsibility and all sectors should contribute to efforts, and 3) health problems require collective action.<sup>78</sup> Five basic needs from a research system in domestic and global setting include: coordination of donor funds, prioritization of research ideas, recognition of successful research including optimal and sustainable implementation strategies, dissemination of new knowledge, and evaluation of the return on investments.<sup>79</sup> Traditional partnerships limited to the health sector will likely not be adequate and will need to transcend across multiple government sectors (e.g., housing, employment, education, environment, agriculture, transportation, and urban planning) and beyond government institutions to health care providers, payers, academia, industry, philanthropy, public research funders, multiple levels of government, and communities.<sup>80</sup> For successful implementation research, decision-makers and health authorities are the highest level of collaborators and will need to be engaged along with affected communities. The Panel felt that since a single model for developing partnerships and

collaboration does not fit all needs. Forming and sustaining partnerships is always a challenge and needs to be tailored to the targets.

With such diverse partners from the public sector, private sector, and civil society, consistency and clarity around common goals and the purposes and partnership expectations need to be established.<sup>80</sup> For example, some communities favor implementation research projects because they benefit from the perceived access to better care that they would not otherwise receive. However, when the project ends, so also may the access to this level of care. Some partners may not be genuinely interested in rigorous evaluations considering that favored interventions may not always fare well. The private sector will potentially have commercial interests and must engage in the pre-competitive mode – the non-competitive or collaborative mode - where government, industry and civil society partners combine efforts tapping diverse strengths to develop a new resource or capacity that will provide common benefit.<sup>80</sup> Those who fund *implementation* efforts need to consider forming partnerships with institutions that fund *implementation research*. Implementation research may be new for some funding organizations that typically fund clinical trials or basic science. Collaborators need to make sure all understand what they are funding and the expectations – short term and long term. Partnerships are also valuable in order to ensure that the implementation research questions asked are the very ones that impact on health care decision-making within the clinical and community systems where the research is occurring. The Panel described multiple partnerships that may serve as useful examples for considering what may need to be fostered for implementation research.

The National Diabetes Prevention Program (NDPP) is a good example of a partnership and collaboration focused on translation of a sound evidence-base in order to reduce the growing risk of developing type 2 diabetes in the U.S.<sup>81-84</sup> It is a public-private partnership that includes federal agencies, state and local health departments, national and community organizations, employers, public and private insurers, health care professionals, university community education programs, and businesses that focus on wellness.

As a major U.S. healthcare payer, the U.S. Centers for Medicare and Medicaid Services (CMS), an important collaborator for implementation research, is establishing value-based partnerships by changing incentives and mindsets. Partnerships also need to be established with hospitals, which CMS is encouraging to implement evidence-based interventions.

Clinton Foundation partners work with the goal to create systematic change through collective impact, and work at the national, local, and community levels simultaneously.<sup>85</sup> Experience finds that partners often have different motivations for joining a collaborative effort, and a success factor is that all partners must accept these differences. This approach requires understanding how to form partnerships and how to align and leverage each partner's efforts.

The Foundation for the National Institutes of Health (FNIH) partners with academia, industry, government agencies, other foundations, societies, and NIH Institutes and Centers.<sup>86</sup> FNIH has mechanisms to develop appropriate terms of engagement for research collaborative agreements that articulate roles, responsibilities, timelines, and milestones. The foundation is committed to open access and working in a precompetitive space.

The Global Alliance for Chronic Diseases (GACD) is a consortium of large public research funders. GACD members jointly launch funding opportunities for proposals and have created a network of grantees to exchange data and best practices.<sup>87</sup> GACD member countries could explore bringing in private partners and jointly funding research. Although science is becoming global, funding for science remains mostly at the national or local level. The Panel recommended bringing together several NIH Institutes and Centers with foundations and creating a common framework for joint calls for proposals for implementation research. However, this approach remains very challenging.

### **Building the Workforce for Implementation Research**

A decade ago, few biomedical scientists would typically describe themselves as implementation researchers. However, with today's growth in the implementation research field, multiple training programs

have been developed. Conferences, workshops, short courses, summer training institutes, graduate courses, and degree programs in implementation research are increasingly available.<sup>88-91</sup> Some NIH institutes and other federal agencies have established dedicated units focused on implementation research that include efforts to train the future workforce (e.g. NHLBI, NCI, NIMH, AHRQ). At the University of Toronto, a Knowledge Translation Program<sup>91</sup> for graduate students provides basic training for researchers and implementers (e.g., health administrators, policymakers, and patients). Team science is included in this training since tackling complex issues will require contributions from several disciplines. This training also addresses core methods, such as evaluation, integration of qualitative and quantitative evidence into systematic reviews, determinants of knowledge uptake, scalability, and sustainability.

The Panel noted that many academic medical centers are setting up centers for innovative research that complement implementation research such as those focusing on quality improvement, closely related to implementation research – the key distinction being that quality improvement focuses on improving health care quality and implementation research generates new knowledge regarding the best processes and approaches for implementation. These centers will be critical actors for creating new models needed to support and sustain implementation research and de-risk career paths for young investigators. Medical, nursing, and allied health professional students are a valuable pipeline for future implementation researchers. Mentorship and partnerships with senior investigators are important for the success of junior implementation researchers.

Recently, the training needs for implementation research were reported.<sup>89</sup> In this report, in spite of many new efforts, training slots were reported inadequate to meet demand and individual programs have struggled aligning across programs and meeting trainee needs.<sup>89</sup>

The Panel had several concrete recommendations for consideration including: creating MD/PhD programs for implementation research; developing team science K-awards (early career support) that bring together multidisciplinary teams; creating center grants (or supplements for existing centers) for implementation research to raise the profile of the field and attract junior investigators; developing an



implementation research curriculum for the NIH Clinical and Translational Science Awards (CTSAs); convening academic medical centers, the American Medical Colleges, the National Academy of Medicine, the Association of Schools and Programs of Public Health, and the American Public Health Association, to explore integration of clinical practice with implementation research; developing national guidelines for training community health workers in implementation research; training U.S. students in low- and middle-income countries with experiences with implementation; and finally, establishing a collective repository of information on implementation research training programs, internships, and potential partners.

Building a cadre of implementation researchers may require targeted changes in the academic culture, research infrastructure and environment, and training opportunities, making it attractive and de-risking it as a career track across disciplines.

## **Discussion**

The landmark studies of the National Research Council and the Institute of Medicine<sup>2,3</sup> clearly described, in detail, a U.S. health disadvantage compared to other peer high-income countries – a disadvantage that cuts across the entire population. More recent studies confirm the major U.S. finding from these landmark studies and report that the U.S. health gains in some subpopulations are stagnant or reversing.<sup>44-46,49</sup> The many drivers of this disadvantage span the social-ecological framework and include both upstream factors such as social determinants and as well as downstream factors such as access to, utilization, and quality of health care. While more and better data may help refine the magnitude and causes of the disadvantage, here we focus more on strategies to tackle it.

This Think Tank Panel, while exploring the key drivers of the U.S. health disadvantage, also focused on identifying key challenges and opportunities for implementation research that will take proven effective treatments and preventive interventions and find optimal and sustainable delivery strategies that will benefit population level health. As was evident, this research strategy can be greatly refined by international research

experiences and their findings. Potential solutions may lie in addressing a number of the critical drivers of the U.S health disadvantage.

Many challenges remain. Despite much effort in the U.S. to improve the quality of clinical care, national surveys find that adult outpatient care has not consistently improved and inpatient care delivery has challenges in providing guideline-based care.<sup>92-94</sup> For example, the sickest 10% of patients account for nearly two thirds of all health care expenses, yet intensive primary care programs have had only limited success to reverse this pattern.<sup>95,96</sup> Moreover, U.S. health care spending is greater than any other country in the world<sup>97,98</sup> with the proportion of its gross domestic productivity nearly twice as much as any other OECD country average (16.4% versus 8.9%) and spending per capita over twice (US\$8,713 versus US\$3,453, respectively).<sup>99</sup> Yet, as noted, the outcomes do not match investments. For the U.S., lack of health care investment is less of an issue and rather, how resources are used and who benefits from these expenditures are key. Implementation research can inform strategies designed to improve uptake of proven interventions that can improve health, minimize inefficiencies, and when conducted in underserved communities can also inform strategies to improve health equity.<sup>100</sup> A community-wide program in one country targeting CVD risk factors and behavior changes over 40 years recently reported improved rural population health – one potential success but there are only few examples.<sup>101</sup>

We are beginning to get insights into the interplay between unmet resource needs and health care benefits.<sup>102,103</sup> A recent U.S. study aimed at improving uptake of primary care included adult patients from three academic internal medicine practices in a metropolitan area and screened them for unmet resources needs related to food, medications, transportation, utilities, employment, elder care services, and housing.<sup>102</sup> Patients who reported one or more unmet needs and who enrolled in the assistance program (57% of the total study population had one or more needs), demonstrated modest improvements in blood pressure and lipid control over the 3-year study. Further study will be needed to understand the exact impact of this intervention. The study's accompanying editorial noted that addressing unmet social needs has become increasingly recognized as a

critical component to effective health care delivery and these are often related to key social determinants of health as well.<sup>103</sup>

Broad partnerships and collaborations will play a critical role across all these efforts. Finally, while progress has been made, much attention to developing, fostering, and sustaining a robust community of investigators for implementation research is clearly needed.

The path ahead is challenging. However, the benefits will be great. A complement of optimal and sustainable strategies targeted at the key drivers of the U.S. health disadvantage should prove impactful and will allow for capitalizing on our vast biomedical knowledge base we now have at hand.

## **Conclusion**

Development of the U.S. health disadvantage has taken decades and seemingly is continuing to evolve. Its origins are complex and span the nation's entire socio-ecological spectrum with contributions from every level. This Think Tank meeting of national and international experts and key stakeholders from peer countries provided insights into understanding its determinants and to identifying implementation research opportunities that will help address it. With better understanding and the relevant knowledge to tackle it, prioritizing implementation research can be a strong part of reversing this enduring health disadvantage.

## **References**

1. Fineberg HV, Hunter DJ. A global view of health--an unfolding series. *The New England journal of medicine* 2013; **368**(1): 78-9.
2. Woolf SH, Aron, L., editor. U.S. Health in International Perspective: Shorter Lives, Poorer Health. Panel on Understanding Cross-National Health Differences Among High-Income Countries. Washington, D.C.: Institute of Medicine National Academies Press; 2013.
3. Crimmins EM, Preston, S.M., Cohen, B., editor. Explaining Divergent Levels of Longevity in High-Income Countries. Washington, D.C. : National Research Council of the National Academies 2011.
4. Marmot M. The Health Gap. The Challenge of an Unequal World. Great Britain: Bloomsbury 2015.
5. Egen O, Beatty K, Blackley DJ, Brown K, Wykoff R. Health and Social Conditions of the Poorest Versus Wealthiest Counties in the United States. *American journal of public health* 2016: e1-e6.

6. Banks J, Marmot M, Oldfield Z, Smith JP. Disease and disadvantage in the United States and in England. *Jama* 2006; **295**(17): 2037-45.
7. Ali MK, Jaacks LM, Kowalski AJ, Siegel KR, Ezzati M. Noncommunicable Diseases: Three Decades Of Global Data Show A Mixture Of Increases And Decreases In Mortality Rates. *Health Aff (Millwood)* 2015; **34**(9): 1444-55.
8. Xu J, Murphy SL, Kochanek KD, Arias E. Mortality in the United States, 2015. NCHS Data Brief No. 267 December 2016. <https://www.cdc.gov/nchs/data/databriefs/db267.pdf> (accessed Dec 9, 2016). (accessed).
9. Dwyer-Lindgren L, Bertozzi-Villa A, Stubbs RW, et al. US County-Level Trends in Mortality Rates for Major Causes of Death, 1980-2014. *Jama* 2016; **316**(22): 2385-401.
10. Roth GA, Dwyer-Lindgren L, Bertozzi-Villa A, et al. Trends and Patterns of Geographic Variation in Cardiovascular Mortality Among US Counties, 1980-2014. *Jama* 2017; **317**(19): 1976-92.
11. Mensah GA, Goff DC, Gibbons GH. Cardiovascular Mortality Differences-Place Matters. *Jama* 2017; **317**(19): 1955-7.
12. Gebreab SY, Davis SK, Symanzik J, Mensah GA, Gibbons GH, Diez-Roux AV. Geographic variations in cardiovascular health in the United States: contributions of state- and individual-level factors. *Journal of the American Heart Association* 2015; **4**(6): e001673.
13. Murray CJ, Kulkarni SC, Michaud C, et al. Eight Americas: investigating mortality disparities across races, counties, and race-counties in the United States. *PLoS Med* 2006; **3**(9): e260.
14. Lu Y, Ezzati M, Rimm EB, Hajifathalian K, Ueda P, Danaei G. Sick Populations and Sick Subpopulations: Reducing Disparities in Cardiovascular Disease Between Blacks and Whites in the United States. *Circulation* 2016; **134**(6): 472-85.
15. Kontis V, Bennett JE, Mathers CD, Li G, Foreman K, Ezzati M. Future life expectancy in 35 industrialised countries: projections with a Bayesian model ensemble. *Lancet* 2017; **389**(10076): 1323-35.
16. Sampson UK, Chambers D, Riley W, Glass RI, Engelgau MM, Mensah GA. Implementation Research: The Fourth Movement of the Unfinished Translation Research Symphony. *Glob Heart* 2016; **11**(1): 153-8.
17. Mensah GA. NCD Research in the Post-2015 Global Health Agenda: Perspectives from the NHLBI Strategic Vision. *Glob Heart* 2016; **11**(4): 479-83.
18. World Bank. Remarks As Prepared for Delivery: World Bank Group President Jim Yong Kim at the Annual Meeting Plenary Session <http://www.worldbank.org/en/news/speech/2012/10/12/remarks-world-bank-group-president-jim-yong-kim-annual-meeting-plenary-session>. (accessed Dec 1 2016).
19. WHO, editor. Implementation Research in Health: A Practical Guide. Geneva: WHO; 2013.
20. Engelgau MM, Peprah E, Sampson UK, Mensah GA. A global health strategy to capitalize on proven-effective interventions for heart, lung, and blood diseases. *Glob Heart* 2015; **10**(1): 87-91.
21. Mensah GA, Engelgau M, Stoney C, et al. News from NIH: a center for translation research and implementation science. *Translational behavioral medicine* 2015; **5**(2): 127-30.
22. Wilensky G. Addressing Social Issues Affecting Health to Improve US Health Outcomes. *Jama* 2016; **315**(15): 1552-3.
23. Smith KB, Humphreys JS, Wilson MG. Addressing the health disadvantage of rural populations: how does epidemiological evidence inform rural health policies and research? *Aust J Rural Health* 2008; **16**(2): 56-66.
24. Commission on Social Determinates of Health (2008). Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health. Geneva, World Health Organization. [http://www.who.int/social\\_determinants/thecommission/finalreport/en/](http://www.who.int/social_determinants/thecommission/finalreport/en/) (accessed Nov 15, 2016). (accessed).
25. Social Determinants of Health: The Solid Facts. 2nd Edition. (2003) Michael Marmot and Richard Wilkinson Eds. Geneva, World Health Organization. <http://www.euro.who.int/data/assets/pdf/file/0005/98438/e81384.pdf> (accessed Nov 15, 2016).
26. Montez JK, Zajacova, A., Hayward, M.D. . Explaining inequalities in women's mortality between U.S.States. *SSM - PopulationHealth* 2016; **2**: 561-71.

27. Stringhini S, Carmeli C, Jokela M, et al. Socioeconomic status and the 25 x 25 risk factors as determinants of premature mortality: a multicohort study and meta-analysis of 1.7 million men and women. *Lancet* 2017; **389**(10075): 1229-37.
28. Heckman JJ, Raut LK. Intergenerational Long-Term Effects of Preschool - Structural Estimates from a Discrete Dynamic Programming Model. *Journal of econometrics* 2016; **191**(1): 164-75.
29. 2104 OOUJ.
30. Dondo TB, Hall M, Timmis AD, et al. Geographic variation in the treatment of non-ST-segment myocardial infarction in the English National Health Service: a cohort study. *BMJ Open* 2016; **6**(7): e011600.
31. Spatz ES, Beckman AL, Wang Y, Desai NR, Krumholz HM. Geographic Variation in Trends and Disparities in Acute Myocardial Infarction Hospitalization and Mortality by Income Levels, 1999-2013. *JAMA Cardiol* 2016; **1**(3): 255-65.
32. Beckman AL, Bucholz EM, Zhang W, et al. Sex Differences in Financial Barriers and the Relationship to Recovery After Acute Myocardial Infarction. *Journal of the American Heart Association* 2016; **5**(10).
33. Kim LK, Looser P, Swaminathan RV, et al. Sex-Based Disparities in Incidence, Treatment, and Outcomes of Cardiac Arrest in the United States, 2003-2012. *Journal of the American Heart Association* 2016; **5**(6).
34. Agency for Healthcare Research and Quality. National Healthcare Quality and Disparities Report and National Quality Strategy 5th Anniversary Update: Combined Report <http://www.ahrq.gov/research/findings/nhqrdr/nhqrdr15/index.html> (accessed Nov 6, 2016). (accessed.
35. Devaux M dLM. Income-Related Inequalities in Health Service Utilisation in 19 OECD Countries, 2008-2009. OECD Health Working Papers, No. 58, OECD Publishing, Paris (2012). <http://dx.doi.org/10.1787/5k95xd6stnxt-en> (accessed April 18, 2017)
  
36. OECD. Health at a Glance 2013: OECD Publishing, Paris; 2013.
37. Di Cesare M, Khang YH, Asaria P, et al. Inequalities in non-communicable diseases and effective responses. *Lancet* 2013; **381**(9866): 585-97.
38. Clark CR, Williams DR. Understanding County-Level, Cause-Specific Mortality: The Great Value-and Limitations-of Small Area Data. *Jama* 2016; **316**(22): 2363-5.
39. van Hedel K, Avendano M, Berkman LF, et al. The contribution of national disparities to international differences in mortality between the United States and 7 European countries. *American journal of public health* 2015; **105**(4): e112-9.
40. Bradley EH, Canavan M, Rogan E, et al. Variation In Health Outcomes: The Role Of Spending On Social Services, Public Health, And Health Care, 2000-09. *Health Aff (Millwood)* 2016; **35**(5): 760-8.
41. McCullough JM, Leider JP. Government Spending In Health And Nonhealth Sectors Associated With Improvement In County Health Rankings. *Health Aff (Millwood)* 2016; **35**(11): 2037-43.
42. Karthikesalingam A, Holt PJ, Vidal-Diez A, et al. Mortality from ruptured abdominal aortic aneurysms: clinical lessons from a comparison of outcomes in England and the USA. *Lancet* 2014; **383**(9921): 963-9.
43. Ford ES, Ajani UA, Croft JB, et al. Explaining the decrease in U.S. deaths from coronary disease, 1980-2000. *The New England journal of medicine* 2007; **356**(23): 2388-98.
44. Wilmot KA, O'Flaherty M, Capewell S, Ford ES, Vaccarino V. Coronary Heart Disease Mortality Declines in the United States From 1979 Through 2011: Evidence for Stagnation in Young Adults, Especially Women. *Circulation* 2015; **132**(11): 997-1002.
45. Sidney S, Quesenberry CP, Jr., Jaffe MG, et al. Recent Trends in Cardiovascular Mortality in the United States and Public Health Goals. *JAMA Cardiol* 2016; **1**(5): 594-9.
46. Case A, Deaton A. Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century. *Proc Natl Acad Sci U S A* 2015; **112**(49): 15078-83.
47. Ho JY. Mortality under age 50 accounts for much of the fact that US life expectancy lags that of other high-income countries. *Health Aff (Millwood)* 2013; **32**(3): 459-67.

48. Drefahl S, Ahlbom A, Modig K. Losing ground--Swedish life expectancy in a comparative perspective. *PloS one* 2014; **9**(2): e88357.
49. Hansen H NJ. Is the Prescription Opioid Epidemic a White Problem? . *Am J Pub Hlth* 2016; **106**(12): 2127-9.
50. Pierce JR, Schott PK. Trade liberalization and mortality: evidence from U.S. counties. NBER Working Paper Series 22849. National Bureau of Economic Research. <http://www.nber.org/papers/w22848> accessed Nov 25, 2015. (accessed.
51. U.S. Department of Health and Human Services (HHS) OotSG, Facing Addiction in America: The Surgeon General's Report on Alcohol, Drugs, and Health. Washington, DC: HHS, November 2016.
52. REasons for Geographic and Racial Differences in Stroke (REGARDS) Project. <http://www.regardsstudy.org/about> (accessed Dec 12 2016). (accessed.
53. Chung SC, Gedeberg R, Nicholas O, et al. Acute myocardial infarction: a comparison of short-term survival in national outcome registries in Sweden and the UK. *Lancet* 2014; **383**(9925): 1305-12.
54. Mackenbach JP, Kulhanova I, Artnik B, et al. Changes in mortality inequalities over two decades: register based study of European countries. *Bmj* 2016; **353**: i1732.
55. Mackenbach JP, Kulhanova I, Bopp M, et al. Inequalities in Alcohol-Related Mortality in 17 European Countries: A Retrospective Analysis of Mortality Registers. *PLoS Med* 2015; **12**(12): e1001909.
56. Mackenbach JP, Stirbu I, Roskam AJ, et al. Socioeconomic inequalities in health in 22 European countries. *The New England journal of medicine* 2008; **358**(23): 2468-81.
57. European Health Care Outcomes, Performance and Efficiency. <http://www.eurohope.info/index.html> (accessed Dec 9, 2016). (accessed.
58. Health disparities in Europe: hope for the future? *Lancet* 2014; **383**(9926): 1360.
59. Hakkinen U, Iversen T, Peltola M, et al. Health care performance comparison using a disease-based approach: the EuroHOPE project. *Health policy* 2013; **112**(1-2): 100-9.
60. Behavior Risk Factor Surveillance System. CDC. <http://www.cdc.gov/brfss/>.
61. CMS DataNavigator. Centers for Medicare & Medicaid Services. <https://dnv.cms.gov/> (accessed Dec 9, 2018). (accessed.
62. The Youth Risk Behavior Surveillance System. CDC. <http://www.cdc.gov/healthyyouth/data/yrbs/> (accessed Dec 1, 2016).
63. National Children's Study (NCS). National Institutes of Health. <https://www.nichd.nih.gov/research/NCS/Pages/default.aspx> (accessed Dec 1, 2016).
64. American Community Survey (ACS). United States Census Bureau. <http://www.census.gov/programs-surveys/acs/about.html> (accessed Dec 1, 2016).
65. Background, Development and Organization of MONICA. WHO. [http://www.who.int/cardiovascular\\_diseases/media/en/a1\\_40.pdf](http://www.who.int/cardiovascular_diseases/media/en/a1_40.pdf) (accessed Dec 1, 2016).
66. Benach J, Malmusi D, Yasui Y, Martinez JM. A new typology of policies to tackle health inequalities and scenarios of impact based on Rose's population approach. *Journal of epidemiology and community health* 2013; **67**(3): 286-91.
67. Benach J, Malmusi D, Yasui Y, Martinez JM, Muntaner C. Beyond Rose's strategies: a typology of scenarios of policy impact on population health and health inequalities. *International journal of health services : planning, administration, evaluation* 2011; **41**(1): 1-9.
68. Health Quality Ontario. Let's make our health system healthier. <http://www.hqontario.ca/About-Us> (accessed Dec 22, 2016). .
69. Kassler WJ, Howerton M, Thompson A, Cope E, Alley DE, Sanghavi D. Population Health Measurement at Centers for Medicare & Medicaid Services: Bridging the Gap Between Public Health and Clinical Quality. *Population health management* 2016.
70. Australia Government Department of Health. Close the Gap. <http://www.health.gov.au/internet/main/publishing.nsf/Content/mc15-002185-close-the-gap> (accessed Dec 9, 2016).
71. Statistic New Zealand. [http://www.stats.govt.nz/browse\\_for\\_stats/health/life\\_expectancy/NZLifeTables\\_HOTP12-14.aspx](http://www.stats.govt.nz/browse_for_stats/health/life_expectancy/NZLifeTables_HOTP12-14.aspx) (accessed Dec 9, 2016).

72. Edwards R, Gifford H, Waa A, Glover M, Thomson G, Wilson N. Beneficial impacts of a national smokefree environments law on an indigenous population: a multifaceted evaluation. *International journal for equity in health* 2009; **8**: 12.
73. Tobias M, Blakely T, Matheson D, Rasanathan K, Atkinson J. Changing trends in indigenous inequalities in mortality: lessons from New Zealand. *International journal of epidemiology* 2009; **38**(6): 1711-22.
74. Eikemo TA, Hoffmann R, Kulik MC, et al. How can inequalities in mortality be reduced? A quantitative analysis of 6 risk factors in 21 European populations. *PloS one* 2014; **9**(11): e110952.
75. Gregoraci G, van Lenthe FJ, Artnik B, et al. Contribution of smoking to socioeconomic inequalities in mortality: a study of 14 European countries, 1990-2004. *Tob Control* 2017; **26**(3): 260-8.
76. Jaffe MG, Lee GA, Young JD, Sidney S, Go AS. Improved blood pressure control associated with a large-scale hypertension program. *Jama* 2013; **310**(7): 699-705.
77. Bartolome RE, Chen A, Handler J, Platt ST, Gould B. Population Care Management and Team-Based Approach to Reduce Racial Disparities among African Americans/Blacks with Hypertension. *Perm J* 2016; **20**(1): 53-9.
78. National Academies of Sciences, Engineering, and Medicine 2016. The role of public-private partnerships in health systems strengthening: Workshop summary. Washington, DC: The National Academies Press. (accessed.
79. Rudan I, Sridhar D. Structure, function and five basic needs of the global health research system. *J Glob Health* 2016; **6**(1): 010505.
80. Mensah GA. New Partnerships to Advance Global Health Research for NCD. *Glob Heart* 2016; **11**(4): 473-8.
81. Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *The New England journal of medicine* 2002; **346**(6): 393-403.
82. Tuomilehto J, Lindstrom J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *The New England journal of medicine* 2001; **344**(18): 1343-50.
83. Pan XR, Li GW, Hu YH, et al. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. *Diabetes Care* 1997; **20**(4): 537-44.
84. National Diabetes Prevention Program <https://www.cdc.gov/diabetes/prevention/about/index.html> (accessed Oct 10, 2016). (accessed.
85. Clinton Foundation. <https://www.clintonfoundation.org/> (accessed Dec 6 2016).
86. Foundation for the National Institutes of Health <http://www.fnih.org/> (accessed Dec 6 2016). (accessed.
87. Global Alliance for Chronic Diseases <http://www.gacd.org/> (accessed Dec 6, 2016).
88. Training Institute on Dissemination and Implementation Research (TIDIRH). <https://obsr.od.nih.gov/training/training-institutes/training-institute-on-dissemination-and-implementation-research-tidirh/> (accessed Dec 6, 2016).
89. Chambers DA, Proctor EK, Brownson RC, Straus SE. Mapping training needs for dissemination and implementation research: lessons from a synthesis of existing D&I research training programs. *Translational behavioral medicine* 2016.
90. 9th Annual Conference on the Science of Dissemination and Implementation <http://www.academyhealth.org/events/site/9th-annual-conference-science-dissemination-and-implementation> (accessed Dec 6 2016).
91. Knowledge Translation Program University of Toronto <http://knowledgetranslation.net/> (accessed Dec 22, 2016).
92. Levine DM, Linder JA, Landon BE. The Quality of Outpatient Care Delivered to Adults in the United States, 2002 to 2013. *JAMA Intern Med* 2016; **176**(12): 1778-90.
93. Cheung A, Stukel TA, Alter DA, et al. Primary Care Physician Volume and Quality of Diabetes Care: A Population-Based Cohort Study. *Annals of internal medicine* 2016.
94. Tsugawa Y, Jena AB, Figueroa JF, Orav EJ, Blumenthal DM, Jha AK. Comparison of Hospital Mortality and Readmission Rates for Medicare Patients Treated by Male vs Female Physicians. *JAMA Intern Med* 2016.

95. National Advisory Council. Trends in Healthcare Costs and the Concentration of Medical Expenditures. 2012; Slide Presentation from the July 13, 2012. <https://www.ahrq.gov/news/events/nac/2012-07-nac/cohenmeyers/cohenmeyersssl18.html> (accessed Jan 3, 2017). . (accessed).

96. Peterson K, Helfand M, Humphrey L, Christensen V, Carson S. Evidence Brief: Effectiveness of Intensive Primary Care Programs. VA Evidence-based Synthesis Program Evidence Briefs. Washington (DC); 2011.

97. Dieleman JL, Baral R, Birger M, et al. US Spending on Personal Health Care and Public Health, 1996-2013. *Jama* 2016; **316**(24): 2627-46.

98. Emanuel EJ. How Can the United States Spend Its Health Care Dollars Better? *Jama* 2016; **316**(24): 2604-6.

99. OECD Health Statistics 2015. Country Note: How does health spending in the United States compare? <https://www.oecd.org/unitedstates/Country-Note-UNITED%20STATES-OECD-Health-Statistics-2015.pdf> (accessed Nov 30 2016). (accessed).

100. Stronks K, Mackenbach JP. Evaluating the effect of policies and interventions to address inequalities in health: lessons from a Dutch programme. *European journal of public health* 2006; **16**(4): 346-53.

101. Record NB, Onion DK, Prior RE, et al. Community-wide cardiovascular disease prevention programs and health outcomes in a rural county, 1970-2010. *Jama* 2015; **313**(2): 147-55.

102. Berkowitz SA, Hulberg AC, Standish S, Reznor G, Atlas SJ. Addressing Unmet Basic Resource Needs as Part of Chronic Cardiometabolic Disease Management. *JAMA Intern Med* 2016.

103. McMullen AM, Katz MH. Targeting Unmet Social Needs-Next Steps Toward Improving Chronic Disease Management. *JAMA Intern Med* 2016.

**Table 1. Key challenges and recommendations from the NHLBI Think Tank meeting on the United States Health Disadvantage.**

A. Understanding the U.S. health disadvantage

<b>Key Challenges</b>	<b>Key Recommendations</b>
<ul style="list-style-type: none"> <li>• Large disparities in life expectancy by income and geography exist in the U.S.</li> <li>• Determinants of health are highly linked, complex, and operate at multiple levels.</li> <li>• Geography can drive health behaviors, socioeconomic, and educational behaviors.</li> <li>• Common origins of many health disparities lay in early childhood development.</li> <li>• Community social issues (education, housing, safety, access to healthy foods) are priority issues but not typically considered important for health within the community.</li> <li>• The role of “upstream” factors such as socioeconomic status and other social determinants of health and “downstream” factors such as access to health care can both make major contributions to health status.</li> <li>• A life course approach will take longer term planning and implementation while rapid improvements are also needed.</li> <li>• Transnational health outcome research is occurring in peer countries but requires highly harmonized data systems over the long term.</li> <li>• Patient level socioeconomic level data are need to understand its influence on health yet have several challenges including: confidentiality, non-availability or accessibility of data, declining survey response rates, poor harmonization across data sources; validity of self-reported risk, lack of policy and intervention exposure</li> <li>• Currently much data in the U.S. are underused.</li> </ul>	<ul style="list-style-type: none"> <li>• In-depth comparative assessments of geographic areas with the worst and best health outcomes may contribute to understanding geographic variation.</li> <li>• Age-specific death causes and should lend insight to current trends and can examine stagnating U.S. population mortality while it falling in peer countries.</li> <li>• Assess and compare health policy implementation across states and sub-region.</li> <li>• Explore longstanding cohort studies to understand complex evolving social and health inequities.</li> <li>• Consider tapping administrative and “big” data and other current data sources for studies.</li> <li>• Use mixed methods (qualitative and quantitative) in comparative effectiveness research to identify the active components of multicomponent strategies.</li> <li>• Time-series analyses or multiple meta-analyses of small studies might be more powerful than single RCTs because their findings are more representative of the population.</li> <li>• Observational study designs that monitor local initiatives in may help determine whether they are making a difference.</li> <li>• Understand why the U.S. is doing better for some key indicators compared to peer countries</li> <li>• Minimize collection of new primary data and develop a large new data enterprise using existing data as the focus of current efforts.</li> </ul>



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**B. Potential solutions for the U.S. health disadvantage**

<p><u>Key Challenges</u></p> <ul style="list-style-type: none"> <li>• A gradient of health disadvantage exists throughout the entire population.</li> <li>• Implementation of interventions within complex systems has multiple dimensions within and outside the health care system.</li> <li>• Health care systems may not perceive they have a role in population health.</li> <li>• Various socioeconomic factors and health risk factors profiles may have discordant trends (i.e., one can improve while the other worsens).</li> <li>• Beneficial new technologies can be taken up quicker in advantaged populations and exacerbate inequities.</li> <li>• International comparisons will need to account for the differences in duration of the policies that have been in place.</li> </ul>	<p><u>Key Recommendations</u></p> <ul style="list-style-type: none"> <li>• Targeting populations across the entire socioeconomic spectrum will prevent missing a substantial portion of the total disadvantage burden.</li> <li>• Key elements for interventions will be at every level of the sociological model (e.g. personal incentives, regulations, laws, self-efficacy, and culture).</li> <li>• Understanding the organization of health care, accountability and quality improvement, financing, provider incentives, along with access to care is needed.</li> <li>• Establish a small number of highly focused priority disadvantage topic areas (e.g. hypertension prevention and control) to keep efforts focused.</li> <li>• Consider both long term life-course approaches and short term approaches.</li> <li>• A social determinate focus should include recommendations of the WHO Commission on the Social Determinants of Health</li> </ul>
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**C. Partnerships, collaborations, and building the workforce to tackle the U.S. health disadvantage**

<i>Partnerships and Collaborations</i>	
<p><u>Key Challenges</u></p> <ul style="list-style-type: none"> <li>• Collaborations across the socioecological spectrum (health sector, housing, employment, education, environment, agriculture, transportation, academia, funders, industry, philanthropy, etc.) are difficult and challenging</li> <li>• Forming and sustaining partnerships will be a challenge since a single model does not fits all partner needs.</li> <li>• Implementation translation research is new for some health research organizations that typically fund clinical trials or basic science. Collaborators and partners, therefore, need to make sure that everyone understands what they are funding.</li> <li>• Some stakeholders might not want researchers to publish results that show the sponsor in an unfavorable light.</li> </ul>	<p><u>Key Recommendations</u></p> <ul style="list-style-type: none"> <li>• Partnerships at multiple levels are needed and essential for implementation research.</li> <li>• Develop common goals among partners with competing interests.</li> <li>• Bring together several NIH Institutes and Centers with foundations and create a common framework for joint initiative calls for proposals for implementation research that address knowledge gaps with the potential of the greatest population impact.</li> <li>• The high level goal is to create systematic change through collective impact.</li> </ul>

<i>Building the Workforce for Implementation Research</i>	
<p><u>Key Challenges</u></p> <ul style="list-style-type: none"> <li>• Over a decade ago no researcher at NIH would typically have described themselves as an implementation researcher.</li> <li>• Many basic scientists think that implementation science is not rigorous and should not be funded.</li> <li>• A culture change is needed so that implementation scientists are treated in the same way as basic scientists in the promotion and tenure process.</li> <li>• Implementation research and quality improvement are largely siloed within most academic health institutions.</li> </ul>	<p><u>Key Recommendations</u></p> <ul style="list-style-type: none"> <li>• Training needs for dissemination and implementation (D&amp;I) research have recently been described.</li> <li>• Team science should be included in this training because tackling complex issues and methods such as evaluation, integration of qualitative and quantitative evidence into systematic reviews, determinants of knowledge uptake, and sustainability and scalability should be included.</li> <li>• Promote integration of implementation research and quality improvement through funding initiatives.</li> </ul>

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| <ul style="list-style-type: none"><li>• Need to de-risk implementation research career path for young investigators considering it.</li></ul> |  |
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