

Psychological Science and Behavioral Economics in the Service of Public Policy

IN THE SERVICE OF PUBLIC POLICY

**May 22, 2013
Washington, DC**

MEETING SUMMARY

**National Institute on Aging
National Institutes of Health**

FOR ADMINISTRATIVE USE

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EXECUTIVE SUMMARY

Introduction

Two recent reports by the National Academies, both commissioned by the National Institutes of Health (NIH), have been instrumental in calling attention to indications of poorer health status and lower life expectancy in the United States relative to countries of comparable income and in meticulously reviewing the evidence to understand the reasons for these outcomes, which occur despite U.S. advantages in wealth and health care spending.¹ There is no single explanatory factor for the health disadvantage, which is pervasive across age and socioeconomic groups. The areas of greatest discrepancy—adverse birth outcomes, accidents and homicides, teen pregnancy, human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS), obesity and diabetes, heart disease, and drug-related mortality—stem in large part from individual behavior and social determinants of health. The return on investment from basic and translational research on behavior change is therefore potentially enormous.

On May 22, 2013, the National Institute on Aging (NIA), NIH, in collaboration with the White House Council of Economic Advisers (CEA), the White House Office of Science and Technology Policy (OSTP), and the Association for Psychological Science (APS), convened a meeting of eminent scientists from the fields of psychology and behavioral economics to highlight the potential for social and behavioral research to play a more influential role in the service of public policy, discuss strategies for bringing important research findings to the attention of policy makers, and identify lessons that can be learned from approaches undertaken in the United Kingdom Cabinet Office Behavioural Insights Team to leverage behavioral research findings, a great deal of which has been from research conducted in the United States. While NIA does not support policy research per se, findings from the basic behavioral and social science research that it does support are an important resource for informing policies that address the multiple causes of the U.S. health disadvantage.

Psychological scientists and behavioral economists conduct policy-relevant basic and translational research on health and economic decision making, health care utilization and health behaviors, and on social and behavioral factors that impact the health, economic status, and well-being of individuals and societies. In addition to keynote addresses commenting on the role of psychological science and economics in public policymaking, behavioral economics and America's greatest challenges, and applying behavioral insights in the service of public policy, more than 20 invited experts highlighted the essence of their research and its

¹ National Research Council. (2011). *International Differences in Mortality at Older Ages: Dimensions and Sources*. Washington, DC: The National Academies Press.

National Research Council. (2013). *US Health in International Perspective: Shorter Lives, Poorer Health*. Washington, DC: The National Academies Press.

significance for policy discussions in succinct presentations that were clustered in three substantive areas: (1) individual level risk factors and intervention targets; (2) social risk factors and intervention targets; and (3) new directions in the science of behavior change.

The Relevance of Behavioral Economics and Psychological Sciences for Policy

The field of behavioral economics is concerned with developing a more realistic understanding of the way people make decisions individually and in groups; its methods and models draw from more traditional behavioral science perspectives, particularly in the areas of cognition, judgment, and emotion. It overlaps with psychological science, which is concerned with a broad range of topics, from basic brain and physiological functioning to how people think, learn, and remember, to how people interact and function in families and organizations.

Decades of psychological research findings have significant implications for both prevention and intervention programs. Presenters offered compelling examples of research findings with policy relevance, including: self-control and delay of gratification among preschoolers predicts consequential life-long health and economic relevant outcomes including social functioning, body mass index (BMI), and cognitive ability; neuroplasticity of the brain indicates opportunities for reversing negative impacts of early adversity; childhood experiences of attachment and security (in rhesus monkeys) have long-term behavioral and physiological effects that can be partially reversed with intervention; and social connectedness and engagement influence health and mortality across the lifespan.

Collaboration across the fields of behavioral economics and psychological science is critical for generating scientific evidence that can be used to inform policies to promote positive behavior change in a variety of areas (e.g., health-promoting behaviors, retirement savings). Economists have traditionally played a more visible role than psychological researchers in policy discussions. While the Executive Office of the President includes the CEA, psychologists are less prominently represented, despite the relevance of psychological science for many policy areas. Yet there is increasing collaboration among behavioral economists, psychologists, and neuroscientists to understand human behavior, to better anticipate behaviors in response to proposed policy prescriptions, and to find ways to “nudge” individuals to act in ways beneficial to themselves and to society as a whole. Although economics and psychological science share many similarities including interest in causal pathways, experiments, and decision making, some contrasts perhaps favor economics for policy design.

Economists have increasingly used field and natural experiments to test external validity of theories, are more interested in effect sizes, and think system-wide with more concern about unintended consequences of interventions. By adopting some of these features of economics research, psychological research might be more amenable to policy design and application. More work is needed to increase the appreciation among policy makers, the media, and the public of behavioral research as a tool for informing policy. The field of psychology itself needs to place greater value on applied research—with top universities, top journals, and funding

agencies leading the way—in order to develop the best talent for applying psychological principles to policy interventions.

Behavioral economics research can help address some of the greatest challenges facing this country, such as expanding the middle class, reducing long-term unemployment, and closing the income inequality gap. Measures of subjective well-being (SWB) can augment traditional markers of a healthy society, such as Gross Domestic Product (GDP), to inform policy and provide a more nuanced gauge of society's progress. Well-known behavioral economic principles (e.g., loss aversion, present bias, overweighting small probabilities) can be used to design optimal incentive systems to induce behavior change. Collaborative work with the private sector can leverage resources and allow for testing programs in real-world settings.

The U.K. Cabinet Office Behavioural Insights Team has taken a leading role in developing ideas and initiatives that apply behavioral insights, often products of U.S.-based researchers, to improve health and well-being. The U.K. Cabinet Office Behavioural Insights Team also employs randomized controlled trials (RCTs) in developing public policies and providing robust evidence of efficiency and cost-effectiveness. Critical to its success has been high-level support from the Prime Minister and other officials, as well as early successes in areas that resonate with the public.

Next Steps

Building on the valuable insights generated at this meeting, OSTP, CEA, the Office of Management and Budget, and the Department of Treasury co-hosted a meeting on May 23, 2013, that focused on how research findings from the social and behavioral sciences can be harnessed to increase federal program integrity and performance. This effort is part of the Administration's broader agenda to advance evidence-based policymaking through the increased use of innovative, low-cost approaches to program design and evaluation. The meeting concluded with commitments from the Executive Offices, federal agencies, and external foundations regarding concrete next steps they will take to help accelerate and build infrastructure for this approach. These are all welcome signs of progress toward harnessing insights from basic behavioral and social science to inform the development of policies that benefit the health and well-being of all Americans.

MEETING REPORT

Introduction

Psychological scientists and behavioral economists conduct policy-relevant basic and translational research on health and economic decision making, health care utilization and health behaviors, and on social and behavioral factors that impact the health, economic status, and well-being of individuals and societies. The Division of Behavioral and Social Research (BSR) at NIA, NIH, Department of Health and Human Services has been working to integrate approaches from psychology and economics in a wide range of health-related areas, including the decision sciences and neuroeconomics, behavioral economics and interventions, measurement of economic phenotypes, and research on subjective well-being (SWB). In 2007, NIA launched its first funding opportunity in neuroeconomics and has been encouraging work on basic mechanisms of decision making and behavior change through NIA and trans-NIH initiatives. Recent momentum in behavior change research has brought heightened attention to the potential for use of choice architectures derived from behavioral economics as a way of removing barriers to and creating incentives for positive health behaviors. Helping people to make the changes that they already wish to do but never manage to start or maintain is a key priority for NIA. Through a series of meetings and initiatives, NIA has attempted to stimulate dialogue between the disciplines of psychology and economics to advance these goals.²

Building on these initiatives, NIA, in collaboration with the OSTP, the APS, and the CEA, convened a meeting of invited experts on May 22, 2013, at the Eisenhower Executive Office Building in Washington, DC (see appendix A for meeting agenda). The purpose of this meeting was to stimulate dialogue among psychological scientists, behavioral economists, policy makers, and funding agencies on: ways to promote evidence-based policy design at the institutional, local, and national levels; use-inspired basic research; and the dissemination and translation of scientific research findings. Invited speakers included eminent leaders in psychological science, behavioral economics, sociology, social epidemiology, and policy (see appendix B for the list of participants.) A number of promising new investigators in the fields of behavioral economics and psychological science, as well as representatives from the sponsoring

² See, for example, reports from the following NIA meetings:

Second Annual Behavioral Economics Conference, Ithaca, NY (May 13-14, 2010) at <http://www.ceda.berkeley.edu/Conferences/confbehav2010report.pdf>; Workshop on Advancing Integrative Psychological Research on Adaptive and Healthy Aging, (May 21, 2009) at <http://www.nia.nih.gov/about/events/2011/workshop-advancing-integrative-psychological-research-adaptive-and-healthy-aging>; Action Research in Psychology and Economics (March 4-5, 2005) at <http://www.nia.nih.gov/about/events/2011/action-research-psychology-and-economics>; Small Interventions with Large Effects: The Psychological Foundations of Effective Policies (November 14, 2003) at <http://www.nia.nih.gov/about/events/2011/small-interventions-large-effects-psychological-foundations-effective-policies>; Motivation and Aging: Toward the Next Generation of Behavioral Interventions (June 18-19, 2012) <http://www.nia.nih.gov/about/events/2013/motivation-and-aging-toward-next-generation-behavioral-interventions>

agencies and funding organizations, such as NIH and the Economic and Social Research Council (ESRC), also participated in the meeting.

On behalf of their respective organizations, Philip Rubin, Ph.D., (OSTP), Alan Kraut, Ph.D., (APS), and Richard Suzman, Ph.D., (NIA) welcomed meeting participants, expressed their hopes that the meeting would have a substantial impact, and thanked staff members from all the collaborating agencies, particularly Lisbeth Nielsen, Ph.D., (NIA) and Rebecca Grimm (OSTP), who were instrumental in the meeting planning and execution. The meeting occurred the day before the 25th annual convention of the APS in Washington, DC, thus offering a timely and fitting tribute to the importance of behavioral science in the Nation's capital. Behavioral science has much to offer the Executive Office of the President in a wide variety of policy domains, including economic productivity, learning and literacy, saving for retirement, social and emotional well-being, health care decision making, and substance abuse. The following highlights key themes from the presentations and discussion at the meeting.

Economics, Psychology, and Policy

Psychological and Economic Voices in the Policy Debate

David Laibson, Ph.D., Harvard University

Behavioral economists embed the best ideas from the field of psychology into economic models, which can be used to explain economic behavior. For example, psychological insights about human behavior (e.g., self-control) can inform policy interventions that cost-effectively change behavior in the desired manner.

Hyperbolic Discounting

Hyperbolic discounting is an economic model informed by psychology. Psychologists Richard Herrnstein, Ph.D., and George Ainslie, M.D. demonstrated that people and animals discount the future hyperbolically. Economists developed a model of present-biased preferences, which is a mathematical simplification of Herrnstein and Ainslie's model showing that immediate rewards are valued twice as much as delayed rewards.³

Procrastination provides an example. A person can exercise today (effort cost of 6) to gain delayed health benefits (future value of 8). The hyperbolic discounting model shows that the net benefit of exercising today for someone with present bias ($-6 + \frac{1}{2} [8] = -2$) is less than the net benefit of exercising tomorrow ($0 + \frac{1}{2} [-6+8] = 1$). Exercising tomorrow involves a delayed cost and delayed benefit, which means that people are likely to procrastinate each day rather than follow through.

Individuals demonstrate procrastination in saving for retirement as well. Out of every 100 surveyed employees in a large firm, 68 report saving too little, 24 plan to raise their savings rate

³ Phelps, E. S. & Pollak, R. A. (1968). On second-best National saving and game-equilibrium growth. *Review of Economic Studies*, 35, 185-199.

in the next 2 months, and three actually raise their savings rate.⁴ People are aware of the problem and plan to fix it, but follow-through is abysmal. Improving 401(k) participation by reducing or eliminating barriers between the undesired (non-enrollment) and desired behaviors (enrollment) demonstrates the application of present bias and hyperbolic discounting to behavior change policy. Several policy options were compared on the outcome of 401(k) enrollment: default non-enrollment (40% participation at 1 year); quick enrollment (50%); active choice enrollment (70%); and default enrollment, or opt-out (90%).⁵ Opt-out, or default enrollment in 401(k), resulted in the highest rate of participation at 1 year.

These same principles can be applied to the health domain. Individuals and society have aligned goals: improve health and control costs. Individuals generally have good intentions for their health and want to change their behavior (e.g., improve diet, increase physical activity, stop smoking, follow treatment advice)—just not right now. The challenge is to align intentions and actions. Flu shot adherence and home delivery of chronic medications are two examples of psychology-informed behavioral economics that have been applied to health policy.

Katherine Milkman, Ph.D., and colleagues examined responses to different strategies to increase flu shot adherence.⁶ Employees in the control condition were informed about the dates and times of free flu shot clinics in the workplace. The control condition was compared to two arms, both of which still included information about the dates and times of the clinics: (1) employees were invited to choose and write down a *date* they planned to get the flu vaccine; and (2) employees were invited to choose and write down a *date and time* they planned to get the flu vaccine. The control condition resulted in 33% of the individuals obtaining the flu vaccine compared to 34.6% of those invited to choose a date and 37.2% of those invited to choose a date and time. The simple strategy of prompting individuals to make a concrete plan to follow through on their intended behavior can impact the desired outcome.

John Beshears, Ph.D., and colleagues examined the use of home delivery of chronic medications, which can lower costs for both employees and employers, save employees' time,

⁴ Choi J., Laibson, D., Madrian, B., & Metrick, A. (2002). Defined contribution pensions: Plan rules, participant decisions, and the path of least resistance. *Tax Policy and the Economy*, 16, 67-114.

⁵ Madrian, B. C. & Shea, D. F. (2001). The power of suggestion: Inertia in 401(k) participation and savings behavior. *Quarterly Journal of Economics*, 116, 1149-1187.

Choi, J. J., Laibson, D., Madrian, B. C., & Metrick, A. (2004). Plan design and 401(k) savings outcomes. *National Tax Journal*, 57, 275-298.

Carroll, G. D., Choi, J. J., Laibson, D., Madrian, B., & Metrick, A. (2009). Optimal defaults and active decisions. *Quarterly Journal of Economics*, 124, 1639-1674.

Choi, J. J., Laibson, D., & Madrian, B. C. (2009). Reducing the complexity costs of 401(k) participation through quick enrollment. In D. A. Wise (Ed.). *Developments in the Economics of Aging* (pp. 57-82). Chicago, IL: University of Chicago Press.

⁶ Milkman, K. L., Beshears, J., Choi, J. J., Laibson, D., & Madrian, B. C. (2011). Using implementation intentions prompts to enhance influenza vaccination rates. *Proceedings of the National Academy of Sciences*, 108, 10415-10420.

and improve medication adherence and safety.⁷ In a pilot study requiring employees in a large firm to make an active choice between home delivery and standard pick up, 52.2% of employees chose home delivery and 47.8% chose standard pharmacy pick up for eligible chronic medications. Prior to the active choice program, 6% of all prescriptions (including those not eligible for home delivery) were filled via home delivery, and after the active choice program, that number increased to 18%. This shift saved the employees and the employer over \$1 million in one year.

Next Frontier in Behavior Change

It is possible that the next frontier in behavior change policy will involve individuals choosing to “bind their own hands” in recognition of their own inability to follow through. Beshears and colleagues conducted a study in which a sample of individuals was given the choice to allocate \$500 to a freedom or goal account.⁸ The freedom account was completely liquid, yielded 22% interest per year, and had no penalties for withdrawal. The goal account required the participant to pick a goal date before which the funds in the account would be illiquid with a 10% early withdrawal penalty and had the same 22% interest rate.

On average participants allocated 35% of the money to the goal account (including the 20% that allocated nothing). Interestingly, when the goal account penalties and restrictions increased for other samples drawn from the same representative population of adults, participants allocated *more*, not less, money to the goal account: 43% of the \$500 was allocated to goal accounts with 20% early withdrawal penalty and 56% was allocated to goal accounts with no withdrawal option. These findings indicate that people know that they have self-control problems and will make choices to protect themselves.

Economic versus Psychological Research

Government agencies and other entities usually have a positive orientation towards economists. Many past and current high-level government officials are economists and the United States maintains the CEA in the Executive Office of the President. Despite the relevance of psychology to many policy areas, psychologists are less prominently involved in government. For example, few, if any, psychologists are included on the U.S. Consumer Financial Protection Bureau’s Academic Research Council or the Commission on the Measurement of Economic Performance and Social Progress (France). It is difficult to ensure relevant psychological research informs policy decisions if psychologists are not seated at the policy table. In contrast, the United Kingdom’s Academic Advisory Panel for the Cabinet-level Behavioural Insights Team includes a balance of psychologists and economists.

⁷ Beshears, J., Choi, J. J., Laibson, D., & Madrian, B. C. (forthcoming). Active choice and health outcomes: Evidence from prescription drug home delivery. NBER Working Paper.

⁸ Beshears, J., Choi, J. J., Laibson, D., Madrian, B. C., & Sakong, J. (2011). Self-control and liquidity: How to design a commitment contract. NBER Working Paper. Retrieved June 7, 2013 from http://scholar.harvard.edu/files/laibson/files/self_control_and_liquidity_how_to_design_a_commitment_contract.pdf

Economists and psychologists share several methodological principles—both fields: (1) care about causal pathways (not correlation); (2) are empiricist; (3) use experiments to understand the world; and (4) study human decision making. However, some methodological contrasts tend to favor economists over psychologists when it comes to policy design.

First, economists give primary emphasis to field and natural experiments to test the external validity of theories. External generalizability is critical for policy design and implementation. Economic research is 65% field work compared to 10% psychological research.

Second, economists want to know how large an effect is and how effect sizes compare in magnitude in different settings. Economic research typically reports effect sizes whereas psychological research focuses on the statistical significance of effects (p -values).⁹ Effect sizes are not critical for understanding mechanisms and consequently effect sizes are sometimes de-emphasized in psychological research. Understanding the magnitude of an effect, and not just statistical significance, is important when making policy decisions. Policy decision making must involve evaluations of costs and benefits, feasibility, and scalability, all of which are common in economic research.

Third, economists tend to think “system-wide” and worry about both direct and indirect effects of an intervention or program. Understanding the likely intended and unintended consequences of an intervention is important for policy decision making.

However, other methodological factors would likely advantage psychologists as potential policy makers: (1) most economists still believe that human behavior is best explained by the rational actor model while most policy makers do not believe in this model; (2) most economists focus exclusively on behavior and ignore other potentially useful social science variables (e.g., neuroimaging data, surveys of subjective well-being, attitudinal surveys, beliefs, forecasts, emotions); and (3) economists focus on outcomes and tend to overlook psychological mechanisms.

Economists have learned a great deal from psychologists. To date, economists have played the leading roles in translating psychological research insights to the policy sphere. Psychological researchers need to emphasize external validity, effect sizes and tradeoffs, and system-wide thinking that encompasses indirect effects to enhance the direct impact of psychological research on policy.

⁹ Editor’s note: Some psychologists undertaking intervention studies do have interest in reporting and comparing effect sizes. Many psychological journals now (and have for some time) required authors to report effect sizes in addition to p -values. We thank George W. Rebok for pointing this out.

Some Observations from a Psychologist at the Policy Table

Elke U. Weber, Ph.D., Columbia University

Psychological science is under-utilized in several policy areas: consumer finance, health care delivery, energy use, and environmental policy. There are basic differences in the approaches of psychological and economic research that have implications for policy relevance. The field of psychological research focuses on verbal theories, directional predictions, individual differences, and causal process models that include a broad range of variables and entry points for interventions. In contrast, economic research focuses on quantitative theories, point predictions, parameters, and input-output models that are only concerned with outcomes and not process or mechanisms. Cooperation across the two fields of research is more useful for public policy than competition. Contributions from one field to the other are complements, not substitutes. However, sometimes this cooperation can be difficult because neither side wants to give up perceived influence and power.

Dividing labor between the two fields of research by domain expertise is too simplistic and creates silos. Another way to divide labor is by task decomposition and task expertise. For example, economic research could inform the substance of a policy intervention (e.g., a specific subsidy) and psychological research could inform the best implementation of that policy (e.g., whether the subsidy occurs at point of purchase or as a tax refund). Labor could also be divided by policy tool (e.g., mandates versus economic incentives versus choice architecture tools).

It is important for psychologists to consider the perspective of policy makers and how they evaluate the possible impact of a policy. Policy makers want quantitative predictions (not verbal theories) about the effectiveness of planned policies, tests and demonstrations of new policy tools, and simple explanations in a language they can understand. As mentioned earlier, none of these are things that most psychologists do routinely.

Weber agreed with Laibson's assertion that to enhance the direct impact of psychological research on policy, researchers need to more intensely emphasize external validity, effect sizes and tradeoffs, and system-wide thinking. She also noted that economists should remember that not all the action is at the behavior level—mental representation matters. Neuroscience techniques can be used as an objective way of validating mental constructs such as framing or perceived risk.

Interdisciplinary interaction between psychologists, economists, and real-world policy makers can be both interesting and frustrating. The field of psychology has a lot to contribute but its contributions need to be more widely valued than they are today. Psychology researchers also need better training and preparation to conduct policy-relevant research. Cultural and structural change within universities and beyond is needed to shift value and recognition toward applied, boundary-spanning psychological work.

What Social Science Should Teach Social Scientists

The Honorable Brian Baird, Ph.D., former U.S. Representative

Social science is not influential in policy because the field fails to use social science methods to advocate on its own behalf. Policy makers' and others' responses to the idea of using social science to inform policy range from "social science is just common sense and simple economics" to "this sounds like government-sponsored mind control." These attitudes illustrate the myriad ways in which policy makers tend to respond to social science research.

People have different views of the roles of government and science. Social scientists believe that empirical data can inform effective policy. However, others do not believe it is the role of government to address social issues. Efforts to use social science to influence policy are moot in the face of such beliefs. There are current proposals and discussions about reducing or eliminating federal government funding for different types of social science.

The transtheoretical model of evidence-based behavior change can be applied to views of the role of social science research in policy development. The model outlines five stages of change: precontemplation, contemplation, preparation, action, and maintenance.¹⁰ Most people are in the precontemplation stage with respect to social science informing public policy. Policy makers may not be able to even consider the effectiveness of social science research results—or be able to convince their constituents of its value—because they are in the precontemplation stage.

In a time of major budget deficits, it is very difficult for politicians to defend government-supported social science in the face of tangible policy concerns and lack of general understanding about its value. Supporting federal funding of investigator-initiated social science research (or more indirectly, the scientific review process that results in funding such research projects) in the face of competing obligations can be politically risky. During the consideration of the NIH budget for fiscal year 2004 as part of the Labor, Health and Human Services, and Education Appropriations bill, Representative Pat Toomey (R-PA) introduced an amendment to defund five awarded NIH grants because he did not think that research on sexual behavior and health was an appropriate use of federal research dollars.¹¹ Baird faced a potentially political career-ending vote when he defended the scientific review process and voted against the amendment. The House did ultimately defeat the Toomey amendment—but only by two votes.

Social science is central to solving several grand policy challenges: energy and climate, health care, national security, demographics and aging, and economic opportunity and competition. Providing information about social science research findings is not sufficient for those in the precontemplation stage. Social scientists need to establish the legitimacy of the endeavor and demonstrate how and why social science is relevant to policy. Baird proposed the "how do you

¹⁰ See <http://www.prochange.com/transtheoretical-model-of-behavior-change> for more information.

¹¹ See <http://www.cossa.org/CPR/toomey.htm>.

know” campaign to garner public support for asking critical questions about policies we take for granted. For example, public materials could ask “how do you know?” what the best treatment for post-traumatic stress disorder (PTSD) is—this question applied across many areas would prompt people in the precontemplation stage to start thinking about how research can and should inform policies and programs. The goal is for people to come to the conclusion on their own that social science has merit in terms of informing policies.

Panel Discussion

Role of Psychologists at the Policy Table

Nielsen opened the panel discussion by noting the need for strategies to strengthen the role of psychological scientists at the policy table. Often it is the case that whoever is constructing advisory panels and other government groups assumes that economists are adequate representatives of pertinent psychological research. Baird encouraged psychological researchers to meet people where they are—rather than present findings and assert why they are important for public policy, focus on the policy makers’ goals and then demonstrate what social science can offer. Policy makers and the public can be primed to consider policy that is *not* informed by research to be unacceptable through a long-term, research-driven campaign (e.g., “how do you know?”). Laibson agreed that a research-driven campaign is a more effective strategy than assertions made in an editorial fashion.

Social scientists are under-represented in Congress. Most representatives are attorneys. Lawyers generally employ an adversarial approach versus an empirical approach, which is a fundamental difference in the way problems are solved. Baird initially thought policymaking would involve a collaborative decision making process based on cost-benefit analyses but was proven wrong.

Johannes Haushofer, Ph.D., expressed support for Laibson’s list of differences between the fields of economic and psychological research and the respective reasons economics appears more valid for informing policy and added another: economists are not afraid to speak simple messages with a unified voice. Simplicity and parsimony help in a policy debate. In contrast, the field of psychology thrives on complexity and nuance, which from the outside can appear to be fragmentation and clutter. Baird agreed that psychological scientists need to better communicate meaningful and actionable concepts and other complex messages that are difficult to interpret in the policy realm.

U.S. Health in International Perspective

A recent National Academies report examined U.S. life expectancy and health in comparison to that of other wealthy countries and found that the U.S. ranking has dropped from the middle of the distribution in the 1970s to the bottom today.¹² Further, the report found that most factors

¹² National Research Council. (2013). *US Health in International Perspective: Shorter Lives, Poorer Health*. Washington, DC: The National Academies Press. Retrieved June 7, 2013 from http://www.nap.edu/catalog.php?record_id=13497.

that explain the drop and discrepancy are behavioral rather than medical. Suzman noted that while NIH is heavily invested in finding medical cures, which is appropriate and necessary, the report implies that people get sicker sooner in the United States and that behaviors and social circumstances might underlie the discrepancy between the U.S. rank in health and expenditures on health. Behavioral and social determinants account for a large portion of rates of premature mortality and disability adjusted life years. It is a challenge to design policies that attempt to change people's behavior against their perceived interests. Laibson offered that one way these issues could be addressed is to be less reactionary to policies being considered today and focus instead on building long-term policy goals and designing feasible building blocks to accomplish meaningful change incrementally by the end of 10 years.

Susan Fiske, Ph.D., observed that these discussions incorrectly presuppose that the status quo is neutral, when in fact, the status quo is filled with its own set of biases. Perhaps if people understood this better, they would be more receptive to empirical evidence supporting new and different policies. Laibson agreed but noted that the status quo is nevertheless the reference point, which generates losses and gains in people's minds, making it difficult to change. Weber added that research has demonstrated people will change their minds about the status quo when public welfare is improved with an alternative policy, but it takes time (9-16 months).

Robert Cialdini, Ph.D., observed that private companies use strategies (e.g., advertising) to change people's buying behavior. The public finds this acceptable because responses to such tactics are assumed to be personal choice. Government needs to be able to use these methods as well; policies could create a context in which the private sector has the opportunity to promote nudges in the desired direction.

Epigenetics

Walter Mischel, Ph.D., advocated for the addition of not just psychologists at the policy table but also scientists in the burgeoning fields of epigenetics and neuroscience. There have been breakthroughs in understanding the role of DNA in human nature, including how individual actions influence our DNA.

Individual Risk Factors and Intervention Targets

Marshmallows and Public Policy: From Pre-K to 401(k)

Walter Mischel, Columbia University

Mischel identified the main determinants of choice behavior through his work. What later became termed "temporal discounting" started with a set of experiments in Trinidad in the late 1950s.¹³ There is a gap between deciding to make a choice and following through with that choice. Examining how and when individuals make the transition between stimulus control and

¹³ For an overview, see Mischel, W. (2012). Self-control theory. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), *The Handbook of Theories of Social Psychology*, Vol. 2. (pp. 1-22). Thousand Oaks, CA: SAGE.

self-control during the development process became of great interest to Mischel in his research. This led to the development of the “marshmallow” test—a test of a delayed gratification for young children. A child is offered one treat now or two treats later if he or she can wait about 15 minutes until the researcher returns.

The trust built between the child and the researcher, which is sometimes overlooked, is enormously important in the marshmallow test. There is no reason to delay gratification unless the child has the expectation that the treats will be delivered as promised. Treats can be any number of things and are not typically marshmallows. Executive function—keeping a goal in mind, having sufficient active memory to hold that goal, having the ability to suppress interfering responses that impede goal attainment, and using attention control and other cognitive strategies to allow an individual to reach the goal—is demonstrated and measured with the marshmallow experiment. In addition, a set of emotional skills may be activated if certain other motivation systems are nudged or in place. A video showing several children engaged in the marshmallow test shows the children using strategies such as self-distraction (kicking chair, miming what it would be like to eat a cookie), psychological and physical distance between the person and the behavior (turning around, moving bell farther away), and being deceitful (opening an Oreo cookie, licking the frosting, and then replacing the cookie).

Preschool self-control, as measured by the marshmallow test, predicts consequential life-long health and economic-relevant outcomes, including social functioning, BMI, and cognitive ability. Those who delayed gratification at age 4 demonstrate better social-cognitive functioning at age 16, lower BMI at age 30, higher education levels, lower levels of drug use, and fewer features of personality disorders than those who did not delay. Brain scans of adults at age 45 differ between those who delayed gratification at age 4 and those who did not.

Janet Metcalfe, Ph.D., and Mischel proposed a two-system framework—hot/emotional/go versus cool/cognitive/know—for understanding the processes that underlie self-control as measured by delay of gratification.¹⁴ The hot system is simple, emotional, reflexive, and is accentuated by stress. This amygdala-centered stimulus control system develops early and undermines efforts to self-control. In contrast, the cool system is cognitive, complex, reflective, and is attenuated by stress. This frontal lobe-centered cool system is the source of self-regulation and self-control and develops late. The balance of these two systems and the determinants of the balance—stress, developmental level, and self-regulatory dynamics—within an individual inform research findings on willpower.

Mental representation can trump physical representation. When a child is cued to use a cognitive strategy and engage the cool system—imagine the cookie is just a picture of a cookie—he or she is able to delay much longer. This demonstrates that one’s behavior can be changed by reorienting how one thinks.

¹⁴ Metcalfe, J. & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review*, 106, 3-19.

There is sufficient neuroplasticity in the human brain for these skills to be taught very early—to toddlers, preschoolers—which has significant policy implications:

1. Individual differences in delay ability and self-control to cool/hot temptations are stable and visible early in life.
2. The cool, cognitive executive function skills that enable such control are teachable.
3. The social and economic costs of having poor executive function skills are enormous.
4. The plasticity of the brain is surprisingly great, making such interventions feasible even in adults.
5. Evidence-based preschool curricula and educational interventions can narrow the achievement gap between individuals with high and low socioeconomic status with huge potential economic benefits over the life course (pre-K to 401(k)).

Behavioral, Biological, and Epigenetic Consequences of Different Early Social Experiences

Stephen Suomi, Ph.D., *Eunice Kennedy Shriver* National Institute of Child Health and Human Development

Suomi is a senior investigator at the Comparative Behavior Genetics Section laboratory in the intramural research program at the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development. The primary laboratory goals are to characterize distinctive biobehavioral phenotypes in the rhesus monkey colony, determine how genetic and environmental factors interact to shape the developmental trajectories of each phenotype, and assess the long-term behavioral and biological consequences for monkeys from various genetic backgrounds when they are reared in different physical and social environments. A second major program of research investigates how rhesus monkeys and other non-human primate species born and raised under different laboratory conditions adapt to placement into environments that model specific features of their natural habitat.

Rhesus monkeys develop four times faster than humans, which allows researchers to study lifespan development and the transmission of characteristics from one generation to the next over a short period of time. Rhesus infants are raised in either a natural habitat on the grounds or in the laboratory. Monkeys in a natural habitat spend the first month of life in continuous physical contact with their mothers and build a strong and enduring attachment relationship that is functionally equivalent to the relationships human infants form with their caregivers. The monkeys begin leaving their mothers for short periods to explore the environment once they are older, while continuing to use the mother as a secure base. The mother's presence in the immediate environment is crucial to sustain a young monkey's exploration. As time passes, the monkeys spend more time away: by 6 months, 20% of the monkeys' waking hours are spent in contact with their mother and 80% are spent with peers. Because 80 to 90% of rhesus monkeys are born within a 2 to 3 month period, they have many age-mate peers. Social skills are developed in the context of peer play.

The researchers separate some monkeys from their biological mother at birth, hand reared in a neonatal nursery, and raised with peers only (or a non-biological mother for genetic studies). Once the monkeys are 7 months old they are all moved into a larger social group that includes

mother- and peer-reared monkeys, which allows the researchers to examine differences that can be traced back to the first 7 months of life.

Differences in Behavior, Physiology, and Genetics

Peer-reared monkeys display several deleterious differences compared to their mother-reared counterparts. They are dysfunctionally attached to their peers and develop rudimentary patterns of play. Because of this, even though they have had more time with peers, they are play deprived. The peer-reared monkeys are excessively fearful and anxious, more likely to have raised cortisol levels, and become overly aggressive. In the wild, fear and anxiousness is seen in about 20% and excessive aggression is seen in 5 to 10% of monkeys. Peer-reared monkeys also exhibit deficits in serotonin metabolism as measured by lower levels of 5-hydroxyindoleacetic acid (5-HIAA) in cerebrospinal fluid (CSF).

Brain scans indicate that the brains of peer-reared monkeys are not activated as much as their mother-reared counterparts. The peer-reared monkeys have less serotonin binding potential throughout the brain. Structural magnetic resonance imaging studies have demonstrated that the brains of peer-reared monkeys are not only functionally different but also structurally different, than that of mother-reared monkeys.

Genetic analyses have shown that there is little overlap of expressed genes between the mother- and peer-reared monkeys. Compared to their mother-reared monkey counterparts, peer-reared monkeys show underexpression of immunoglobulin production and Type I interferon antiviral response and overexpression of inflammation, cell growth and differentiation, and transcription control. Methylation studies of chromosome 1 and 2 show that 4,400 genes following systematic patterns are differentially expressed as a function of rearing condition in the first 7 months of life.

Reversibility

Early experiences are clearly very important. Suomi's laboratory is also examining the extent to which the effects of poor early experiences can be reversed. An intervention conducted at the laboratory adds foster grandparent monkeys to the peer groups at 7 months. These elderly male and female monkeys provide security and keep the peace among the peer-reared monkeys. Early results have shown that the number of genes differentially methylated in peer-reared monkeys at 2 years after the intervention is reduced from 5,000 at 1 month to 2,500 for males and 750 for females: the regulation of the genes becomes normalized as a result of the intervention. In short, intervention does provide improvement but, for rhesus monkeys at least, the best strategy for promoting health and well-being is to ensure that infants get a healthy start from the outset.

Neuroticism: A Public Health Challenge?

Stephen B. Manuck, Ph.D., University of Pittsburgh

It is customary to view preventable risks for common sources of morbidity and mortality as public health challenges. Obesity and Type-2 Diabetes, cigarette smoking, and elevated blood

pressure and cholesterol levels are major risk factors in heart disease, for instance, and prevention efforts aim at their reduction through behavioral or pharmacologic means. Thus, a person who appears to be in robust, good health but possesses an unfavorable risk profile may leave a physician's office with a sheaf of prescriptions and directive to alter his or her lifestyle. If the risk factor were a mental attribute, such as a personality trait, however, would it be accorded the same status as a biological risk factor or injurious habit? Or would it be viewed instead as a quality fundamentally different, intangible and personal, and not within the purview of public health concern? Dr. Manuck suggested that a mental health trait could, in fact, have many of the properties of an epidemiologic risk factor.

One such trait, labeled neuroticism, refers to the tendency to experience negative emotional states—*anxious, irritable, or depressed mood*—in situations of threat, frustration, or loss, and is often accompanied by feelings of vulnerability and heightened self-consciousness. Like physical risk factors, levels of neuroticism are normally distributed in populations and have both genetic and environmental causes. And just as we increasingly understand how aspects of circulatory physiology and lipid metabolism underlie variation in blood pressure and cholesterol, we are beginning to understand the neurobiology of neuroticism. Neuroticism entails functional and possibly structural variation in brain circuitries of emotion processing, including, for instance, heightened sensitivity of a key structure, the amygdala, to sensory cues to threat or challenge. In common also with elevated blood pressure and cholesterol levels, three emotion-related constructs for which neuroticism confers liability—*depression, anxiety, and problems of anger and anger expression*—increase risk of heart disease, complicate recovery, and predict clinical recurrence and mortality. Probable mechanisms accounting for these relationships include altered autonomic nervous system activity, systemic inflammation, insulin resistance, impaired health-related decision making, and poor health behaviors, all of which associate with higher levels of neuroticism.

Higher neuroticism has been linked to a broader array of consequential life outcomes as well, including diminished physical functioning in older adults, decreased longevity in population samples, and reduced survivorship in the already ill, such as patients with chronic renal disease. In addition to increased risk for mood and anxiety disorders, the mental health burdens of high neuroticism include suicidal thoughts and attempts among adolescents and young adults; more severe symptoms, poorer treatment response, and a greater risk of recurrence in geriatric depression; increased likelihood of experiencing stressful life events, including trauma, and of PTSD in response to trauma exposure; and more prevalent co-morbidities among these disorders. Beyond overt psychopathologies, heightened neuroticism portends a number of adjustment difficulties, such as unstable interpersonal and marital relationships; more frequent divorce; and high rates of work-related absenteeism, often for unfounded somatic complaints. These many adverse outcomes also impose high economic costs, as seen in a recent Dutch study that tracked direct and indirect medical expenditures and costs due to lost productivity among persons ranked in the upper 25% of scores on a short neuroticism scale.¹⁵ In this

¹⁵ Cuijpers, P., Smit, F., Pennix, B. W. J. H., de Graaf, R., Have, M., & Beekman, A. T. F. (2010). Economic costs of neuroticism: A population based study. *Archives of General Psychiatry*, *67*, 1086-1093.

population sample, excess annual costs of high neuroticism exceeded \$5,500 per capita,¹⁶ or by extrapolation, nearly \$1.4 billion per million individuals.

Epidemiologic risk factors inform public health as predictors of later disease and its sequelae, and when modifiable, offer targets for disease prevention. Thus, antihypertensive and cholesterol-lowering medications are prescribed to reduce risk for incident cardiovascular disease, as are behavioral interventions directed at the control of obesity and sedentary lifestyle. It is possible that high neuroticism, a personality trait, is also amenable to intervention. Just as hypertension is not cured, but managed, by drugs that act on mechanisms of blood pressure regulation, the reactive affect that individuals high in neuroticism experience can be managed by cultivating skills that act on mechanisms of emotion regulation. Here, there exist a family of self-regulatory strategies and training approaches that are already commonly used in treating the mood and anxiety disorders that are heir to neuroticism and that might be applied more generally. These include, for instance, cognitive bias modification (to blunt patterns of selective attention toward threat-related cues in the environment), aspects of cognitive-behavior therapy, and various stress-management techniques. Randomized clinical trials with pathway outcomes are now needed, however, to determine if such interventions can bend trajectories of emerging disease risk. There is potential also for workplace training and school-based programs, possibly targeted to developmentally-sensitive periods.

Another possible target area for intervention is personality-informed health promotion, such as tailoring health messages to the motivational roots of neuroticism in the need for safety and security. Enhancing health literacy and health decision making strategies could also give direction to those whose worries might then be channeled toward improved health behaviors. Finally, what is needed overall is a better basic understanding of neuroticism—its neurobiologic, genetic, and developmental antecedents; the core psychological processes involved; the mechanisms linking neuroticism to outcomes; and the potential for change over the life course.

Key Challenges for Long Lived Societies

Laura L. Carstensen, Ph.D., Stanford University

By the year 2015, there will be more people over the age of 60 than under the age of 15 in the United States. Generally, discussions of aging are couched in terms of crisis—yet, the near doubling of life expectancy in just a century reflects a spectacular achievement of science and technology, coupled with effective efforts to change behavioral practices. Still, the speed of the increase in life expectancy has resulted in a mismatch between the length of our lives and the culture in which we live. Longer lives demand lifestyles that will optimize health and well-being for decades into the future. We need to find ways to establish connections between present and future identities in order to motivate individuals to plan well and activate and sustain health practices well into old age.

¹⁶ When adjusted for sociodemographic correlates and any mental disorder, the excess costs totaled \$3,530.

Studies Related to Motivation

People are not wired to contemplate the future, let alone how they will feel in the future, and tend to plan for it in an impersonal way. Hal Hershfield, Ph.D., and other researchers at the Virtual Human Interaction Lab at Stanford University used virtual reality to create an empathic connection between young individuals and their older selves to motivate them to save more money.¹⁷ Digital avatars were created for all of the participants. For 30 minutes they explored a virtual apartment that contained a mirror that reflected these look-alike avatars.¹⁸ For half of the participants, the avatars looked very much as the participants looked. For half of the participants, however, avatars were age-morphed 60 years. Participants wore virtual reality head-gear and explored a world in which the images reflected in mirrors were their older selves. People in the study who saw their future aged selves in the virtual reality world allocated twice as much money toward a hypothetical retirement savings account. Individuals may be more motivated to plan for the future if they can find an empathic connection to it and envision it being a happy one.

Another study tested a walking intervention to improve fitness into old age. Most of the public health messages about fitness in our culture are directed at young people, yet we need these messages for older adults as well. Americans, especially the elderly, are a sedentary population. Nanna Notthoff and Carstensen tested an intervention comparing groups of elderly people who received information about the positive benefits of walking or the negative risks of inactivity. Early results have shown that those who received positive messages walked more than those who received negative messages, when adjusting for baseline walking. The differences were sustained and even increased over 30 days and appear to generalize to other forms of activity.

Social norms influence when major life events are expected—when to go to school, get married, have children, or advance in careers—yet these norms may not apply in the same way to a society with longer life expectancies. Dedicating early life to education, mid-life to work, and late life to leisure made more sense when the life expectancy was 50 years. Quality of life can be improved across the life course if effective interventions are used to help individuals be mentally and physically fit and financially secure well into their later years.

Well-Being Science and Public Policy: Approaches and Applications in the United States and the United Kingdom

Arthur A. Stone, Ph.D., Stony Brook University

Well-being as broadly defined by the Centers for Disease Control and Prevention (CDC) includes self-perceived health, longevity, healthy behaviors, absence of mental and physical illness, social connectedness, productivity, and factors in the social and physical environment. Subjective well-being (SWB), a component of well-being, can be conceptualized in several ways

¹⁷ Hershfield, H. E., Goldstein, D. G., Sharpe, W. F., Fox, J., Yeykelis, L., Carstensen, L. L., & Bailenson, J. N. (2011). Increasing savings behavior through age-processed renderings of the future self. *Journal of Marketing Research*, 48, S23-S37.

¹⁸ Notthoff, N. & Carstensen, L.L. (under revision). Positive messaging promotes walking in older adults. *Psychology and Aging*.

including experienced affect (emotions ranging from joy to misery) and evaluations of life satisfaction/dissatisfaction. In recent decades, interest has grown rapidly in research on broader measures of national well-being that go beyond material standard of living and market-based economic concepts (e.g., GDP). The United Kingdom, the Gallup World Poll, the Organisation for Economic Co-operation and Development (OECD), and the Commission on the Measurement of Economic Performance and Social Progress (Sarkozy Commission)¹⁹ have argued that governments and population surveys should measure citizens' well-being as a way of assessing societal progress.

SWB is comprised of three types: eudemonic, life satisfaction or evaluative, and experienced or hedonic well-being. Eudemonic well-being is an individual's sense of meaning and purpose in life, connections with family and friends, a sense of control, and feeling a part of something larger than themselves. Life satisfaction measures ask an individual to reflect on his or her life as a whole and make an assessment of how life is going overall, or on certain aspects of his or her life. Hedonic well-being measures positive and negative experiences (or affect) over a short time frame to capture SWB on a short-term basis, including the concept of suffering, and often in connection with specific daily activities. Research has shown that it is possible to collect meaningful and reliable data on SWB.

There has been a great deal of positive movement toward using SWB in larger scale surveys conducted by official statistical offices and other governmental agencies. The Kingdom of Bhutan has a well-being program, the United Kingdom measures SWB in national surveys, and the American Time Use Survey (ATUS) includes an experimental module on SWB. NIA and the ESRC asked a panel of the National Research Council's Committee on National Statistics to review the current state of research knowledge, evaluate methods for measuring self-reported well-being, and offer guidance about adopting SWB measures in official population surveys.²⁰ The OECD recently published an extensive report on measuring SWB and it will soon announce the establishment of a High-Level Expert Group on the Measurement of Economic Performance and Social Well-Being.²¹

Measures of SWB are self-reports and, as such, are affected by factors such as question interpretation, processing information, capacity of memory, and reporting biases. The fields of cognitive science, autobiographical memory, and social psychology contribute to understanding self-reported information. The field is advancing and there are multiple efforts to refine the measurement strategies for SWB.

¹⁹ The Sarkozy Commission report can be found at <http://www.stiglitz-sen-fitoussi.fr/en/index.htm>.

²⁰ More information about the NAS panel can be found at <http://www8.nationalacademies.org/cp/projectview.aspx?key=49411> and an interim report on the SWB module in the ATUS can be found at <http://www.ncbi.nlm.nih.gov/books/NBK109558/>.

²¹ The OECD report can be found at <http://www.oecd.org/statistics/Guidelines%20on%20Measuring%20Subjective%20Well-being.pdf>.

Surveys Currently Using Subjective Well-Being Measures

In general, the life satisfaction component of well-being is most often measured. The national survey conducted by the U.K. Office of National Statistics (ONS) covers all three components of SWB. The questions have been included in the last three years of the survey (N=80,000). The ATUS experimental module conducted by the U.S. Bureau of Labor Statistics (BLS) measures SWB in terms of time use—experienced well-being tied to daily activities. The module was administered to a subsample of participants in the 2010 Current Population Survey (CPS) (N=26,000). The U.S. Health and Retirement Study (HRS) includes evaluative and hedonic measures of SWB for a subsample of participants (N=9,000). Gallup has been a leader in measuring well-being and has conducted 1.8 million interviews to date including questions about life satisfaction and hedonic well-being. The CDC conducts two surveys that include measures of evaluative well-being: Behavioral Risk Factor Surveillance System (N=560,000) and National Health Interview Survey (N=75,000 to 100,000).

Selected Findings and Implications

Evaluative SWB measures are sensitive to important life events. For example, measures of life satisfaction are high just before, at, and just after getting married when compared to 5 to 10 years earlier or later.²² As people age into their 50s and beyond, they tend to have a higher level of evaluative well-being.²³ However, the other components of well-being show a different pattern, especially for negative emotions. Daniel Kahneman, Ph.D., and Angus Deaton, Ph.D., showed that the life satisfaction as measured by the Cantril Self-Anchoring Striving Scale increases as a function of income.²⁴ The authors showed that hedonic measures also rise with income, but not past an annual income of about \$75,000. They concluded, “high income buys life satisfaction but not happiness and low income is associated both with low life evaluation and low emotional well-being” (2010, p. 16489). All three components of SWB need to be measured because they each provide different information for different purposes.

SWB is now being taken seriously in policy development and it offers the possibility of augmenting GDP by shedding new light on the progress of society. Additional research on SWB measurement and its use is needed and several issues should be considered: (1) the meaning of SWB assessments among different groups (e.g., culture, nationality); (2) how and why SWB changes over time; (3) how the three components of SWB are related and which one(s) are policy-relevant; (4) the optimal methods for measuring SWB; (5) the importance of contextual factors in measures (e.g., ordering, setting) and how they can be addressed; and (6) the degree to which SWB measures are sensitive to change.

²² Stutzer, A. & Frey, B. S. (2006). Does marriage make people happy, or do happy people get married? *The Journal of Socio-Economics*, 35, 326-347.

²³ Stone, A., A., Schwartz, J. E., Broderick, J. E., & Deaton, A. (2010). A snapshot of the age distribution of psychological well-being in the United States. *Proceedings of the National Academy of Sciences*, 107, 9985-9990.

²⁴ Kahneman, D. & Deaton, A. (2010). High income improves evaluation of life but not emotional well-being. *Proceedings of the National Academy of Sciences*, 107, 16489-16493.

Panel Discussion

Collaboration is Critical

Meeting participants saw transdisciplinary collaboration as essential for moving the science of behavior change forward. Phenomena of interest in behavior research and of relevance to policy are not domain-specific—phenomena cut across disciplines, including psychology, economics, neuroscience, genetics, and sociology. Participants encouraged funding agencies to employ strategies to foster opportunities for such collaboration.

Suomi noted that his experience collaborating with economist James Heckman resulted in research on the impact of early-life adversity on health outcomes that would not have otherwise happened.²⁵ Carstensen observed that often transdisciplinary collaboration works best when there is a problem to solve and everyone at the table is needed. Solving a problem shifts the focus away from the disciplinary distinctions and silos of research. The collaboration among Kahneman, Alan Krueger, Ph.D., Stone, and others on an interdisciplinary team of economists and psychologists is another successful example. This team developed the Day Reconstruction Method for assessing experienced well-being and then continued the work as a Roybal Center for Translation Research in the Behavioral and Social Sciences, funded by NIA.²⁶ A number of participants credited Suzman for fostering collaborations between psychological scientists and economists over the years.

Real-World Settings

Nielsen remarked that an important question moving forward will address how these research findings and information can be translated to the community, whether in the context of schools, neighborhoods, senior communities, etc. Carstensen recently formed a partnership with the county in which her work is located involving sit-to-stand desks in the workplace. Such projects can be challenging for researchers because they have less control over the environment than they would in a laboratory but it has also been rewarding and informative.

Intervention Persistence

More research on the long-term sustainability of interventions and generalization to other behaviors is needed. Mischel noted that in early research of cognitive behavioral therapy (CBT) to reduce fears, there was concern about symptom substitution. However, the effects of CBT are generalizable, when done well and with follow up.

Reversibility

Suzman noted that Terrie Moffitt's, Ph.D., work on early childhood self-control and its effects on achievement, crime, and health into early middle age raises the issue of reversibility. Suomi cautioned against overly generalizing the reversibility findings from the rhesus monkeys to

²⁵ Conti, G., Hansman, C., Heckman, J. J., Novak, M. F. X., Ruggiero, A., & Suomi, S. (2012). Primate evidence on the late health effects of early-life adversity. *Proceedings of the National Academy of Sciences*, *109*, 8866-8871.

²⁶ Kahneman, D., Krueger, A. B., Schkade, D. A., Schwarz, N., & Stone, A. A. (2004). A survey method for characterizing daily life experience: The Day Reconstruction Method. *Science*, *306*, 1776-1780.

humans; however, he has been astonished at the results of the experiment of putting the peer-reared monkeys with “grandparent” monkeys. There have been discernible differences in behavior, functional magnetic resonance imaging (fMRI) scans, blood pressure, and other biological features. Early experience is important, but it is not the whole story. As scientists build a better understanding of how behavior, biology, and genes interact, the capacity for designing efficacious interventions to reverse early adverse effects will grow.

Social Risk Factors and Intervention Targets

Social Isolation

John T. Cacioppo, Ph.D., University of Chicago

Humans are social animals. Social species create emergent structures, which evolved alongside genetic, neural, hormonal, and cellular mechanisms to support them because the consequent social behaviors promoted survival, reproduction, and genetic legacies. Social neuroscience is the study of the neural, hormonal, cellular, and genetic mechanisms underlying these emergent social structures. Cacioppo and colleagues applied the dose response approach—comparing the biology and behavior of individuals who differ in the extent to which they are socially connected or isolated—to investigate the effects of these connections.

The central role of the human brain in these effects is underscored by the importance of an individual’s perception of social isolation—or what has been termed “loneliness” in the psychological literature. Individuals can be around others and still feel socially isolated (lonely). Using data from the HRS, Cacioppo and colleagues estimated the effect of loneliness on mortality and examined social relationships, health behaviors, and health outcomes as potential mechanisms to determine the extent to which social isolation affects mortality risk among the elderly.²⁷ They found that feelings of loneliness were associated with increased mortality risk over a 6-year period, an effect that could not be explained by demographic factors, objective social isolation, or health behaviors.

Research using animal models has demonstrated the experimental effects of social isolation. For example, fruit flies genetically modified to have short lives that are co-housed with active young flies have an extended lifespan and improved physical condition when compared to their socially isolated counterparts.²⁸ Isolating other social animals also has deleterious health effects—effects that cannot be explained in terms of the influence of others on health behaviors per se.

Individuals who feel lonely also overexpress gene products involved in inflammation, cell growth/differentiation, and transcription control and underexpress those regulating

²⁷ Luo, Y., Hawkey, L. C., Waite, L. J., & Cacioppo, J. T. (2012). Loneliness, health, and mortality in old age: A national longitudinal study. *Social Science & Medicine*, 74, 907-914.

²⁸ Ruan, H. & Wu, C. F. (2008). Social interaction-mediated lifespan extension of *Drosophila* Cu/Zn superoxide dismutase mutants. *Proceedings of the National Academy of Sciences*, 105, 7506-7510.

immunoglobulin production and Type I interferon antiviral response.²⁹ In addition, when people feel lonely, they show more fragmented sleep and wake up feeling fatigued. Thus, not only do they experience more toxic days, they do not detoxify the days as completely when they sleep.

The phenomenology of loneliness is one of intense isolation and pain. However, psychological science has demonstrated over the past century that phenomenology can be misleading. Loneliness needs to be understood in the context of the evolutionary history of humans and where humans fit within the biology of life. For instance, the pain of loneliness serves a signaling function just as do the aversive signals of hunger, thirst, and pain, but in the case of loneliness it motivates people to attend to and care for their relationships to others. If loneliness becomes chronic, however, its deleterious effects increase the odds of morbidity and mortality.

Indeed, a meta-analysis of studies that provided data on individuals' mortality as a function of social relationships found that people with stronger social relationships had a 30% increased likelihood of survival compared to those with weaker social relationships.³⁰ Social relationships were found to be more predictive of the risk of death in studies that included complex measures of social isolation versus simple proxies such as marital status. To put this finding in perspective, the effect size of loneliness on risk of mortality is twice as large as that of the effect for obesity.

Not only are there large effects of chronic loneliness on health, loneliness is increasingly prevalent in the United States. According to the U.S. Census, the percent of single-person households has increased significantly from roughly 13% in 1960 to almost 28% in 2011.³¹ Data from the HRS indicate that a surprising 43% of elderly participants reported feeling lonely, were more likely to experience decline in activities of daily living, and had an increased risk of death.³²

A meta-analysis Cacioppo and colleagues performed indicated that interventions to address loneliness could be effective. Four major categories of interventions have been studied: improving social skills; enhancing social support; increasing opportunities for social contact; and addressing maladaptive social cognition. The meta-analysis revealed that the most successful interventions were those that addressed maladaptive social cognition.³³ This type of intervention is now being tested within platoons in the Army, with preliminary results indicating

²⁹ Cole, S., Hawkey, L. C., Arevalo, J. M. G., & Cacioppo, J. T. (2011). Transcript origin analysis identifies antigen-presenting cells as primary targets of socially regulated gene expression in leukocytes. *Proceedings of the National Academy of Sciences*, *108*, 3080-3085.

³⁰ Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine*, *7*: e1000316. doi: 10.1371/journal.pmed.1000316.

³¹ Source: US Census Bureau, Current Population Survey, 1960 to 2011. Annual Social and Economic Supplements.

³² Perissinotto, C. M., Cenzer, I. S., & Covinsky, K. E. (2012). Loneliness in older persons: A predictor of functional decline and death. *Archives of Internal Medicine*, *172*, 1078-1084.

³³ Masi, C. M., Chen, H. Y., Lawkley, L. C., & Cacioppo, J. T. (2011). A meta-analysis of interventions to reduce loneliness. *Personality and Social Psychology Review*, *15*, 219-266.

that it decreases loneliness and increases platoon cohesion.³⁴ This research is in the early stages but it is encouraging and might be applied to national issues.

Humans are Intent Detectors: Policy Implications

Susan T. Fiske, Princeton University

Humans detect warmth and competence in others within the first few seconds of seeing someone. These often-stereotypical judgments can be mapped by societies for their own social groups. In a representative U.S. sample, groups of people are perceived by others to be in one of four categories (Stereotype Content Model of high/low warmth and high/low competence).³⁵ Those viewed as having high competence and high warmth are seen with pride and include groups such as Christians, middle-class, and Americans. Survey respondents report that those viewed as having low competence and low warmth are seen with disgust and include groups such as those on welfare, homeless people, undocumented immigrants, and drug addicts. Those viewed as having high warmth and low competence are reportedly seen with pity and include the physically and cognitively disabled and older people. Those viewed as having low warmth and high competence are seen with envy and include the British, Jews, Asians, and the rich. Respondents report all these stereotypes and emotional prejudices for how society reacts to these clusters of groups.

Each of the four categories has behavioral implications. Individuals reportedly want to help and associate with those they see with pride, go along with but distrust those they see with envy, help but socially exclude those they see with pity, and avoid or attack those they view with disgust. This 2x2 space can be applied globally and provides an instant cultural map for an initial understanding of societies, with some cultural variations (e.g., people in East Asia perceive their pride groups as generally with more modesty and humbleness than in the West).

These findings also have implications for national level understanding of income inequalities. A study using the Social Content Model across countries demonstrates that the Gini index—a measure of income inequality—predicts ambivalence.³⁶ Societies with greater income inequalities, such as the United States, report more ambivalent stereotypes, whereas societies with more income equality report more high/high societal ingroups and low/low societal outgroups. Income inequality apparently requires a more complex stereotype map. Also relevant to policy is the finding that “the U.S. immigrant problem” refers mainly to a particular

³⁴ Cacioppo, J. T., Reis, H. T., & Zautra, A. J. (2011). Social resilience: The value of social fitness with an application to the military. *American Psychologist*, *66*, 43-51.

³⁵ Cuddy, A. J. C., Fiske, S. T., & Glick, P. (2007). The BIAS map: Behaviors from intergroup affect and stereotypes. *Journal of Personality and Social Psychology*, *92*, 631-628.

³⁶ Durante, F., Fiske, S. T., Kervyn, N., Cuddy, A. J., Akande, A. D., et al. (2012). Nations' income inequality predicts ambivalence in stereotype content: How societies mind the gap. *British Journal of Social Psychology*, epub ahead of print. doi: 10.1111/bjso.12005.

group—poor, undocumented immigrants from Latin America.³⁷ The Stereotype Content Model can also be applied to perceptions of animals, brands, and types of mental illness.

The overall causal model suggests that bias is not one-size-fits-all. In the Stereotype Content Model, social structure (competition, status) impacts images of warmth and competence, which impact emotions (disgust, pity, envy, or pride), which in turn impact behavior (active or passive, help or harm). Notably, the proximal predictor of behavior is emotion.

Work, Family, and Health in an Aging Society: The Long-Run Impacts of Labor and Family Policies on Health

Lisa F. Berkman, Ph.D., Harvard University

The United States is facing a serious public health challenge: since 1980, life expectancy at birth has dropped from the middle to the bottom of the OECD rankings when compared to other wealthy countries. While the problem is a population health issue, the solution can be discovered with social science. Medical care may be modestly related to this drop in life expectancy, but it is not the total answer. Health and life expectancy are explained largely by conditions that can and need to be prevented. One potential social science solution is improving social connectedness and social engagement.

Social connectedness and engagement influence health and mortality across the life course. Most interventions aimed at improving social engagement have met with modest success in terms of impacting health outcomes such as cardiovascular disease and stroke. However, it might be useful to examine work as a promoter of social engagement. Work might be health benefitting for a number of reasons: it provides income benefits, opportunities for social engagement in the workplace, and exposure to workplace policies and practices that influence work/family balance and health (e.g., work hours, workplace wellness programs, flexible scheduling).

Research Examples: Supportive Managers, Welfare Reform, and Retirement

Work and family practices, the Earned Income Tax Credit (EITC), and retirement are examples of policy areas that can impact health across an individual's lifespan. Berkman is part of a network studying the impact of work-family policies on the health of employees and their families. The network is currently in the final months of a 5-year RCT testing whether providing options to improve work-family balance (e.g., increasing schedule control, training supervisors to allow flexibility) improves employee health outcomes. An earlier project that led to the RCT examined the relationship between nursing home managers' openness and flexibility towards employee work-family needs and employee independent health assessment results.³⁸ Employees whose managers were less supportive were more than twice as likely to have higher risk for

³⁷ Lee, T. L. & Fiske, S. T. (2006). Not an outgroup, not yet an ingroup: Immigrants in the Stereotype Content Model. *International Journal of Intercultural Relations*, 30, 751-768.

³⁸ Berkman, L. F., Buxton, O., Ertel, K., & Okechukwu, C. (2010). Managers' practices related to work-family balance predict employee cardiovascular risk and sleep duration in extended care settings. *Journal of Occupational Health Psychology*, 15, 316-329.

cardiovascular disease (two or more risk factors) and slept less (about 30 minutes, measured by actigraphy) than employees with managers who were supportive, creative, and open about work-family needs. Sleep is an important mediator for metabolic health.

Expansions of the EITC, in conjunction with welfare reform in 1996 (Temporary Assistance for Needy Families block grant to states), contributed to the trend of tying cash assistance more frequently to labor market participation and wages. EITC increases income; however, it is unclear if this increase translates into better environments for children and families. Poor employed mothers may be more financially strapped than mothers on welfare due to costs associated with work (e.g., transportation, child care). Additionally, the strain and stress associated with low-wage jobs and time constraints may make it harder for poor mothers to provide good environments for their children and maintain their own health during pregnancy. Another study examined the effects of state level EITC on infant health. Findings from a difference in differences analysis showed that for unmarried mothers with less than a high school education, labor force participation and wages increased, infant birth weight increased, and tobacco consumption decreased.³⁹

Findings from a study by Susann Rohwedder, Ph.D. and Robert Willis, Ph.D. of cross-nationally comparable survey data from the United States, United Kingdom, and several European countries suggest that early retirement has a significant negative impact on the cognitive ability of people in their early 60s.⁴⁰

Health Insurance and Health Outcomes for Low-Income Adults

Katherine Baicker, Ph.D., Harvard University

There is limited existing evidence on the effects on health care use and health outcomes of expanding Medicaid to low-income adults. Gauging the causal effect of Medicaid is challenging because individuals enrolled in Medicaid often have lower income or higher health needs, making it difficult to disentangle the effect of Medicaid from those confounding factors that are also associated with worse health outcomes and higher health care consumption. The Institute of Medicine reviewed evidence that resulted in suggestive, but uncertain, findings. Quasi-experimental studies improve on observational ones but are often focused on unique populations (e.g., children, elderly). The RAND Health Insurance Experiment, while groundbreaking, examined the effect of cost-sharing, not health insurance coverage itself.⁴¹ Thus, while there is suggestive evidence that access to health care affects health care and outcomes, there has been scant solid evidence.⁴²

³⁹ Strully, K., Rehkopf, D. H., & Xuan, Z. (2010). Effects of prenatal poverty on infant health: State Earned Income Tax Credits and birth weight. *American Sociological Review*, 75, 534-562.

⁴⁰ Rohwedder, S. & Willis, R. J. (2010). "Mental retirement." *Journal of Economic Perspectives*, 24, 119-138.

⁴¹ Newhouse, J. P. (1993). *Free for all? Lessons from the RAND Health Insurance Experiment*. Cambridge, MA: Harvard University Press.

⁴² Institute of Medicine. (2003). *Hidden costs, value lost: Uninsurance in America*. Washington, DC: National Academies Press.

The Oregon Health Insurance Experiment is the first RCT to evaluate the impact of Medicaid on health care use, health outcomes, financial strain, and well-being of low-income adults.⁴³ The state of Oregon expanded its Medicaid program for low-income, uninsured adults in 2008 using a lottery system because funds were not available to expand to all who qualified. This gave researchers the opportunity to evaluate the effects of Medicaid using an experimental design. Primary and secondary data collection included enrollment information, administrative records on enrollment, hospital discharges, mortality, and credit reports, mail and in-person surveys; and physical exams. The study population is similar in many ways to those expected to be covered under the expansion of Medicaid under the Patient Protection and Affordable Care Act (PPACA), but there are limits to the generalizability of the results, including the fact that the newly insured in Oregon were a relatively small group unlikely to strain system capacity and the effects observed in the first 2 years might be different from longer-run effects.

The study examined a broad range of outcomes including health care utilization, financial strain, and physical and mental health. Medicaid coverage led to increased health care use, including primary and preventive care, prescription drugs, and hospitalizations (which some had speculated might decline). Overall, health care use increased by about 25 to 35% for those newly covered by Medicaid compared with the control group.

Medicaid coverage also led to substantial reductions in financial strain, including a drop in bills sent to collection, the need to borrow or skip paying other bills because of health costs, and the near elimination of catastrophic out-of-pocket medical expenses.

Medicaid coverage resulted in large improvements in self-reported physical and mental health. Clinical assessment results were mixed: there were substantial reductions in the prevalence of depression, but no detectable effect on measured blood pressure, HbA1c (a measure of diabetic blood sugar control), or cholesterol, although there was an increase in the diagnosis of and treatment for diabetes.

The effects of expanding Medicaid are likely to be manifold and how policy-makers weigh the multifaceted benefits and costs depends on policy priorities. Further investigation may help shed light on the many steps in the pathway between insurance and clinical health outcomes. Innovation in insurance coverage, such as the expansion of coordinated care, may augment the effects of insurance on health. Social determinants and the built environment may also play an important mediating role. The study highlights the type of collaborative opportunities that researchers and policy-makers can take advantage of to evaluate important programs and answer such questions.

⁴³ Information about the experiment can be found at <http://www.nber.org/oregon/>.

The Baltimore Experience Corps® Trial: Increasing Social Capital for an Aging Society

George W. Rebok, Ph.D., Johns Hopkins University

Older adults represent an important source of social capital. The opportunity to “give back” can be motivating and social engagement has the potential to be health promoting for older adults. A study of older individuals’ perceptions of their own usefulness indicated that those who do not feel useful have 2 to 3 more times the risk of mortality or disability over 7 years.⁴⁴

The Experience Corps® program is a model of senior service and health promotion that simultaneously creates meaningful roles for older adults while meeting unmet needs of public elementary schools. It was designed in 1993 to 1995 by Linda Fried, M.D., and Marc Freedman (President, Civic Ventures, Inc.) and evaluated in 2000 to 2002. Volunteers aged 60 and older serve in public elementary schools in kindergarten through third grades. They adopt meaningful classroom roles and address important school needs. The model is high intensity because the volunteers work at least 15 hours per week at the schools for up to 2 school years and are reimbursed for their expenses. The seniors are grouped together in a critical mass (12 to 20) within each school, allowing them to form a community. Results of a pilot trial demonstrated Experience Corps®-related improvements among older adults in mobility⁴⁵ and executive function among those at highest risk.⁴⁶

Participation by seniors in Experience Corps® engages their physical, cognitive, and social activity pathways to mechanisms such as strength and balance, brain plasticity, executive function, and social integration, and gives them an opportunity to contribute to future generations (i.e., generativity). The mechanisms can be assessed by performance-based measures of secondary outcomes (e.g., falls, walking speed, frailty, memory, Instrumental Activities of Daily Living [IADL], psychosocial well-being) and the primary self-report outcome of mobility function.

Children in participating schools also experience activation of primary pathways—academic stimulation, behavioral management, and readiness for learning with academic performance and classroom behavior as the primary outcomes. In addition to individual students, the school community as a whole is evaluated for primary outcomes as measured by aggregate academic performance, school climate, teacher retention, and volunteer retention.

The Experience Corps® model creates a win-win situation for all participants. The children and schools benefit from improved academic outcomes, school climate, and teacher retention. The

⁴⁴ Gruenewald, T. L., Karlamangla, A. S., Greendale, G. A., Singer, B. H., & Seeman, T. E. (2008). Increased mortality risk in older adults with persistently low or declining feelings of usefulness to others. *Journal of Aging and Health, 21*, 398-425.

⁴⁵ Tan, E.J., Xue, Q-L., Li, T., Carlson, M.C., & Fried, L.P. (2006). Volunteering: A physical activity intervention for older adults-The Experience Corps® Program in Baltimore. *Journal of Urban Health, 83*, 954-969.

⁴⁶ Carlson, M.C., Saczynski, J.S., Rebok, G.W., Seeman, T., Glass, T.A., McGill, S., Tielsch, J., Frick, K., Hill, J., & Fried, L.P. (2008). Exploring the effects of an “everyday” activity program on executive functioning and memory in older adults: Experience Corps®. *Gerontologist, 48*, 793-801.

aging volunteers have an opportunity to be useful, demonstrate the benefits of an aging society, and experience a decrease in adverse health outcomes.

Preliminary findings at 12 months indicate that when compared to control volunteers, a greater percentage of Experience Corps® volunteers reported feeling they were making a difference, they had more social ties, they felt they had others around to check on them, and they felt needed. This social participation and feelings of support extend beyond the end of the Experience Corps® program. At 12 months post participation, 90% of former Experience Corps® volunteers reported that they still talk with volunteer friends from the program, more than 60% report that they talk at least once a week, and about 35% report they continue to visit with volunteer friends.

A large-scale RCT of the Baltimore Experience Corps® trial, funded in part by NIA, began in 2006 and concluded in 2011.⁴⁷ More than 700 seniors were randomized to either to the Experience Corps® program or a low-activity control condition and served for up to 2 years. Outcome measures included physical (e.g., disability, mobility, walking speed), cognitive (e.g., memory, executive function, IADL), and psychosocial (e.g., depressive symptoms) factors.

The Brain Health Substudy of 115 participants (average age of 68 years) is nested within the Baltimore Experience Corps® trial and designed to translate the findings of connections between physical and cognitive activity and brain health into the real world. Early findings suggest that even small increases in physical activity may matter. Cross-sectional data show that greater step activity was significantly associated with greater hippocampal volume. The data suggest that even low to moderate levels of activity may help maintain plasticity in a brain structure important to spatial and verbal memory. Pilot data indicate that participation in Experience Corps® over 6 months led to clinically relevant changes in executive function and associated brain regions in the prefrontal cortex.⁴⁸

The goal of the Brain Health Substudy was to examine the direct causal effects of an enriched environment on brain structure and functions. A representative subsample informed the larger behavioral trial by identifying mechanisms. Outcomes of interest included effects on executive function and memory. Intermediate outcomes may precede changes in behaviors. The substudy provided the opportunity to incorporate biological and physiological mechanisms that help identify and isolate activity pathways that may mediate and moderate intervention effects, including neuroimaging, salivary cortisol, and fasting blood biomarkers. Physical activity was measured by step activity devices.

⁴⁷ Fried, L.P., Carlson, M.C., McGill, S., Seeman, T., Xue, Q-L., Frick, K., Tan, E., Tanner, E.K., Barron, J., Frangakis, C., Piferi, R., Martinez, I., Gruenewald, T., Martin, B.K., Berry-Vaughn, L., Stewart, J., Dickersin, K., Willging, P.R., & Rebok, G.W. (2013). Experience Corps: A dual trial to promote the health of older adults and children's academic success. *Contemporary Clinical Trials*, 36, 1-13.

⁴⁸ Carlson, M.C., Erickson, K. I., Kramer, A. F., Voss, M. W., Bolea, N., Mielke, M. et al. (2009). Evidence for neurocognitive plasticity in at-risk older adults: The Experience Corps Program. *Journals of Gerontology: Biological Sciences and Medical Sciences*, 64, 1275-1282.

There are several potential implications for volunteering programs designed as a social model for health promotion. Volunteering can be a vehicle to attract and retain more, and more diverse, older adults than standard intervention programs. The volunteering experiences can be intentionally designed to enhance generalizable physical, cognitive, and social activity within stimulating environments. This approach also represents an opportunity to invest in health promotion for older adults in a way that augments resources for other generations (e.g., elderly not competing for scarce resources with children). This is potentially a model for a population-based approach to health promotion. Governor Martin O'Malley has become a strong supporter of the Experience Corps® program and helped make its expansion possible in Maryland.

Exploiting Network Externalities

Nicholas Christakis, M.D., Ph.D., Yale University

For tens of thousands of years, humans have been embedding themselves in social networks—networks that obey particular biological, psychological, sociological, and mathematical principles.⁴⁹ A visual image of a real social network includes dots for each individual and lines between them to represent relationships. Social networks are intricate things of beauty: they are elaborate, complex, and ubiquitous.

Research evidence shows that structure and function of social networks is not a coincidence.⁵⁰ Social networks are formed with particular properties. There is evolutionary significance to, and heritability of, social network structure and function. Phenomena like homophily and peer influence have ancient and fundamental significance. Across evolutionary time, it seems the benefits of a connected life in our species outweigh the costs.

Studies using both observational and experimental methods have provided evidence that a variety of behaviors and phenomena spread within networks via social contagion (e.g., obesity, smoking, sleep, happiness, depression, drug use, loneliness, exercise, altruism). People's attitudes, decisions, and behaviors depend in quantifiable ways on the attitudes, decisions, and behaviors of others. Networks magnify whatever they are provided; if something is introduced into the network, the network will function as a social magnifying glass. This property can be exploited to maximize interventions to induce behavior change in populations. People are connected and therefore, their behaviors are connected.

Example Experiments: Manipulating Contagion

Christakis presented a paradigm of experiments to illustrate the manipulation of contagion in social groups. Imagine a set of two villages in the developing world—although this principle

⁴⁹ See, for example, Apicella, C. L., Marlowe, F. W., Fowler, J. H., & Christakis, N. A. (2012). Social networks and cooperation in hunter-gatherers. *Nature*, *481*, 497-501.

⁵⁰ See, for example, Rand, D. G., Arbesman, S., & Christakis, N. A. (2011). Dynamic social networks promote cooperation in experiments with humans. *Proceedings of the National Academy of Sciences*, *108*, 19193-19198. Fu, F., Nowak, M., Christakis, N. A., & Fowler, J. H. (2012). The evolution of homophily. *Nature Scientific Reports*, *2*, 845. doi:10.1038/srep00845

could be applied to groups of classrooms, work places, hospitals, etc.—with a population of 100 in each village. In the first experiment, *peer effects under control*, a behavioral intervention is administered to six randomly chosen individuals in one village. Following the intervention, outcomes are compared for the untreated individuals in both villages—comparing the *untreated* individuals provides a pure measure and a clean test of spillover effects. In this first experiment, perhaps four of the six treated would adopt the target behavior and they might recruit four of the 94 untreated members of their village (8% adoption) compared to two of the 100 in the untreated village who demonstrate the target behavior on their own (2% adoption).

In a second experiment—*peer effects under acceleration*—individuals receiving the treatment are not randomly selected but rather strategically selected because they are influential and central to the village network. The influence of individuals can be mathematically quantified by examining the network and relationships. In this scenario, six strategically selected members of the first village receive the intervention and four adopt the target behavior as in the first experiment. However, because of the treated individuals' network influence, they recruit an additional 30 people (compared to 4 in the first experiment). Hand selecting targets based on an understanding of network structure increases the impact of the intervention in the village.

A third version of the experiment—*peer effects under group treatment*—adopts an algorithm that targets six individuals who are in a relatively defined clique with high transitivity. In this scenario, all of the six targeted individuals may respond to the treatment because of their close connections with each other.

Many other algorithms are being explored.

The Friendship Paradox

Mapping a network is not always feasible; it can be expensive or impractical. The friendship paradox—a mathematical fact about social networks—can help identify influential individuals without having to map network ties for the entire population. The friendship paradox is simply that “your friends have more friends than you do.” The intervention can be targeted at the *friends of* randomly selected individuals because on average, the friends have more links and are also more central to the network than the randomly selected individuals. The mean number of contacts for the friends will be greater than the mean for the random sample when there is variance in the population.⁵¹ A sample of central and influential individuals can be derived without mapping the whole network by first sampling people at random and then choosing their friends as targets of the intervention.

Field Experiments of Network Targeting

Christakis and colleagues have been conducting field trials of these strategies using public health and other interventions in various settings: vitamins and water purification in Honduras; HIV treatment in Uganda; perinatal care in India; and prescribing behavior or safety practices

⁵¹ Christakis, N. A. & Fowler, J. H. (2010). Social network sensors for early detection of contagious outbreaks. *PLoS One*, 5, e12948.

among physician networks. In the Honduras experiment, the researchers mapped the network of all the adults in 32 villages and then randomly assigned the 32 whole villages (5,000 individuals) to one of three targeting algorithms with 5% of individuals being targeted from each village: random; in-degree (centrality); and friendship nomination. The goal was to move an entire village to change behavior and, in doing so, identify whom to target given a budget constraint and determine which method creates the most externalities for behavior change.

Results in the Honduras experiment demonstrate that adoption of the target behavior change—vitamin use and water purification—in the village in which friendship nomination was used was 25% more effective than the other groups. Similar (and even better) results have been found in the other field experiments. Using network effects to enhance behavioral interventions can deliberately create spillover and peer reinforcement. The return on investment can be quadrupled in some settings (since we might deliver an intervention to one person but get three others to also adopt the intervention) and taking into account network externalities should modify cost-effectiveness assessments.

Panel Discussion

Field Experiments

Field experiments offer rich opportunities and unique challenges for research. Collaborating with community partners to include items of interest to them (Berkman, Rebok, Christakis), being patient (Cacioppo), garnering support by demonstrating results (Berkman, Rebok), working with key stakeholders early in the process (Baicker), and adding on to existing intervention research (Christakis) to minimize participant burden were all discussed as strategies for successful community-based field experiments. Fiske underscored the critical importance of building trust. Researchers need to understand the context, and the community collaborators need to trust that the researchers will not exploit them. Baicker stressed the need for collaboration with policy makers and program staff at the state level when conducting an evaluation of a policy or program. An evaluation can be seen as threatening to program staff because they already believe in their program and its value. Staged roll-outs of new policies and programs offer many opportunities for researchers to work with key stakeholders early in the process.

Mechanisms

Understanding the mechanisms of behavior change is a fundamental scientific question that can inform intervention research, when relevant. An intervention could be tailored to *when* it would be most effective if there is a better understanding of mechanisms and timing.

Role of Hierarchy

Suomi inquired about the role of dominance hierarchy, which is evident in every social group of non-human primates, in behavior change and social networks for humans. Fiske noted that in her research, the dimension of competence correlates with perceived social status ($r = 0.80$), suggesting that people think hierarchy is based on meritocracy. However, the dimensions of warmth and trust seem more important than dominance hierarchy. People need to feel

interdependent on others in a positive way in order for the medial pre-frontal cortex to become engaged, consistent with learning to individuate and perhaps trust others. Fiske asserted that the interdependence dimension of social structure is often more important than hierarchy. Christakis commented that this is a complicated topic and his research is moving away from attributional hierarchy—Black, White, rich, poor, etc.—and looking more intently at positional hierarchy. Some individuals are central to the network and some are not.

Health Insurance

Baird found the Oregon health insurance experiment results to be disheartening. It is assumed that people need health insurance, but perhaps other behavioral and health interventions are more critical than health insurance, a distinction that would have significant policy implications. Health insurance can be seen as a consequence of other factors and perhaps those other factors matter more than the lack of health insurance. Baicker clarified that the results of the experiment indicate that it is beneficial for everyone to have health insurance based on the financial protections alone. However, health insurance is necessary but not sufficient to impact all areas of health. People may enter the health care system sicker and harder to treat. Health insurance interacts with social determinants of health and therefore, both need to be addressed. Berkman added that a system that addresses both prevention and treatment of the sick is needed.

Behavioral Economics and America's Greatest Challenges

Alan Krueger, Chairman of the President's Council of Economic Advisers

The CEA provides unvarnished analysis and recommendations informed by evidence, not political considerations. As chairman of the CEA, Alan Krueger's goal is to represent the best evidence available from the field of economics, including credible dissenting views. Krueger's professional background is in labor economics but he incorporates other areas of economics, including behavioral economics, in the advice he gives the President and other members of the administration.

The CEA has several functions and areas of focus, some of which are or could be informed by behavioral economics: macromonitoring, macroforecasting, energy and climate change, gas prices, tax reform, the PPACA, long-term unemployment, financial reform, agricultural and food policy, and immigration reform. The CEA acts as a consumer of research as well as conducts its own analyses.

Two of the Council's main functions are macromonitoring and macroforecasting. The CEA was formed in 1946 and its primary function was designing countercyclical fiscal policy. Its mission has evolved over time, but monitoring the overall health of the economy is still an important role for the Council. The CEA is required to conduct forecasting as part of the budget process and it is necessary for various policy considerations (e.g., a forecast of the unemployment rate is necessary for the Administration to estimate expenditures on unemployment benefits). The CEA leads the forecasting process in collaboration with the Department of Treasury and the Office of Management and Budget (OMB).

The CEA conducts computational modeling on a variety of issues, such as gas prices. The public responds to gas prices more strongly than other items in their budgets. There appears to be an asymmetry in terms of how prices affect consumption. The CEA has looked at how well the futures market for wholesale gasoline predicts gas prices for consumers.

Government policy and programs do not necessarily operate according to a public finance textbook. There are often streams of funding dedicated to particular projects, policies, or populations for political reasons (i.e., the funding stream is tied to the purpose of the revenue). This serves as a constraint in terms of identifying the best economic policy and implications for tax reform because funds are not necessarily spent on the projects that have the highest marginal benefit.

Some specific policy areas are well suited to behavioral economics evidence. The PPACA is an area that is ripe for behavioral economics research and application. It is critical that accurate information is presented to people in an understandable way.

Greatest Economic Challenges

Behavioral economics research and evidence can help address some of the greatest economic challenges facing this country. President Obama highlighted one of these challenges in his 2013 State of the Union address: fostering an economy that creates good middle-class jobs and, related to that, helping the long-term unemployed. A second economic challenge is addressing the growing income inequality in the United States. Unemployment has an adverse effect on people beyond its financial impact, as behavioral economics would predict.

The standard model of unemployment—the search model—predicts that a person’s reservation wage (the lowest wage an unemployed worker will accept) is constant unless something changes in the environment. However, research has shown that unemployment has independent effects on people apart from the effect on income. Data show that reservation wages vary with the length of unemployment.⁵² Hirschel Kasper, Ph.D., and others have found that relative to the previous wage, the average reservation wage declines 3 to 7% over the course of a year of unemployment. The reservation wage appears to be a stronger predictor than the previous wage of whether or not a long-term unemployed person will accept a job. Other research demonstrates that well-designed programs providing job search assistance are effective and have a high benefit-cost ratio. These programs may encourage individuals to lower their reservation wage.

⁵² Kasper, H. (1967). The asking price of labor and the duration of unemployment. *The Review of Economics and Statistics*, 49, 165-172.

Krueger, A. B. & Mueller, A. (2011). *Job search and job finding in a period of mass unemployment: Evidence from high-frequency longitudinal data*. Princeton University Center for Economic Policy Studies Working Paper No. 215. Retrieved June 12, 2013 from <http://www.princeton.edu/ceps/workingpapers/215krueger.pdf>.

Fairness and the problems of income inequality are also among our greatest economic challenges.⁵³ Many economists believe that inequality is mostly a result of global and technological change. However, there are other forces at work and economists have not sufficiently considered the role of fairness. There is overwhelming evidence from psychology and behavioral economics that fairness has an impact on behavior and expectations and these considerations in turn influence the distribution of pay. Ernst Fehr, Ph.D., for example, found in randomized field experiments that raising pay for workers who felt underpaid resulted in increased productivity, but there was no change in productivity when pay was increased for workers who did not feel underpaid. Payment relative to a reference wage appeared to influence output. Another field experiment demonstrated that increasing the disparity in pay among workers decreased the productivity of all workers, suggesting that equal wage distribution would raise morale and productivity. Research on the effects of minimum wage increases also supports the notion that fairness matters.⁵⁴

The tremendous rise in inequality has been driven by labor income. A large majority, 84%, of total market-based income growth from 1979 to 2011 went to the top 1% of families. There is little focus in the field of economics on how the norms, institutions, and practices that support fairness in the market have been eroded over the past 30 years. This erosion has contributed to income inequality and the difficulty faced by Americans trying to move into the middle class. More research is needed on these shifts and changes in practices that previously supported fairness in setting pay.

A great deal of behavioral economic research focuses on individuals. More research is needed about the behavior of organizations and markets. Findings and evidence from this type of research could inform macroeconomic forecasting.

Discussion

Long-term Unemployment as a Signal

Jonathan King, Ph.D., noted that it is to be expected that prospective employers view a candidate's long-term unemployment negatively during good economic times. However, it is puzzling that the effect of long-term unemployment on hiring decisions appears to be the same or worse during a deep recession, suggesting a topic ripe for behavioral analysis. Krueger also expressed surprise that even during a recession the initial reaction of many employers to a long bout of unemployment is that something must be wrong with the candidate. It is possible that some firms, particularly large ones, are unaware that their human resources offices are weeding out applicants based on this factor.

⁵³ See http://www.whitehouse.gov/sites/default/files/docs/oberlin_final_revised.pdf for Krueger's speech on "Fairness as an Economic Force."

⁵⁴ Falk, A., Fehr, E., & Zehnder, C. (2006). Fairness perceptions and reservation wages: The behavioral effects of minimum wage laws. *Quarterly Journal of Economics*, 121, 1347-1381.

Psychological Science and Policy

Suzman inquired about the likelihood of a U.S. counterpart to the CEA (similar to the U.K. Cabinet Office Behavioural Insights Team) and of SWB being incorporated into policy decisions. Krueger responded that insights from behavioral economics and psychological science are often already embedded in policy discussions as the President has several advisers who are knowledgeable about the research of many participants at this meeting. Krueger himself has been influenced by his own work on SWB with Kahneman and others and that knowledge has informed his advice and recommendations in overseeing the CEA's statutory responsibility for conducting budget forecasts.

Policy Applications of the Science of Behavior Change

Applying Behavioural Insights in the Service of Public Policy

David Halpern, Ph.D., U.K. Cabinet Office Behavioural Insights Team

Halpern, an academic in the field of psychology, worked for Prime Minister (PM) Tony Blair for 6 years and upon leaving, published a book in which the final chapter included a section titled, "10 Things to Do If You're Prime Minister."⁵⁵ The section discusses, among other items, the importance of embracing behavioral economics. The current PM, David Cameron (Conservative Party) asked Halpern to return to government and implement some of the strategies discussed in the book.

The PM and Deputy PM (Nick Clegg, Liberal Democrat), issued a programme for government in which they stated "Our government will be a much smarter one, shunning the bureaucratic levers of the past and finding intelligent ways to encourage, support, and enable people to make better choices for themselves" (p. 8).⁵⁶ A time of budget constraints and a directive to avoid additional regulations and mandates, both of which limited what civil servants could do, provided a ripe context for focusing on how behavioral economics could inform improvements to policies and practices.

Halpern serves as the director of the U.K. Cabinet Office Behavioural Insights Team, which is counseled by an Academic Advisory Panel consisting of both psychological scientists and economists. An advantage of the U.K. Cabinet Office Behavioural Insights Team is that they are not simultaneously managing an agency; this allows them time and freedom to explore many areas of government for opportunities to apply psychological science and behavioral economics research. The public was initially skeptical of the formation of this office. Headlines in mainstream media proclaimed that such government activity was a threat to choice, freedom, and democracy. In time, however, opinions changed based on clear and effective results of many controlled trials in areas such as pension opt-outs, tax collection, attic insulation for

⁵⁵ Halpern, D. (2010). *The hidden wealth of nations*. Cambridge, UK: Polity Press.

⁵⁶ The Coalition's Programme for Government can be found at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/78977/coalition_programme_for_government.pdf

energy conservation, and job search support for the unemployed. A good place to start to garner support is an area where rapid effects can be documented and outcomes can be tracked using existing administration resources.

Collecting Delinquent Taxes

Using social norms to collect unpaid taxes has been effective.⁵⁷ The U.K. Cabinet Office Behavioural Insights Team conducted a trial in which it sent a collection letter to a sample of delinquent taxpayers that included the statement “Nine out of ten people pay their tax on time.” Other arms included variations on the statement, all with the purpose of invoking social norms. The percent of individuals paying their taxes after 23 days for the control group receiving the standard collection letter was 33.6% versus 39% of those who received a letter referencing a local norm and debt norm. The trials can further hone practices by identifying which messages are most effective for which groups of people. Positive results also have been shown with handwritten envelopes for tax notices (21.8% response rate from plain brown envelope versus 26% response rate for personalized envelope).

Energy Efficiency

Another area the U.K. Cabinet Office Behavioural Insights Team has addressed is reducing barriers to uptake of subsidies for making homes more energy efficient by installing attic insulation. Many homeowners have too many things stored in their attic, which must be removed in order to insulate. Despite the clear economic benefits to the homeowner of insulating, this extra step presents a barrier to uptake for about one-third of the population. The offer of a group discount had no effect on uptake. However, offering to arrange for an attic clearing service to homeowners increased the odds of insulation installation by a factor of 2.8— even though the cost of the attic clearing service was borne by the homeowner. Efficacy was raised even further (about 4.8 times more than the control) when the attic clearing service was offered for a lower price (i.e., at cost).

Job Search Assistance for the Unemployed

U.K. job centers provide unemployment benefits and offer job search assistance. The typical process involves a great deal of time consuming paperwork. The U.K. Cabinet Office Behavioural Insights Team tested an alternative process in which the unemployed participants met with a person instead of completing excessive paperwork, made a written commitment of what job search activities they planned to do in the following 2 weeks, and identified their strengths in writing. An average of 67% of participants in the alternative process versus 57% in the traditional process discontinued unemployment benefits after 13 weeks.

These evidence-based strategies for changing behavior by reducing barriers, making commitments, and identifying strengths could be applied to other policy areas. There are many

⁵⁷ U.K. Cabinet Office Behavioural Insights Team. (2012). *Applying behavioural insights to reduce fraud, error and debt*. Retrieved June 12, 2013 from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/60539/BIT_FraudErrorDebt_accessible.pdf.

examples of minor changes that can induce desired behavior change (e.g., tax letters). Another approach is to change the system all together (e.g., make the tax system simpler as a whole). For example, reducing information asymmetry by providing opportunities for individuals to publicly rate government services or gain access to their own personal information such as energy use would introduce transparency and create incentives for the system to improve as a whole.

Subjective Well-Being

Each year, the ONS asks 150,000 Britons questions on all three components of SWB—life satisfaction, hedonic, and eudemonic. International comparisons of life satisfaction indicate a great deal of variance even among countries with comparable GDP per capita—for example, Denmark and Canada rate much higher than the United Kingdom and the United States. Data from the ONS demonstrate differences in life satisfaction by locality, economic growth, social relationships, connection to neighbors, and government policies. Publicly available data on life satisfaction could inform an individual’s decision making (i.e., an 18 year old interested in a legal career could find out the average life satisfaction of attorneys relative to that of another profession).

Conclusion

Research evidence from psychological science and behavioral economics, when tested with RCTs, can inform policies pertinent to a wide range of areas: growth, employment, improving government efficiency, consumer practices, energy efficiency, taxes and incentives, social mobility, crime, charitable giving, and well-being. The RCT approach for testing evidence-based policy can work at the level of goals (e.g., SWB), policies (e.g., regulation, public health), and processes (e.g., tax letters, call centers, job centers). The goal of the U.K. Cabinet Office Behavioural Insights team is to inform policy with research results using approaches that are easy, attractive, social, and timely.

The Financial Costs of Sadness

Jennifer Lerner, Ph.D., Harvard University

The work of the U.K. Cabinet Office Behavioural Insights Team as described by Halpern is admirable and inspiring. Psychological science does not seem to be valued to the same degree in the public policy realm in the United States. One way of addressing this problem would be obtaining high-level buy-in from individual government officials who know and trust psychological research. But that will not be sufficient, Lerner argued. Psychological scientists—both early investigators and established researchers—require additional information, training, and incentives to conduct policy-relevant and intervention-ready research in a way that can translate to real world settings. Psychological scientists also need more input from policy practitioners in order to best design studies that make a real difference in policy (i.e., “intervention ready”)—not just studies that could one day be applied to policy (i.e., “intervention relevant”). This kind of readiness is easier to achieve in economics because the field is concerned with outcomes. Psychological science is concerned with the mechanisms as well as the outcomes.

Lerner described some of her studies that fall into the “intervention-relevant” category, hoping for insights on how to make them “intervention-ready.” Lerner conducts research on how emotion affects decision making—an area that is at the intersection of psychology and economics. Emotion is a main driver of behavior and research on emotion could be useful in informing public policy and future iterations of implementable interventions. Citizens make some of the most consequential financial decisions when they are sad: death of a loved one, divorce, unemployment, natural disasters, or when suffering from clinical depression. Multiple studies with incentivized choices have demonstrated that incidental sadness makes people: (a) more impatient (resulting in loss of money in the long run); (b) pay more to obtain new possessions; and (c) sell their possessions for less. Impatience is of particular importance. Having a high discount rate is linked to numerous financial and health problems.

Experimental designs using emotion manipulations that are specific to the target emotion (i.e., the sad video makes viewer sadder but does not affect fear, anger, or disgust) demonstrate precise theoretically-driven predictions about emotion matter. For example, as the Appraisal-Tendency Theory predicts, sad participants are more impatient (i.e., lower annual exponential discount factor) than participants in a neutral or disgusted group.⁵⁸ The difference in present bias is not due to general negativity but is specific to sadness. These and related findings demonstrate that emotion is driving major policy level problems such as credit card debt and insufficient savings.

The Bandwidth Cost of Interventions

Eldar Shafir, Ph.D., Princeton University

Recent work from Shafir and colleagues demonstrates that scarcity changes how individuals allocate attention and use cognitive resources.⁵⁹ Those with scarce resources show greater vigilance and attentiveness but engage in persistent trade-off thinking, often focus on the short-term, and are distracted, which can lead to depletion and error. All costs of interventions—not just financial costs, but especially those on bandwidth—need to be considered and interventions should be scrutinized for disproportionate effects on individuals facing scarcity.

Like others who face scarcity, people who are budget constrained experience greater cognitive limitations in decision making than those who are not. In an experiment in a New Jersey mall, participants were asked how they would take care of a problem—a broken down car. High- and low-income participants demonstrated similar levels of cognitive performance and executive function (as measured by a cognitive control task and Raven’s Progressive Matrices) when the car repairs were presented as relatively inexpensive (\$150). However, when the car repairs were presented as expensive (\$1,500), the low-income participants scored significantly lower

⁵⁸ Lerner, J. S., & Keltner, D. (2001). Fear, anger, risk. *Journal of Personality and Social Psychology*, *81*, 146-159.

⁵⁹ Shan, A. K., Mullainathan, S., & Shafir, E. (2012). Some consequences of having too little. *Science*, *338*, 682-685.

Mullainathan, S., & Shafir, E. (2013). *Scarcity: Why Having Too Little Means so Much*. Henry Holt Times Books.

Mani, A., Mullainathan, S., Shafir, E., & Zhao, J. (2013). Poverty impedes cognitive function. Manuscript.

on cognitive performance and executive function (i.e., effect size was such that the effect of thinking about the expensive car repair for a poor person could be thought of as equivalent to a 13 point reduction in IQ]). The irony of poverty is that the poor must make high-stakes decisions under conditions of scarcity yet they are in a worse position to do so. These findings have implications for interventions and policy.

Interventions that address underappreciated cognitive costs, such as those that come from the demand on attention, can be beneficial for those experiencing a scarcity of cognitive bandwidth and can have an impact on a variety of other tasks and decisions. For example, automatic payments and savings defaults may decrease attentional demand, planning stress, and distraction among low-income adults and enable them to do better in other areas of their lives. Interventions that tax cognitive bandwidth, such as education and training programs, especially if delivered on an inflexible schedule, will impact those facing scarcity the most. There are plenty of well-meaning interventions intended to assist low-income people, but the cognitive load and attention required for participation impose a cost we would never contemplate imposing in pecuniary ways, which can hurt uptake and limit success. (One example is Mayor Bloomberg's otherwise commendable conditional cash transfer program, delivered in the form of a large and complicated coupon book). An intervention's full costs, beyond the purely monetary, need to be considered; a program may be offered free of (financial) charge to the consumer, but the level of cognitive bandwidth required can also represent a steep cost and it is one that disproportionately affects the poor.

Panel Discussion

Lessons from the U.K. Cabinet Office Behavioural Insights Team

The political framing of the efforts of the U.K. Cabinet Office Behavioural Insights Team has been key to its success. The coalition government has maintained a broad emphasis on deregulation, which has provided a window of opportunity. Applying behavioral insights to policy in this context serves as an alternative government role to the traditional functions of passing laws and spending money. Addressing areas that consumers care about and that provide quick successful results wins public support for the use of behavior change science in informing policies in many areas. The use of RCTs to test multiple arms of policy interventions not only provides evidence of effectiveness but also allows for a test of public acceptability of the program. It is the hope of the U.K. Cabinet Office Behavioural Insights Team that one of the lasting legacies of its work will be to improve methodology for evaluating interventions.⁶⁰

Laibson inquired about the long-term persistence of the impacts demonstrated by the policy changes initiated by the U.K. Cabinet Office Behavioural Insights Team. Halpern conceded that the long-term effects are unknown at this point. However, he pointed out that in many cases, the long-term effects are not relevant. For example, pension opt-out defaults and attic

⁶⁰ U.K. Cabinet Office Behavioural Insights Team. (2012). *Test, learn, adapt: Developing public policy with randomized controlled trials*. Retrieved June 15, 2013 from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/62529/TLA-1906126.pdf

insulation installation only need to happen once, not repeatedly. Once a shift is made in behavior, such as companies getting in the habit of paying taxes early, it tends to be consistent.

There have been no major failures of efforts of the U.K. Cabinet Office Behavioural Insights Team to date. There have been cases where one arm of a multi-arm RCT was found to be ineffective. This type of “failure” is much more palatable because many alternatives are being tested. In some cases, political or administrative barriers to change have prevented the U.K. Cabinet Office Behavioural Insights Team from implementing and testing desired interventions.

Broad Measures of Effects

Suzman remarked that several speakers presented research that demonstrated the need for measurement of a broad range of effects of an intervention (e.g., network effects, unintended consequences, systematic effects). Baicker’s research found that because everyone was expecting health insurance to have a clear effect on specific health outcomes, the significant effect on financial security and the person’s discount rate might have been overlooked. Financial security is important and ties in with Shafir’s discussion of the impact of scarcity (in this case, lack of health insurance) on financial stress and decision making. Halpern has encouraged the PM to look at broader measures of effects.

New Directions in the Science of Behavior Change

The Upward Spiral Theory of Lifestyle Change

Barbara L. Fredrickson, Ph.D., University of North Carolina at Chapel Hill

Fredrickson’s current work builds on research on the broaden-and-build theory, which posits that not only does the experience of positive emotions impact and guide behavior in the moment, but collective experiences of positive emotions have long-lasting consequences on physical, intellectual, social, and psychological resources.⁶¹ A great proportion of disease and mortality can be attributed to modifiable behaviors at a great cost to individuals and society. The return on investment for basic and translational research on behavior change is enormous.

Willpower is insufficient to sustain behavior change and providing information about how and why a person should change his or her behavior is ineffective. The conscious application of willpower is not helpful, especially for the disadvantaged. However, those who experience enjoyment are 4.5 times more likely to maintain a wellness behavior after 15 months.⁶² Enjoyment sets the stage for future seeking behavior, as in the case of addiction.⁶³ Things that are enjoyed become more apparent in the environment. In sickness behavior, inflammation in and of itself creates a suite of behaviors characterized by desire for social isolation and physical

⁶¹ Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56, 218-226.

⁶² Cohn, M. A. & Fredrickson, B. L. (2010). In search of durable positive psychology interventions: Predictors and consequences of long-term positive behavior change. *The Journal of Positive Psychology*, 5, 355-366.

⁶³ Berridge, K. C. (2007). The debate over dopamine’s role in reward: The case for incentive salience. *Psychopharmacology*, 191, 391-431.

inactivity. Inflammation turns down the positive emotion reward system and results in less activation in the ventral striatum.⁶⁴ Insights from the neuroscience of addiction and inflammation can inform the psychology of wellness behavior.

The psychology of wellness behavior is that biological systems can also amplify positive emotions, making wellness behaviors—being physically active, being social, learning something new, pursuing meaning, eating well, caring for the body—increasingly appealing over time. There is reciprocal causality with many of the biological resources that amplify positive emotions, such as cardiac vagal tone. Collaborative work with genomics scholar Steve Cole, Ph.D., is focused on identifying gene expression profiles that amplify the positive yield of wellness behaviors. This upward spiral theory of lifestyle change posits that wellness behaviors that produce positive emotions in turn create nonconscious wanting (dopaminergic response), broadened awareness, and increments in the enduring resources that further amplify the positive emotion yield of wellness behaviors. As such, positive emotions can create increasing and nonconscious motives for wellness behaviors.⁶⁵

Current research funded by the National Cancer Institute is focused on testing these ideas and determining if teaching people skills to self-generate positive emotion is more effective than willpower for maintaining wellness behaviors. Understanding the basic mechanisms underlying motivations to engage in wellness behaviors can inform approaches to inducing sustained behavior change. The goal is for people to enjoy exercise (or another wellness behavior), even at moderate levels, so that they are intrinsically drawn toward maintaining that behavior, bypassing the need for willpower.

Changing Emotions, Changing Decisions

Elizabeth Phelps, Ph.D., New York University

Findings from affective neuroscience demonstrate that emotions and reason are not competing processes. There are not separate brain “systems” of emotion and reason. Rather, emotion has a modulatory role in cognition, including the computation of value and decisions. As Lerner discussed, an affective state (e.g., mood, stress) can alter decision making processes. In addition, the affective response to the choice or choice outcomes is a component of the value computation.

Phelps and colleagues Colin Camerer, Ph.D., and Paul Glimcher, Ph.D., are investigating whether the tools of affective neuroscience and neuroeconomics can be used to characterize more precisely how and when emotion is incorporated into value computation and decision making. They are also examining whether techniques that can be used to change emotion will change choices. Emotion consists of several components—subjective feelings, bodily response,

⁶⁴ Eisenberger, N. I., Berkman, E. T., Inagaki, T. I., Rameson, L. T., Mashal, N. M., & Irwin, M. R. (2010). Inflammation-induced anhedonia: Endotoxin reduces ventral striatum responses to reward. *Biological Psychiatry*, *68*, 748-754.

⁶⁵ Fredrickson, B. L. (2013). Positive emotions broaden and build. *Advances in Experimental Psychology*, *47*, 1-53.

expression, and tendency to action. This line of research focused solely on the bodily response of arousal as an indicator of emotion and explored emotion's impact on two decision variables: loss aversion and temporal discounting.

Loss Aversion

To investigate loss aversion, participants were offered the option of (1) a risky gamble comprising two amounts, each with a 50-50 chance, or (2) nothing. Loss aversion for each individual participant was quantified by varying the amounts in the risky gamble option across trials. Results indicate that the greater the arousal response to losses relative to gains, the greater loss aversion. In addition, the amount of activity in the amygdala to losses relative to gains was also correlated with loss aversion. The amygdala is a brain region broadly implicated in emotion-cognition interactions, including decision making.

Temporal Discounting

In a study of discounting, the participant has the option of two possible rewards—a smaller immediate reward or a larger delayed reward. The delay options included 7, 30, 60, 100, or 180-day delays. People vary in how much they discount future rewards. A larger discount rate indicates more impatience. The experiment demonstrated that arousal at choice correlated with the subjective value of the delayed reward and that those with higher arousal at choice were more patient and showed less discounting. In other words, arousal at choice is related to higher subjective value of the delayed reward. In this choice context, it seems that individuals who are capable of getting excited about future rewards may be more likely to choose them.

Emotion Regulation

Emotion regulation strategies can alter behavioral and physiological responses to emotional stimuli and the neural correlates of those responses in regions such as the amygdala or striatum. One strategy for regulating emotion is reappraisal, which encourages taking a different perspective (e.g., seeing the glass as half full). A reappraisal manipulation was used during the loss aversion paradigm described above. On some choices participants in the loss aversion experiment were told to attend to each choice in isolation, while on others they were told to think about this choice as one of many, as if they were a 'trader assembling a larger portfolio.' Loss aversion was decreased when this regulation strategy (i.e., 'think like a trader') was employed and the reduction in loss aversion correlated with decreases in physiological responses to losses.⁶⁶ There was also a decrease in activation in the amygdala to losses during the regulation condition and increases in brain regions known to play a role in the cognitive control of emotion. Future research will explore how manipulating the emotional response to immediate and delayed rewards through changing the choice context or framing the choice might alter the tendency to discount future rewards.

⁶⁶ Sokol-Hessner, P., Hsu, M., Curley N.G., Delgado, M.R., Camerer, C. F., & Phelps, E. A. (2009). Thinking like a trader selectively reduces individuals' loss aversion. *Proceedings of the National Academy of Sciences* 106, 5034-40.

By combining insights from affective neuroscience and behavioral economics, we can begin to specify precisely how emotions might influence decisions and take advantage of this knowledge to change choices through changing emotion.

Behavioral Economics and Policy-Relevant Advances in Health Behavior

Kevin G. Volpp, M.D., Ph.D., University of Pennsylvania

In a 2012 National Business Group on Health survey, employers identified poor health habits as the number one challenge to maintaining affordable health benefits coverage.⁶⁷ In 2013, 85% of large firms—up from 36% in 2009—reported using or plans to use some type of incentive to drive better health behaviors. The PPACA allows for penalties or rewards of 30 to 50% of total premiums, which may result in cost shifting. Public policy reflects the importance of incentives, but the optimal path is uncertain. Changing individual behavior more effectively and identifying the optimal incentive system(s) requires application of behavioral economics.⁶⁸

George Loewenstein, Ph.D., and Volpp's research on using decision errors to help individuals make better health choices identified several applications of behavioral economics to incentive structures.⁶⁹ Present-biased preferences can be addressed with frequent and immediate rewards for beneficial behavior. The framing and segregating of rewards is important for effectiveness: a \$100 cash reward will likely be more effective than a \$100 discount on the premium. Research shows that people overweight small probabilities (e.g., they play the lottery) and this can be exploited by providing probabilistic rewards for self-interested behavior. Individuals' desire to avoid regret can be tapped by telling them they would have won if they had been adherent. Loss aversion could be addressed by putting the rewards at risk if behavior does not change. Finally, the bias people have towards maintaining the status quo could be addressed by creating a path of least resistance to behavior change.

Applying Behavioral Economics Principles to Behavior Change

In a study of 878 participants from 85 General Electric work locations throughout the United States by researchers at the University of Pennsylvania, an RCT compared a control group that was given information about smoking cessation programs and a treatment group that was given the same information plus the opportunity for incentives totaling \$750.⁷⁰ Eligibility for the program was tied to quitting in the first 6 months. The difference in quit rates between the two

⁶⁷ Towers Watson and National Business Group on Health. (2012). *United States performance in an era of uncertainty: 17th Annual Towers Watson/National Business Group on Health employer survey on purchasing value in health care*. Retrieved June 15, 2013 from <http://www.changehealthcare.com/downloads/industry/Towers-Watson-NBGH-2012.pdf>

⁶⁸ Volpp, K. G., Asch, D. A., Galvin, R., & Loewenstein, G. (2011). Redesigning employee health incentives: Lessons from behavioral economics. *The New England Journal of Medicine*, 365, 388-390.

⁶⁹ Loewenstein, G., Brennan, T., & Volpp, K. G. (2007). Protecting people from themselves; Using decision errors to help people improve their health. *Journal of the American Medical Association*, 298, 2415-2417.

Volpp, K. G., Pauly, M. V., Loewenstein, G., & Bangsberg, D. (2009). P4P4P: An agenda for research on pay-for-performance for patients. *Health Affairs*, 28, 206-214.

⁷⁰ Volpp, K. G., Troxel, A. B., Pauly, M. V., Glick, H. A., Puig, A., & Asch, D. A., et al. (2009). A randomized, controlled trial of financial incentives for smoking cessation. *The New England Journal of Medicine*, 360, 699-709.

programs was stark: 5% quit rate in the control group versus 14.7% quit rate in the treatment group at 12 months. Unbundled direct reward payments, separate from the health insurance premium structure, were shown to be effective. Based on this evidence, General Electric implemented a nationwide plan in 2010 with 152,000 employees.

Another firm-based study of a mid-sized employer showed that applying principles of behavioral economics increases employee health risk assessment participation relative to standard economics.⁷¹ In year 1, the firm offered a \$25 incentive to employees to complete a health risk assessment. The firm applied standard economic theory in year 2 and increased the incentive to \$50. Participation increased from 40 to 44% between year 1 and year 2 (a 10% increase). In a separate arm in year 2, the Volpp and Loewenstein team used behavioral economic principles of regret aversion and overweighting small probabilities to offer the same \$50 plus a regret lottery. The regret lottery was structured by dividing employees in this arm into small groups, one of which was chosen at random at the end of each week. Each individual in the randomly chosen group who had completed the health risk assessment received \$100. If everyone in the small group had completed the assessment, each member received \$125. Health risk assessment participation in the \$50 incentive plus regret lottery treatment group increased to 64% (a 60% increase from year 1).

There are a number of other examples of the successful use of behavioral economics principles to induce and maintain healthy behaviors. Research evidence has supported the use of daily lottery-based incentives to increase warfarin adherence, lotteries and deposit contracts to achieve initial weight loss, social incentives via a peer mentor for HbA1c maintenance, and the use of default options in advance directives for setting goals for end-of-life care.⁷² The results of these research studies can be translated into practice to achieve desired behavior change.

The shift from fee-for-service to population-based financing of health care (e.g., Accountable Care Organizations, medical homes) requires new service delivery models, as health care delivery organizations are not currently equipped for the level of health engagement needed between clinicians and their patients. Physicians do not know much about what their patients are doing outside of medical visits and they do not have effective tools to affect patient behavior (e.g., medication adherence, weight loss).⁷³ The proliferation of wireless technologies

⁷¹ Haisley, E., Volpp, K. G., Pellathy, T., & Loewenstein, G. (2012). The impact of alternative incentive schemes on completion of health risk assessments. *American Journal of Health Promotion, 26*, 184-188.

⁷² Volpp, K. G., Loewenstein, G., Troxel, A. B., Doshi, J., Price, M., Laskin, M., & Kimmel, S.E. (2008). A test of financial incentives to improve warfarin adherence. *BMC Health Services Research, 8*, 272-277.

Volpp, K.G., Troxel, A. B., Norton, L., Fassbender, J., & Loewenstein, G. (2008). Financial incentive-based approaches for weight loss: A randomized trial. *Journal of the American Medical Association, 300*, 2631-2637.

Long, J. A., Jahnle, E. C., Richardson, D. M., Loewenstein, G., Volpp, K. G. (2012). Peer mentoring and financial incentive to improve glucose control in African American veterans: A randomized, controlled trial. *Annals of Internal Medicine, 156*, 416-424.

Halpern, S. D., Loewenstein, G., Volpp, K. G., Cooney, E., Vranas, K., & Quill, C. M. et al. (2013). Default options in advance directives influence how patients set goals for end-of-life care. *Health Affairs, 32*, 408-417.

⁷³ Asch, D. A., Muller, R., & Volpp, K. G. (2012). Automated hovering: Watching over the other 5,000 hours. *New England Journal of Medicine, 367*, 1-3.

and advances in the understanding of behavioral economics create new opportunities to improve population health. Wireless devices and innovative technologies enhance the use of behavioral economics principles and using support from NIH, the University of Pennsylvania team built a system that can be used to influence patient behavior outside of the clinic with automated methods for data capture, data transmission, rewards communication, and funds fulfillment. Several automated hovering solutions are being tested in a number of areas: smoking cessation, obesity, medical home enhancement initiatives that remotely monitor blood pressure and blood sugar, medication adherence for chronic disease, post acute myocardial infarction (AMI) medication adherence, habit formation, and social incentives.

Conclusion

Incentive programs for changing behavior can be made more effective by applying the evidence of behavioral economics. Simply adjusting premiums is not sufficient; tests of ways to integrate present bias, mental accounting, lotteries, anticipated regret, defaults, and loss aversion are needed. The use of such strategies can improve efficiency of funds already allocated to incentive systems. A combination of technology and behavioral economic engagement strategies can help improve both employer programs and population financing efforts.

What Policy Makers Should Say in Exchanges with Citizens

Robert B. Cialdini, Arizona State University

Cialdini presented the results of research he conducted in San Diego to explore ways to induce energy conserving behavior. A California energy saving survey found that individuals have different beliefs about their motives for conserving energy: environmental protection, benefit to society, save money, and social norms (i.e., keeping up with their neighbors). Respondents reported that environmental protection was the most important and social norms were the least important motive for conserving energy. However, when participants were asked about their actual behavior in the last 6 months—as opposed to their beliefs—correlations revealed the exact opposite. Actual energy conserving behavior was most highly correlated with the extent to which participants believed their neighbors were engaging in the same behaviors. A limitation of this analysis is that it involves two types of self-reports (behavior and beliefs).

In a follow up experimental study, hang tags were placed on the doorknobs of participants that listed one of the four motivations for conserving energy. One control group received no message and another control group received a message urging energy conservation but with no reason provided. Actual energy use was measured by reading the meters located at the houses. There was no significant difference in energy use in either of the control groups. In the treatment group, only messages of social norms (what their neighbors were doing to conserve energy) induced a significant reduction in energy consumption.

There are implications of this research for the usefulness of surveys. Although surveys successfully reflect individuals' attitudes and options, they do not necessarily capture individuals' recognition of the true motivations for their actions. Therefore, policy based on surveys of citizens' reported motives for action is likely to be misguided. RCTs and other

experiments are more likely to provide accurate information to inform effective policy. Simply informing citizens of the socially desirable actions of the majority of people around them is likely to be effective. A private-sector firm called Opower partnered with the researchers to convert this finding into a policy-based program. Opower generated a report for each consumer about his or her energy use in the previous month compared to an average neighbor and a very energy-efficient neighbor. This policy has resulted in increases in average steady state savings over the course of 10 to 16 months in a variety of energy markets. Government policy can accelerate the rate of change toward socially desirable solutions by including private sector entities, which tend to be more nimble, in the process.

Panel Discussion

The Private Sector

Working with a variety of non-government organizations is an effective way to collectively test ideas in settings where they can be implemented. For example, Volpp recently completed a four-arm RCT for a South African insurer. The insurer collected data on 11,000 enrollees and provided it to the researchers for analysis; this kind of sample size would be difficult to obtain without this mutually-beneficial partnership. One of the challenges with private sector research is the expectation of a quick timeline.

Cialdini posited that the role of government is to create a set of conditions (e.g., regulations, incentives) to incentivize the desired behavior. Getting the private sector involved in research on effective options for doing so tends to garner political support from both parties.

Richard Thaler, Ph.D., inquired about the possibility of publication of the results from the Opower research. Cialdini reported that they do not have any publications planned, but it is conceivable that this type of research could be published in a top journal because the research meets the appropriate methodology criteria.

Emotion

Given the evidence for the effect of emotion on decision making, Phelps found it surprising that there is not more ongoing research to measure it in a specific way. The work she is engaged in—attempting to tease apart types of affective responses—is a line of research in its infancy. It is not yet in the stage of being ready to inform policy but could be in the future.

Fredrickson noted that much of the discussion has been focused on behavioral economics yet a lot of the science presented has focused on the importance of connection and social integration. There needs to be a combined approach. Social and emotional issues may be more difficult to quantify but still have great impact.

Educational Interventions

The presentations and discussion have not focused on educational interventions. Education and training is a popular policy tool. Christakis pointed out that one of the ironies of educational interventions is that they seem appealing and in many cases tend to reduce the prevalence of a

problem overall, yet educational interventions do not reduce disparities. For example, the educational “Back to Sleep” campaign for preventing Sudden Infant Death Syndrome (SIDS) reduced cases of SIDS overall but the Black-White disparity in SIDS cases actually increased.

Return on Investment

Volpp raised a broader question about the return on investment in terms of improved health of the American population. The Oregon Health Insurance Experiment demonstrated that simply paying more for health care might not be, by itself, an effective way to improve health. The potential return on investment for social and behavioral interventions to improve health outcomes is much greater.

Concluding Statements

Richard Thaler, University of Chicago

Halpern’s success with the U.K. Cabinet Office Behavioural Insights Team is due in part to the high-level support from the PM and Halpern’s skills as a psychological scientist and policy maker. The goal of meetings with Cabinet Office and Ministry personnel is not to educate them about science or tell them what to do. The U.K. Cabinet Office Behavioural Insights Team simply asks the government office about prevailing problems (e.g., no one is using the attic insulation incentive, 10% of people are not paying their taxes on time). The discussion and subsequent ideas stem from focusing on the problem. The U.K. Cabinet Office Behavioural Insights Team “mantras” for addressing a problem is to “make it easy” and use evidence to support the ideas. Halpern provided many examples of successful interventions, few of which introduced any new psychological evidence. The evidence base is known and the U.K. Cabinet Office Behavioural Insights Team is simply applying it to new settings, situations, and problems.

The field of psychological science needs greater support for applied research in order to have more impact on public policy. Currently the type of psychological research that is useful in the real world is not the type that is valued in the academic profession of psychology or in top journals. Among other things, applied research in psychological science could address two questions often asked about small lab-based interventions: can it be taken to scale and what are the effect sizes?

Thaler’s Save More Tomorrow™ program is an example.⁷⁴ Participants were invited to commit to increasing savings every time they received a raise. The program has three ingredients: it is automatic, it avoids loss aversion because it is linked to raises, and it exploits present bias. None of these were new ideas. The results were large: people increased savings overall from 3 to 13%. Yet this project was not an RCT and likely would not have been able to be published in a major psychology or economics journal.

⁷⁴ Thaler, R. H. & Benartzi, S. (2004). Save more tomorrow™: Using behavioral economics to increase employee saving. *Journal of Political Economy*, 112, S164-S187.

Daniel Kahneman, Princeton University

Kahneman agreed with Thaler's assertion that applied psychological research is undervalued by the field. Forty years ago Kahneman was teaching a graduate seminar at Hebrew University he titled "Applying Psychology" in which he asked students to take a real world problem and find a solution from an undergraduate psychology textbook. "Applied Psychology" is not synonymous with "Applying Psychology." Then and now, applied psychology is not attracting the best talent or held in high regard at the best universities.

Labeling is important when we are trying to improve the prestige of a field of work. Psychology students are not attracted to something called "behavioral economics." Yes, it is amusing to think of the President having "psychological advisers" because of how the mental health connotation, rightly or wrongly, might be perceived. Whatever the name—"applied behavioral science" might be a better term—it needs to be a valued component of the curricula at the best schools to attract academic talent.

Carstensen mentioned that in discussions with economists, psychological scientists need to be able to talk about effect sizes, efficiency, and why their findings matter in the real world. It is important for psychologists and economists to learn about how the other thinks.

Another challenge to applying behavioral science in the service of public policy is garnering bipartisan support. It is important to think about how the evidence can be presented and made relevant to the intended audience. It is noteworthy that Save More Tomorrow™ had bipartisan support in Congress.

There is a great deal of opportunity for applying already well-known psychological and behavioral economic principles to policy interventions. It was impressive to see during this meeting several presentations on new topics, findings, and possibilities for translation to interventions—social networks, neurobiology, and cognitive bandwidth, for example. These are novel ideas, but there is much to be done with older ones. The task that faces the community of behavioral scientists is to combine the application of well-known psychological principles to real world problems (low hanging fruit) with the exploration of new ideas that have the potential for applications to public policy.

David Laibson, Harvard University

The research evidence presented and discussed today offers many opportunities for further exploration and possible application to policy "nudges" to induce desired behavior change in the population. It is equally important that there be an active research agenda to assess public receptivity to nudges. There is universal acceptance of 401(k) defaults, but government regulations mandating that firms offer an auto-enrollment feature is not always supported. The palliative care defaults Volpp discussed would likely raise concerns among the public. It is curious because Social Security is a powerful paternalistic policy, yet it has substantial public support. There should be research on how to predict public reaction to various kinds of nudge

policies, determine the characteristics of nudge policies that generate 90 percent approval, and evaluate the intensity of approval or disapproval for various policies. Two parallel scientific agendas are needed if behavior change research is to have a real impact: how does a nudge change behavior and how does the public perceive such nudges? When are nudges desirable and when are nudges—even effective nudges—prone to generate backlash because they are too paternalistic? This is an opportunity for a new era of research.

David Halpern, U.K. Cabinet Office Behavioural Insights Team

An interesting set of research results does not necessarily point to a policy problem until a possible solution is identified. Much of this behavior change science research is exciting and promising but requires intervention studies to assess applicability. Baird’s suggestion of the “how do you know” campaign is on target. A great deal of money is spent on government programs and policies without any real evidence supporting their effectiveness—that is the true ethical problem. Efforts to shift the public’s thinking in this way would garner support for evidence-based policies.

Early successes in program areas that resonate with the public and policy makers are critical in garnering support for using behavioral science to inform policy generally. If it can be demonstrated that small changes, based on evidence, can improve a policy or program in a way that matters to consumers, they will be more likely to support future research in this area.

Philip Rubin, White House Office of Science and Technology Policy

The Obama Administration has an entrepreneurial spirit. It has involved the private sector as well as academia and invited a wide range of input on many topics. Involvement from behavioral and social scientists is welcome and their participation is invited. Rubin’s role as the assistant director for Social, Behavioral, and Economic Sciences and his dedicated staff send a signal that the Administration values behavioral science even during a time of political tension and stress surrounding public support for the field of social science.⁷⁵ It is essential that our elected officials continue to support social science research. Researchers in turn need to pull together as a community and resist being distracted from the work that needs to be done. OSTP is listening to the ideas presented and working to create an ecosystem and culture that strengthens the voice of behavioral science in government.

Epilogue

The meeting on May 22, 2013, already has generated a number of activities that are informing the Administration’s broader agenda to advance evidence-based policymaking through the increased use of innovative, low-cost approaches to program design and evaluation. OSTP, CEA, the OMB, and the Department of Treasury co-hosted a meeting the following day that focused on how research findings from the social and behavioral sciences can be harnessed to increase

⁷⁵ See, for example, <http://www.psmag.com/politics/the-congressional-war-on-social-science-58407/>.

federal program integrity and performance. The May 23, 2013 meeting included discussion about the operations and strategies that drive the U.K. Behavioural Insight Team's success, existing behavioral insights efforts that are already underway at agencies, as well as proposed trials that agencies have designed in collaboration with offices in the Executive Office of the President and plan to implement within the next 3 months. The meeting concluded with commitments from the Executive Offices, federal agencies, and external foundations, regarding concrete next steps that can be taken to help accelerate and build infrastructure for this approach. A similar meeting occurred at the Brookings Institution in the afternoon that engaged Council for Electronic Billing and Payment, Consumer Financial Protection Bureau, Deloitte LLP, and others. The meeting on May 22, 2013, and its offshoots have succeeded in promoting a culture that strengthens the voice of behavioral and social science in government, with the ultimate goal of informing the development of policies that benefit the health and well-being of all Americans.

APPENDIX A: MEETING AGENDA

Psychological Science and Behavioral Economics in the Service of Public Policy
May 22, 2013
Washington, DC

In conjunction with
Association for Psychological Science 25th Annual Convention

8:00 WELCOME AND INTRODUCTIONS

Philip Rubin, White House Office of Science and Technology Policy
Alan Kraut, Association for Psychological Science
Richard Suzman, National Institute on Aging, Division of Behavioral and Social Research

8:30 ECONOMICS, PSYCHOLOGY AND POLICY—WHO IS AT THE TABLE?

KEYNOTE ADDRESS:

David Laibson, Harvard University: *Psychological and economic voices in the policy debate*

8:50 RESPONDENTS:

Elke U. Weber, Columbia University: *Some observations from a psychologist at the policy table*
Brian Baird, former US Representative: *What social science should teach us, but we too often ignore, about social science and public policy*

9:10 DISCUSSION

Panel Discussions Chaired by Lisbeth Nielsen, NIA/BSR

9:40 BREAK

10:00 INDIVIDUAL LEVEL RISK FACTORS AND INTERVENTION TARGETS

Walter Mischel, Columbia University: *Marshmallows and public policy: From pre-K to 401(K)*
Steven Suomi, Eunice Kennedy Shriver National Institute of Child Health and Human Development: *Behavioral, biological, and epigenetic consequences of different early social experiences*
Stephen B. Manuck, University of Pittsburgh: *Neuroticism—A public health challenge?*
Laura L. Carstensen, Stanford University: *Key challenges for long lived societies*
Arthur Stone, Stony Brook University: *Well-being science and public policy—Approaches and applications in the United States and United Kingdom*

10:50 DISCUSSION

11:20 SOCIAL RISK FACTORS AND INTERVENTION TARGETS

John T. Cacioppo, University of Chicago: *Social isolation*

Susan T. Fiske, Princeton University: *Humans are intent-detectors: Policy implications*

Lisa F. Berkman, Harvard University: *Work, family, and health in an aging society: The long-run impacts of labor and family policies and practices on health*

Katherine Baicker, Harvard University: *Health insurance and health outcomes for low-income adults*

George W. Rebock, Johns Hopkins University: *The Baltimore Experience Corps® trial: Increasing social capital for an aging society*

Nicholas Christakis, Harvard University: *Exploiting social network externalities to magnify the impact of behavioral interventions*

12:20 DISCUSSION

12:50 LUNCH BREAK

Sponsored by the Association for Psychological Science

1:20 BEHAVIORAL ECONOMICS AND AMERICA'S GREATEST CHALLENGES

KEYNOTE ADDRESS:

Alan Krueger, White House Council of Economic Advisers: *Behavioral economics and America's greatest challenges*

1:50 DISCUSSION

2:10 BREAK

2:30 POLICY APPLICATIONS OF SCIENCE OF BEHAVIOR CHANGE

KEYNOTE ADDRESS:

David Halpern, U.K. Cabinet Office: *Applying behavioural insights*

2:50 RESPONDENTS:

Jennifer S. Lerner, Harvard University: *Impediments and opportunities: Response from a psychologist*

Eldar Shafir, Princeton University: *Commentary*

3:20 DISCUSSION

3:45 BREAK

4:15 NEW DIRECTIONS IN THE SCIENCE OF BEHAVIOR CHANGE

Barbara L. Fredrickson, University of North Carolina, Chapel Hill: *The upward spiral theory of lifestyle change*

Elizabeth Phelps, New York University: *Changing emotion, changing decisions*

Kevin Volpp, Philadelphia VA Medical Center and University of Pennsylvania: *Behavioral economics and policy-relevant advances in health behavior*

Robert Cialdini, Arizona State University: *What policy makers should say (but not believe) in exchanges with citizens*

4:55 DISCUSSION

5:20 CLOSING COMMENTARY AND SUMMARY REMARKS

Richard Thaler, University of Chicago

Daniel Kahneman, Princeton University

David Laibson, Harvard University

David Halpern, U.K. Cabinet Office Behavioural Insights Team

Philip Rubin, White House Office of Science and Technology Policy

6:00 CLOSING RECEPTION

Sponsored by the Association for Psychological Science

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Rose Li and Associates, Inc. (Meeting Summary)

Rose Maria Li, President
Chandra Keller-Allen, Associate

APPENDIX C: ABBREVIATIONS AND ACRONYMS

Acronym	Definition
5-HIAA	5-hydroxyindoleacetic acid
AIDS	acquired immunodeficiency syndrome
AMI	acute myocardial infarction
APS	Association for Psychological Science
ATUS	American Time Use Survey
BLS	Bureau of Labor Statistics
BMI	body mass index
BSR	Division of Behavioral and Social Research
CBT	cognitive behavioral therapy
CDC	Centers for Disease Control and Prevention
CEA	Council of Economic Advisers
CPS	Current Population Survey
CSF	cerebrospinal fluid
EITC	Earned Income Tax Credit
ESRC	Economic and Social Research Council
fMRI	functional magnetic resonance imaging
GDP	Gross Domestic Product
HIV	human immunodeficiency virus
HRS	Health and Retirement Study
IADL	Instrumental Activities of Daily Living
NIA	National Institute on Aging
NIH	National Institutes of Health
OECD	Organisation for Economic Co-operation and Development
OMB	Office of Management and Budget
ONS	Office of National Statistics
OSTP	Office of Science and Technology Policy
PM	Prime Minister
PPACA	Patient Protection and Affordable Care Act
PTSD	post-traumatic stress disorder
RCT	randomized controlled trial
SIDS	Sudden Infant Death Syndrome
SWB	Subjective Well-Being
U.K.	United Kingdom
U.S.	United States