The Role of NIH in the Evolution of mHealth: Past, Present, and Future

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A Little Historical Perspective

Figure 1 Consumer technology advances missed during a typical RCT published in 2012.
Pubmed Publications of “mHealth” by Year
NIH Grant Awards in “mHealth” or “mobile health” by Year

![Graph showing NIH Grant Awards in “mHealth” or “mobile health” by Year. The x-axis represents the years from 2008 to 2017, and the y-axis represents the number of grants. The graph shows a steady increase in the number of grants from 2008 to 2017.](image-url)
mHealth Existed Before the Smartphone
NIH Contributions to the Advances in mHealth
Tuesday, September 4, 2007

Genes, Environment and Health Initiative Invests In Genetic Studies, Environmental Monitoring Technologies

The National Institutes of Health (NIH) has selected the first projects to be funded as part of the Genes, Environment and Health Initiative (GEI), a unique collaboration between geneticists and environmental scientists.

"This is groundbreaking research in understanding the complex factors that contribute to health and disease," said Department of Health and Human Services Secretary Mike Leavitt. "Researchers have long known that our genes, our environmental exposures and our own behavioral choices all have an influence on our health. This new initiative will use innovative genomic tools as well as new instruments for measuring environmental factors — from diet and physical activity to stress and substance addiction — in order to begin sorting out how these different factors affect a person's risk for a number of health conditions."

Secretary Leavitt first launched the GEI initiative in February 2006 as a proposal in the President's budget for fiscal year 2007. The funding announced today is for the first research grants under the new initiative. They are part of a broader effort across HHS agencies to build on recent advances in genomic science and medicine, including the Secretary's Initiative on Personalized Health Care. NIH received $40 million in new funding as part of its fiscal year (FY) 2007 budget to support GEI. NIH Institutes already planned to spend some $28 million in FY 2007 on the kinds of studies GEI will conduct. And finally, two institutes chose to add a total of $9 million in additional funding for targeted studies under the Genes, Environment and Health Initiative.
Improved Measures of Diet and Physical Activity

Tom Baranowski, Ph.D., Baylor College of Medicine, Houston
Food Intake Recording Software System: Version 4
$571,000

Carol Boushey, Ph.D., Purdue University, West Lafayette, Ind.
Improving Dietary Assessment Methods Using the Cell Phone and Digital Imaging
$452,000

Patty Freedson, Ph.D., University of Massachusetts, Amherst
Development of an Integrated Measurement System to Assess Physical Activity
$411,000

Stephen Intille, Ph.D., Massachusetts Institute of Technology, Cambridge
Enabling Population-scale Physical Activity Measurement on Common Mobile Phones
$581,000

Kevin Patrick, M.D., University of California, San Diego
A Tool for Geospatial Analysis of Physical Activity
$666,000

Mingui Sun, Ph.D., University of Pittsburgh, Pittsburgh
A Unified Sensor System for Ubiquitous Assessment of Diet and Physical Activity
$587,000

Rick Weiss, M.S., Princeton Multimedia Technologies Corporation, Princeton, N.J.
Mobile Food Intake Visualization and Voice Recognizer (FIVR)
$1,040,000
Tools to Measure Exposure to Psychosocial Stress and Addictive Substances

Thomas W. Kamarck, Ph.D., University of Pittsburgh, Pittsburgh
Computer-assisted Technologies for Tracking Exposure to Psychosocial Stress
$426,000

Gregory D. Kirk, M.D., Ph.D., Johns Hopkins University, Baltimore
Real-time Assessment of Individual and Neighborhood Exposure to Drugs and Stress Using Hand-held Electronic Diaries and Position Technology
$492,000

Santosh Kumar, Ph.D., University of Memphis, Memphis, Tenn.
Wireless Skin Patch Sensors to Detect and Transmit Addiction and Psychosocial Stress Data
$429,000

Kenzie L. Preston, Ph.D., National Institute on Drug Abuse, Baltimore
Real-time Assessment of Individual and Neighborhood Exposure to Drugs and Stress Using Hand-held Electronic Diaries and Position Technology
$157,000

Mark S. Rea, Ph.D., Rensselaer Polytechnic Institute, Troy, N.Y.
A Personal Light-monitoring Device for Reducing Psychosocial Stress
$482,000

Vivek Shetty, D.D.S., Dr. Med.Dent., University of California, Los Angeles
Handheld Salivary Biosensor of Psychosocial Stress
$357,000

Biological Response Indicators of Environmental Stress

Ian Blair, Ph.D., University of Pennsylvania, Philadelphia
Exposure and Biological Response Biomarkers of Cigarette Smoke
$557,000

Sister Dutta, Ph.D., Howard University, Washington, D.C.
Early Disease Biomarkers of PCB-exposed Human Populations
$485,000

Bevin Engelward, Ph.D., Sc.D., Massachusetts Institute of Technology, Cambridge
Comet-chip High-throughput DNA Damage Sensor
$429,000

Albert Fornace, M.D., Geotgenen University, Washington, D.C.
Genomic and Metabolomic Signatures of Alcohol-induced Liver Damage
$288,000

Frank Gonzalez, Ph.D., National Cancer Institute, Bethesda, Md.
Genomic and Metabolomic Signatures of Alcohol-induced Liver Damage
$156,000

Tim Huang, Ph.D., The Ohio State University, Columbus
Epigenetic Signatures of Xenoestrogens to Assess Breast Cancer Risk
$365,000

Bruce Kristal, Ph.D., Brigham and Women's Hospital, Boston
Mitochondrial Metabolite and Protein Biomarkers of Effects of Diet
$454,000

Coral Lamartiniere, Ph.D., University of Alabama at Birmingham
Biomarkers of Biological Response to Endocrine Disruptors
$579,000

David Lawrence, Ph.D., Wadsworth Center, Albany, N.Y.
Biomarker Signatures of Biological, Chemical and Psychological Stress
$446,000

Avrum Spira, M.D., Boston University, Boston
A Non-invasive Gene Expression Biomarker of Airway Response to Tobacco Smoke
$643,000

Charles Thompson, Ph.D., University of Montana, Missoula
Protein Biomarkers of Organophosphate Pesticides
$502,000
mHealth Summit

mHealth Summit Brings Together Health, Technology and Policy

2009 Inaugural mHealth Summit Brings Together Health, Technology and Policy Communities to Advance Technological Innovation in Global Healthcare

WASHINGTON, DC, October 29, 2009 — The 2009 mHealth (Mobile Health) Summit, organized by the Foundation for the National Institutes of Health (FNIH), today opens an unprecedented two-day summit bringing together more than 800 public and private sector science, medical, policy and mobile technology experts to develop a new roadmap related to the integration of science and wireless solutions to improve public health delivery, particularly to underserved populations, in the U.S. and around the world.

“This mHealth Summit challenges the science and technology communities to collaborate and craft a vision for innovation, solving problems and implementing solutions by using the mobile platform,” notes Dr. Charles A. Sanders, Chairman of the Board, Foundation for NIH. “mHealth has the potential to transform public healthcare research and delivery, relieve over-stretched health systems, and revolutionize healthcare in the U.S. and the developing world.”

Goals of the inaugural mHealth Summit include: assessing current mHealth policies, building a bridge between biomedical research and mobile technology experts in identifying mHealth solutions, fostering integration of mobile and medical technologies to improve healthcare delivery to underserved populations, and crafting a vision for moving mHealth technologies forward.

KEYNOTE SPEAKERS

Keynote addresses will be delivered by senior officials including: Kathleen Sebelius, Secretary of Health and Human Services (HHS); Dr. Francis S. Collins, newly appointed Director of the National Institutes of Health (NIH); Dr. Ileana Arias, Acting Principal Deputy Director of the Centers for Disease Control and Prevention (CDC); Ambassador Elizabeth Frawley Bagley, Special Representative for Global Partnerships, U.S. Department of State; Ambassador Eric Goosby, U.S. Global AIDS Coordinator, PEPFAR; Ambassador Eugenio-Richard Gasana, Permanent Representative of Rwanda of Rwanda to the United Nations, and Dr. Roberto Tapia-Conyer, Director General of the Carlos Health Institute of Mexico.
mHealth Summit

mHealth Summit Attracts Leaders in Wireless Health Research

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Investigators will share two posters at the ASGCP @ meeting that starts today. We’re looking to find new... https://t.co/ksMMUuBh
22 hours 21 mn

Today is the first day of ASGCP! This Saturday, the FNHI project team will be speaking at the Annual Lung-MAP Update... https://t.co/MHmXz0b8WX
22 hours 53 mn

RT @HNiNewsJune10_16
MentalHealthMonth. Depression affects a large number of men, but men may be less likely to recognize, talk... https://t.co/6hwAyl9ft1
day 31 mn

Don’t miss out on any big news, announcements or invites from the FNHI! Sign up for our email updates today... https://t.co/0HfFHFqip6
1 day 1 hour

Here are just a few reasons why our staff enjoys working at the FNHI. Want to join our growing team? The

2010 mHealth Summit Attracts Leaders in Wireless Health Research and Technology As Event Sponsors

Verizon Wireless Joins As Partnering Sponsor

WASHINGTON, DC, July 06, 2010 — Industry leaders Abbott, Microsoft Research, Pfizer, Qualcomm, Robert Wood Johnson Foundation, Skype and Verizon Wireless have joined the 2010 mHealth Summit as sponsors, the conference organizers announced today.

The 2010 mHealth Summit, a partnership of the Foundation for the National Institutes of Health, the National Institutes of Health and the mHealth Alliance, will connect leaders in health, government, the private sector, academia and not-for-profit organizations to advance discussion and decision-making related to the intersection of mobile technology, health practice and research, and policy in the United States and abroad. The conference will be held November 8-10 at the Walter E. Washington Convention Center in Washington, D.C.

As the Summit date nears a diverse group of sponsors is offering their support, from leading charitable organizations, to pharmaceutical and technology companies, wireless carriers and media groups.

Anthony Lewis, Vice President, Open Development, of Verizon Wireless said: “Verizon works across the technology, research and business communities every day to advance the use of existing and emerging wireless solutions. We are focused on enabling innovation in patient participation, the quality of preventative care and cost controls as well as enhancing communication among medical professions, hospitals and patients. We’re pleased to be a part of the upcoming mHealth Summit, where these ideas will be discussed and attendees can learn more about the role wireless will play in the future.”

Qualcomm will host a technology pavilion on the exhibit floor, which consists of 40 companies covering a broad spectrum of innovative wireless companies. “We are honored to participate in the mHealth Summit, whose participants are working to lower the costs and improve the quality of health around the world,” said Don Jones, Vice President of Business Development, Health and Life Sciences, Qualcomm.
mHealth Training Institute

• Wendy Nilsen joins OBSSR in 2009
• First mHealth Training Institute in 2011
• Becomes an annual, week-long institute with spin-off pre-conference workshops
• Vivek Shetty continues the annual training institute under an R25 award from OBSSR in 2015
• Brings together:
  • behavioral and biomedical researchers
  • computer scientists and engineers
to advance research in mobile and wireless health
mHealth FOAs

Department of Health and Human Services
Part 1. Overview Information

Participating Organization(s)
National Institutes of Health (NIH)

Components of Participating Organizations
Office of Behavioral and Social Sciences Research (OBSSR)
National Cancer Institute (NCI)
National Institute on Alcohol Abuse and Alcoholism (NIAAA)
National Institute on Drug Abuse (NIDA)
National Institute of Mental Health (NIMH)

Funding Opportunity Title
Intensive Longitudinal Analysis of Health Behaviors: Leveraging New Technologies to Understand Health Behaviors (U01)

Activity Code
U2C Resource-Related Research Multi-Component Projects and Centers Cooperative Agreements

Announcement Type
New

Related Notices

Funding Opportunity Announcement (FOA) Number
RFA-OD-15-129
Now for the Future
(Because you’ve got the Present covered at this showcase)
"Nearly all the grandest discoveries of science have been but the rewards of accurate measurement." Lord Kelvin, 1872
Self-Report – Integrating IRT and EMA

Item Response Theory (IRT) and Computer Adaptive Testing (CAT)

Ecological Momentary Assessment (EMA)

Alignment of Sensor Advances to Causes of Death

Top 10 global causes of deaths, 2016

- Ischaemic heart disease
- Stroke
- Chronic obstructive pulmonary disease
- Lower respiratory infections
- Alzheimer disease and other dementias
- Trachea, bronchus, lung cancers
- Diabetes mellitus
- Road injury
- Diarrhoeal diseases
- Tuberculosis

Sensing Context and the Influences of Behavior

- Physical & Chemical
- Societal
- Medical
- Psychosocial
- Behavioral
- Biological

Diagram showing the interplay between Personal Factors (Cognitive, affective, and biological events) and Environmental Factors with Behavior at the center.
Data Integration and Sharing Across Sources and Platforms
Computational and Other Big Data Modeling
mHealth Interventions
Improvements in JITAI Development

• Theories that Explain and Predict the Behavior of Individuals over Time more so than Differences Between Individuals
• Devised based on Computational Modeling of Naturalistic Behavior over Time
• MOST, SMART, and Micro-randomized Trials
• AI Approaches (e.g., Reinforcement Learning) to Adapt to Individuals over Time
Rapid and Robust Evaluations

• Shift from fixed to iterative and adaptive interventions (more engineering than medicine)
  • Intervention adjustments happen during trials but are seldom reported (Neta et al., 2015)
  • Version improvement designs – e.g., Continuous Evaluation of Evolving Intervention Technologies (CEEBIT; Mohr et al., 2013)
  • Multiphase Optimization Strategies (MOST, SMART; Collins et al., 2007)
• Classic medical D&I model is stepwise and discrete
• But what if the intervention risks are minimal and existing intervention options are either unavailable or of limited or unknown effectiveness?
• Evaluating while disseminating
  • Advances in learning healthcare systems
  • Methods and measures that fit (or are embedded in) the practice setting
Greater Understanding of Stickiness

Modal App Use = 1

“App Addiction”
Connect with OBSSR

Questions? Bill Riley: william.riley@nih.gov

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