

UC BERKELEY STRATEGIC PLANNING

SIGNATURE INITIATIVES WORKING GROUP

SPRING 2018 REPORT

FINAL VERSION - DECEMBER 2018

APPENDIX A5: CHARTING A NEW COURSE TO HEALTH AND WELLBEING

BRIEF SUMMARY:

Health is so much more than the absence of disease. While 20% of the determinants of health are based on clinical interventions, the other 80% of influential forces include our social and economic contexts, time and place, our own behaviors, and the physical environment around us. Berkeley will chart a course to optimal wellbeing by maximizing innovation in life science discovery, accelerating the technological developments to bring these insights to practical application, and minimizing the social barriers to equal access to health. Our aim is to bring the broad and deep expertise of the Berkeley community together around points of innovation to approach the full spectrum—the full 100%—of the factors that influence human health.

EXECUTIVE SUMMARY:

While the clinical care and medical interventions we receive are often the most commonly considered aspects of wellbeing, those factors make up only 20% of the determinants of health. The other 80% of influential forces include our social and economic contexts, time and place, our own behaviors, and the physical environment around us. Berkeley's comprehensive academic excellence enables us to innovate along the entire spectrum, to approach 100% of the factors that determine one's path to health and wellbeing. Berkeley is well suited to succeed in this aim, as we have a long-standing record of innovation at the interfaces between disciplines.

This Signature Initiative will emphasize three major types of innovation for improving human health. First, UC Berkeley will continue to emphasize fundamental scientific discovery that extends our knowledge. Second, at the same time, we will facilitate the technological innovations that bring these insights into practical use. And third, we will foster connections among the many social, economic, environmental, and behavioral impediments to health and wellbeing. A common theme will be the diversity of human experiences related to health and wellbeing, with the aim of creating inclusive strategies for imagining new pathways to better health locally and globally.

Over the next 10 years, Berkeley will chart a course to maximize innovation in life science discovery *and* minimize barriers to access to wellbeing through an integrated approach.

Our Values that Support This Approach:

- **Berkeley believes that opportunities for health and wellbeing should be widely available, inclusive, and accessible without discrimination or bias.** Increasing the health of populations requires considering the needs of everyone in the society and taking diverse approaches to research.
- **Berkeley is forward-thinking.** Berkeley's culture challenges conventional thinking, leverages technology, and builds bridges between basic research, technology development, translational research, implementation, public policy, education, and action. We will focus our academic strengths on a long-term vision for improving human health that will have a lasting impact on the future of humanity.
- **Berkeley is committed to the public good.** We focus our research, education, and service efforts in areas with potential to have transformative impact on health and its contributing factors, from fundamental biological discovery to the development of new therapies, to the effects of environmental change and better understanding the social and economic factors that affect human health, through to designing the infrastructure of tomorrow that will provide future generations with healthier living environments.

THE CHALLENGE:

Despite the dramatic increase of wealth in the world and the development of awe-inspiring medical innovations, millions of people are still living with extremely poor health, here in California and around the world. Declining health and disparities in access to medical intervention are among the most pressing challenges of our time. Despite incredible breakthroughs over the last few decades,

- More than 97% of US adults do not have a healthy lifestyle.¹
- Among the 35 most economically developed countries in the world, the US life expectancy at birth for women now ranks 29th, a drop from 18th in 1980.² The situation is not much better for men.
- Within the US, life expectancy at birth is declining for all ethnicities.³
- While California ranks in the top five states for the lowest infant mortality rates, the differences between ethnic groups show we still have a long way to go.⁴
- And, globally, the infant mortality rate is ten times higher in many African nations compared to California.⁵

¹ [Loprinzi et al. 2016. Mayo Clinic Proceedings 91\(4\):432-442.](#)

² <https://www.cdc.gov/nchs/data/hus/hus16.pdf#015>, Table 14

³ <https://www.cdc.gov/nchs/data/hus/hus16.pdf#015>, Table 15

⁴ <https://www.cdc.gov/nchs/data/hus/hus16.pdf#015>, Table 12

⁵ World Health Organization, http://www.who.int/gho/child_health/mortality/neonatal_infant_text/en/ (accessed 26 March 2018)

Collectively these trends demonstrate the need for more than just a focus on health care and its delivery. They show an urgent need to address the full range of problems, which includes sociological contexts, educational opportunity, the surrounding environment, location and place, and human behavior. California, the US, and the world depend on new thinking that will reverse these global trends.

This is where Berkeley can make significant contributions. Berkeley has a strong community of top life science and public health experts, a broad range of world-renowned social scientists, scholars in the arts and humanities, engineering, law, business, and more. Most importantly, it has a genuine culture of working across disciplines that is unrivaled and will ensure we are greater than the sum of our exceptional parts. In addition, recent technological advancements in scientific tools and data science enable us to investigate the fundamental issues in ways that could hardly be conceived of just a decade ago. This Signature Initiative draws on this diversity of intellectual strength to reimagine a future for human health scholarship and teaching that is more interdisciplinary, more innovative, and, as a result, more likely to have significant impacts on society.

POTENTIAL FOR IMPACT:

WHAT DOES SUCCESS LOOK LIKE IN 10 YEARS?

Impact on the Campus

This initiative will position the University to attract new faculty who bring diverse research approaches and perspectives to the issue of improving health and wellbeing, and who are able to work across disciplinary boundaries in creative and innovative ways. Current faculty will have more opportunities to identify research and teaching synergies in human health that will inspire new insights and novel research programs that provide the breakthroughs of tomorrow. Improving human health also has the potential to be a focal point for discovery-based learning at all levels, from the introductory to the upper-division undergraduate, to the graduate level. Students will learn how to approach the complexity of human health with solutions that are unbounded by traditional academic disciplines. Students will have the resources and guidance to explore entrepreneurial activities throughout their time on campus.

Impact on the State and the Nation

Various populations within California will be key foci for these projects, leading to more direct connections between Berkeley and our fellow Californians. With the diversity of approaches that this Signature Initiative entails, we will reach a broader swath of the population, with more tailored ideas for improving health and, consequently, demonstrate more specifically the benefit to California of having Berkeley among its premiere public institutions.

Impact on the World

Given the breadth of perspective Berkeley brings to human health, the research innovations and insights we develop will also apply to populations around the world, with a focus on those who face significant inequality in wealth and social justice.

EXEMPLAR THEMES WITHIN THIS CHALLENGE:

We invite the UC Berkeley Community to submit ideas (at any stage of development). We also want to

hear from faculty already working on research programs within the scope of this Signature Initiative. For any idea submitted, please limited it to 500 words at this stage. Ideas may be specific or broad, but should lend themselves to measurable and time-bound goals.

DISCOVER THE UNIMAGINABLE: basic science as a foundation for biomedical innovation

The discovery of antibiotics, the identification of disease-causing genes such as *BRCA1*, the detection of the connection between sickle cell trait and malaria, and the development of gene editing tools like CRISPR all derive from fundamental discoveries about the evolution of life on earth. Over the next ten years, through basic discovery, Berkeley will further elucidate the complex interplay of genomics, phenomics, metabolomics, microbiomics, and the environment in a changing world.

Examples:

- **Connecting the Brain and Mind**—Through the Berkeley Brain Initiative, we will begin to unlock the fundamental secrets of how the brain works, in both health and disease, and the interplay with behavior & social contexts.
- **Global Change Biology for Modern Adaptability**—Mobilizing historic and modern biological data, we will illuminate how organisms and ecological systems adapt to global change, and how they sustain wellbeing and apply those lessons to our need to adapt to current ongoing environmental changes.

APPLY DISCOVERY FOR NEAR-TERM IMPACT: Technological innovation as an accelerator of impact and advanced understanding

We will develop the state-of-the-art analytical and technological approaches needed to translate Berkeley's biological insights into biomedical breakthroughs. At the same time, we will use new methods in data science, artificial intelligence, and machine learning to identify the fundamental social, behavioral, and contextual barriers to accessing wellbeing.

Examples:

- **Genomic tools to prevent disease**—Through human innovation, we are in a genomics revolution to develop and apply genome editing technologies to halt disease progression in its tracks and prevent the onset of genetic diseases all together. By advancing efforts both to make CRISPR technologies even more precise and effective, and to develop even better genome editing technologies of the future, Berkeley will have a transformational impact on humanity and the course of disease world-wide.
- **Re-engineering agriculture**—With population growth, environmental changes, and declining available arable land, the ability to feed a global population and sustain agriculture-based economies is at significant risk. Berkeley will accelerate innovations in gene editing, soil health, biologically diversified farming systems, and conservation to improve food security and crop adaptation.
- **AI/data intelligence to unlock social determinants of health**—The collection of data that tracks many elements of the social determinants of health—behavior, location, habits, and more—has become pervasive in this age of digital transformation. These data sets reside in a variety of repositories, be they with the government, industry, or individual consumers. As an engine for both good and innovation, Berkeley has a unique opportunity to apply the latest in intelligence technologies to determine the key components of health and wellbeing, as well as

new socially-integrated technological solutions.

ILLUMINATE THE SOCIAL DETERMINANTS OF HEALTH: Behavior, Culture, Location, and Opportunity

Examples:

- **Integrate Food as a Source of Health**—All people should have access to food they can afford that is healthy, sustainably and equitably produced, and culturally appropriate. Berkeley will determine new pathways to food security, access, and sustainability including: innovative approaches to meal programs in schools, food subsidies for low income families, nutritional “taxes” as incentives to modify behavior, and multidimensional agriculture in both rural and urban environments.
- **Understanding Human Development and the Trajectories to Health and Wellbeing**—So much of a person’s access to health and wellbeing is determined in their earliest years, through adolescence and early adulthood development. Through an interdisciplinary approach that integrates neuroscience, economics, psychology, and human behavior, Berkeley will elucidate which trajectories lead populations to future healthy—or unhealthy—lifestyles.
- **Design New “Health-First” Living and Working Environments**—knowing that our surroundings, including built and natural environments, are significant contributing factors to healthy communities presents an opportunity to re-integrate disciplines of city planning, environmental justice, and public health that will lead to fundamental integration of health into the design of the places where we live, work, otherwise connect with community, and revive ourselves as individuals.

CAMPUS UNITS THAT MAY DRIVE THIS SIGNATURE INITIATIVE:

- **Colleges & Schools:** [L&S Division of Biological Sciences](#), Arts & Humanities, Social Science (Econ, Matrix, etc), Mathematical & Physical Sciences; School of Public Health; Goldman School of Public Policy; Graduate School of Education; School of Journalism; School of Optometry; Haas School of Business; Berkeley Law (e.g. Center on Reproductive Rights and Justice); School of Social Welfare; College of Environmental Design; College of Natural Resources (Departments of Environmental Science and Policy Management, Plant and Microbial Biology, and Nutritional Science and Toxicology); College of Engineering (Engineering Health, EECS Dept, Bioengineering Dept, etc); Data Science Division (undergrad education), College of Chemistry.
- **Centers, Institutes, Museums:** See figure below.
- **Additional Units:** Arts + Design (expression of the human experience)
- **Other UC Collaborators:** Lawrence Berkeley National Lab; the other nine UC campuses with whom we collaborate, including the five medical centers; ANR.



OUR PAST AND ONGOING EFFORTS IN THIS SPACE

- Health Science Initiative
- Berkeley Brain Initiative
- Berkeley Initiative in Global Change Biology
- Innovative Genomics Initiative/Institute (2013-present)
- Future of Biology (2017-present)
- CITRIS Health Initiative

IMPLEMENTATION:

As with all of the Signature Initiatives, to have maximal impact and to represent the breadth of Berkeley's scholarly endeavors and public mission, the efforts to advance the goals of this initiative will be multi-pronged, including:

RESEARCH

- Due to the range of disciplines essential to addressing this complex societal challenge, Berkeley will need to facilitate new models of collaboration and cooperation that bring colleges and schools, centers, and organizations, and their faculty, students, and leaders, together to energize discovery, exploration, and innovation.

EDUCATION

- Integrate undergraduates into Signature Initiatives through Discovery Experiences
- Develop new multidisciplinary Master's level programs on the broad range of health determinants and their intersections.
- Develop a graduate and postdoctoral fellowship program in human health that will bring in more diverse researchers who represent the populations we aim to impact and who will provide connections across faculty and programs on campus around issues in human health writ large. (e.g. UC Presidential Postdoctoral Program)

MARKET IMPACT

- Provide channels for entrepreneurial impact through programs like Bioengineuity and SkyDeck

COMMUNITY IMPACT AND ENGAGEMENT

- Connect with the Public Service Center to align volunteer opportunities with the Signature Initiative goals