Hello! I am honored to share with you the accomplishments of the mHealth Impact Laboratory for 2018-2019. We have had an incredible year and are looking forward to more opportunities to create and curate mobile and digital health solutions that address inequalities in health outcomes.

You may be well aware that there are now hundreds of thousands of technology-based applications—be they smartphone or tablet apps, or social media based, or Internet solutions—that purport to help us achieve or maintain wellness. It is our conviction in the mHealth Impact Lab that it isn’t enough to simply develop technology-based applications and make them available through an app store or via social media. We believe that to truly make contributions in mHealth, one must rigorously evaluate mHealth tools and curate and promote those that have scientific, peer-reviewed evidence that they can impact health behaviors and health outcomes.

Fortunately, our own research and that in the mobile and digital health field more broadly is now consistently demonstrating that mHealth can indeed impact both health behavior and health outcomes. While the field has rigorously reviewed only the smallest fraction of the mHealth tools available to consumers, we now have a growing understanding of “what works” using technology.

We must of course continue to evaluate existing and new mHealth solutions. At the same time, we note that those solutions that have been evaluated have not always—nor even often—been developed specifically for communities that could benefit substantially from mHealth. We are strongly committed to working with communities that face disparities in health outcomes to ensure they have access to mobile and digital solutions that could be impactful for their well-being.

In addition to reaching more communities that face health disparities, we are eager to take investigations in mHealth to scale, so that they can reach and impact entire populations rather than isolated groups. This is the true potential of mHealth—to facilitate on demand, user centric solutions to our pressing health challenges.

In this report you will see specific examples of work we are doing with communities that have been disenfranchised. You will see how our efforts are focused on taking mHealth to scale. We are privileged to work with multiple gifted clinician and public health researchers who share our passions for and commitments to creating and curating impactful mHealth solutions at scale. If you would like to work with us to see your idea for a wonderful new innovation in mobile or digital health realized, we would love to hear from you!

—Sheana Bull, PhD, MPH, mHealth Impact Lab Director
About the mHealth Impact Lab

The mHealth Impact Laboratory is an incubator for innovative health technology and disease management initiatives.

Our Mission

To collaboratively address inequities in health outcomes through creating and curating high quality mobile and digital technology solutions in health promotion, disease prevention, and health care.

Our Vision

Accessible mobile and digital health solutions that benefit marginalized communities worldwide.

Our Values

- High quality scientific design, research, development, implementation, and evaluation.
- Attention to populations and communities facing disparities in health outcomes.
- An emphasis on increasing access to quality care and health promotion.

Our Focus

- Projects with potential for high impact.
- Capacity building in mobile and digital health.
- Development and support of partnerships with diverse organizations.

At the mHealth Impact Lab, we are committed to championing innovation in mobile and digital health. Despite the promise of technology in improving health outcomes and preventing disease, current digital health interventions lack user-centered design, theory-informed features, and evidence of efficacy. We believe that well-designed products, rapid and rigorous research and evaluation, and curated, evidence-based solutions can make all the difference in the science of mobile and digital health.
Facts and Figures, 2018-2019

mHealth Impact at a glance....

Seventeen (17) active projects
Ten (10) partner organizations
Almost 1,500 square feet of research space
Two (2) primary faculty
Ten (10) affiliate investigators
Four (4) students and fellows
And four (4) professional staff.

Annual Revenue

Over the course of fiscal year 2018-2019, the mHealth Impact Lab led or provided services for a total of 17 active research, evaluation, innovation, and quality improvement projects, securing $690,156 in grant, contract, and consultation revenue for the Colorado School of Public Health.

<table>
<thead>
<tr>
<th>Amount ($)</th>
<th>Volume (%)</th>
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<tbody>
<tr>
<td>Grants</td>
<td>$265,186</td>
</tr>
<tr>
<td>Contracts</td>
<td>$397,250</td>
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<tr>
<td>Consists/Other</td>
<td>$27,720</td>
</tr>
<tr>
<td>Total</td>
<td>$690,156</td>
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Grants (38%) $265,186
Contracts (58%) $397,250
Other (4%) $27,720
People and Projects, 2018-2019

Our outstanding team includes a blend of highly professional and dedicated personnel who bring a vast array of experience, in-depth knowledge, and expertise.

mHealth Impact Faculty

**Sheana Bull, PhD, MPH—Director**
A Professor in Community and Behavioral Health at the Colorado School of Public Health, Dr. Bull has investigated the efficacy of using mobile and digital solutions for health promotion and disease self-management since 1998, and has led research projects evaluating mHealth solutions using the Internet, social media, text messaging and most recently mobile apps.

**Susan L. Moore, PhD, MSPH—Associate Director**
Dr. Moore is a Research Assistant Professor in Community and Behavioral Health at the Colorado School of Public Health and the Director for the Mobile Health and Informatics Core at ACCORDS. Her research interests include consumer health informatics, digital health innovation, integrating patient-generated health data into clinical systems, and the use of mobile health technology to deliver patient-centered care.

mHealth Impact Staff

**Joy Waughtal, MPH—Professional Research Assistant**
Joy Waughtal is a Professional Research Assistant and Project Manager for the mHealth Impact Lab. Joy received her MPH from the Colorado School of Public Health in 2017, and previously worked in the Denver non-profit sector with adults experiencing homelessness and people who inject drugs. Joy's research focus highlights interventions and technologies targeting underserved communities and the social determinants of health.

**Kelsey Ford, MPH, DrPH(c)—Senior Professional Research Assistant**
Kelsey Ford is a project manager, evaluator, and doctoral candidate at the Colorado School of Public Health. Her expertise sits at the intersection of human-centered design, systems thinking, and digital behavior change interventions. Her research interests primarily focus on industry-academic collaborations in digital health. Prior to her graduate studies, she worked in sales and marketing for two Fortune 500 companies.

**Isaac Alawobu, MBA, PMP—Senior Business Professional**
Isaac Alawobu has extensive experience in business, operations and project management in education, construction, retail and information technology. He holds an MBA from the University of Connecticut and is a certified project management professional. He is also an entrepreneur, has held various leadership positions in social organizations, and is an advocate for social impact.
People and Projects, 2018-2019

mHealth Impact Staff

**Catia Chávez, MPH—Senior Professional Research Assistant**
Catia Chávez earned her MPH with a focus in Community and Behavioral Health from the Colorado School of Public Health. She has spent more than 15 years working with the Latino community in Colorado in education and public health programs. Catia has experience doing Community Based Participatory Research, Qualitative Research and Evaluation and Management of Programs.

**Charlene Barrientos Ortiz—Senior Professional Research Assistant**
Charlene Barrientos Ortiz is a Program Manager and Community Research Liaison at the Colorado School of Public Health. She is a Colorado native with a background in nonprofit, social justice activism, and public health. She is well known for her work in eliminating health disparities, improving health equity, community based participatory research and community engagement.

**Xuhong Zhang, PhD—Post-Doctoral Fellow**
Dr. Zhang’s research involves the development and application of mathematical, computational, and statistical techniques to theoretical and methodological problems within the areas of biological statistics analysis, quantitative methodology, and computer vision. Her current work includes advanced user engagement analysis, recognition and examination of cellular subpopulations, and automatic end-to-end classification of different tumor cells.

**Starlyrne Gornail, MHS—Doctoral Student**
Starlyrne is pursuing her doctoral degree at the University of Colorado at Anschutz and brings immense knowledge and insight to the mHealth Impact lab from her background that spans working with healthcare payers, federal agencies, and academic institutions. Prior to joining mHealth impact lab, Starlyrne worked at Booz Allen and earlier supported award-winning digital programs such as Text4baby and Real Appeal.

**Kira Elsbernd, MPH—Graduate Research Assistant**
Kira Elsbernd is a Graduate Research Assistant with the mHealth Impact Lab. Kira received her MPH from the Colorado School of Public Health in 2019 and is beginning doctoral studies at Ludwig Maximilian University in Munich, Germany. Her research interests focus on pediatric populations affected by HIV and diarrheal diseases and the potential of technologies to improve health outcomes in resource-limited settings.

**Joshua Silvasstar—Graduate Student Assistant**
Joshua Silvasstar is a graduate student at the University of Colorado, Denver specializing in data analytics and predictive modelling. He is a Student Assistant in the mHealth Impact lab assisting in ongoing projects. His responsibilities include designing and programming mHealth applications and cleaning, coding and analysis of pilot data.

**Melodie Santodomingo, MPH(c)—Graduate Student Assistant**
Melodie is a Graduate Research Assistant with the mHealth Impact Lab. She is currently working on her MPH in Epidemiology and Applied Biostatistics from the Colorado School of Public Health. Her research interests focus on autoimmune diseases, chronic inflammatory diseases, and nutritional health.
People and Projects, 2018-2019

We would like to thank our Scientific and Clinician Researchers & Collaborators who have worked with us this year on numerous projects. We deeply appreciate their contributions toward our mission.

Scientific and Clinician Researchers and Collaborators

**Maya Bunik, MD, MPH**  
Professor, Pediatrics, School of Medicine, University of Colorado Anschutz Medical Campus and Children’s Hospital Colorado

**Amy G. Feldman, MD MSCS**  
Assistant Professor, Pediatrics, University of Colorado Anschutz Medical Campus and Children’s Hospital Colorado  
Program Director, Transplant Hepatology Fellowship  
Investigator, Adult and Child Consortium for Health Outcomes Research and Delivery Science (ACCORDS)

**Bethany M. Kwan, PhD, MSPH**  
Assistant Professor, Family Medicine, University of Colorado Anschutz Medical Campus  
Education Program Lead, Adult & Child Consortium for Health Outcomes Research & Delivery Science (ACCORDS)  
Director of Quality & Process Improvement, CCTSI

**Pamela N Peterson, MD, MSPH**  
Professor, Medicine, University of Colorado Anschutz Medical Campus  
Staff Cardiologist, Denver Health & Hospital Authority

**Carol E. Kaufman, PhD**  
Interim Chair and Professor, Community and Behavioral Health, Colorado School of Public Health and Centers for American Indian and Alaska Native Health

**Michelle Sarche, PhD**  
Associate Professor, Community and Behavioral Health, Colorado School of Public Health and Centers for American Indian and Alaska Native Health
People and Projects, 2018-2019

Scientific and Clinician Researchers and Collaborators

Maria Odette Gore, MD, MSCS
Assistant Professor, Medicine, Division of Cardiology, University of Colorado Anschutz Medical Campus and Denver Health and Hospital Authority

P. Michael Ho, MD, PhD
Professor, Medicine, Division of Cardiology, University of Colorado Anschutz Medical Campus

Pooja Mehta, MD, MSCI
Assistant Professor, Pediatric Gastroenterology, Hepatology & Nutrition, Children's Hospital Colorado and University of Colorado Anschutz Medical Campus

Jennifer Dickman Portz, PhD, MSW
Assistant Professor, Medicine, Division of General Internal Medicine, University of Colorado Anschutz Medical Campus
Digital health products offer an opportunity to reduce health disparities and promote wellbeing. Numerous digital health initiatives are available, reaching over 300,000 mobile applications on the top app stores. A recent nationwide survey found 87% of US adults adopted at least one digital health tool in 2017 and a 3-year trend suggests growing acceptance towards these products.

The adoption of digital health excites both private investors and grant funders. Nationally, venture funding and investments in digital health exceeded $12B+ in 2018, exponentially growing from 2011. Federal and Foundation funding has followed this trend, urging academic researchers and communities to leverage cutting-edge technologies in their health interventions.

As the enthusiasm for digital and mobile health grows, academic and industry sectors are challenged to collaborate to leverage their diverse strengths. Such proposed academic-industry collaborations may promote evidence-based interventions that are designed for dissemination and commercialization.

The mHealth Impact Lab welcomes this call to action for academic-industry collaboration. In 2018-2019, the lab has secured industry partners to design, develop, and test digital health solutions allowing effective collaborations that meet our diverse needs to better translate academic discoveries into real world improvements in health.

Thank you to our academic, community and industry partners who have collaborated with us during the 2018-2019 academic year.
Featured Project: the mHealth Impact Registry

In 2018-2019, the mHealth Impact Lab has been actively working on the mHealth Impact Registry prototype, meeting major milestones that will culminate in the launch of a minimum viable product in late 2019:

1. Our community advisory board guided Registry design and messaging
2. We have begun to market the Registry to research networks (both English and Spanish)
3. Within the Registry, we have embedded
   - a brief survey within the Registry to document user perceived health status
   - English and Spanish language videos explaining the system and our informed consent process

Did you know?

There are >300,000 mobile and digital tools related to health.
Few of these are scientifically studied for impact.
Most haven’t been developed with input from intended users—and new products are rarely developed with diverse audiences in mind!

We are stewards of a list of people who are interested in participating in pilot tests for new mobile and digital health programs.
When mobile health developers approach us, we can help them get useful feedback on their app/device/program from registry members.

How does the Registry work?

First, you answer some questions about you & your health behaviors. We’ll give you some feedback about your answers We’ll ask you to store your information with us. When a mobile health developer reaches out to us with a new program or app to test, we can put them in contact with you—only after we get permission to share information. We will never release participant info without permission!
People and Projects, 2018-2019

Our projects include a variety of mobile and digital health initiatives and goals, and we are proud to showcase what we have been working on.

Research, Evaluation, and Innovation

Taking text messaging to scale to support cardiovascular medication adherence: The Nudge study

*(Co-PIs: Sheana Bull, PhD; Michael Ho, MD)*

To tackle the challenging and complex problem of medication adherence, we are funded by the National Heart Lung and Blood Institute of the National Institutes of Health in partnership with the University of Colorado School of Medicine to work in three large healthcare delivery systems—Denver Health and Hospital Authority, the Veteran’s Administration, and University of Colorado Health. We will leverage their pharmacy refill data to identify patients with gaps in cardiovascular medication refills and test multiple automated approaches using text messaging and an artificially intelligent chat bot to identify and resolve barriers to refill and adherence.

Native WYSE (Women-Young, Strong, and Empowered) making CHOICES

*(Co-PIs: Carol Kaufman, PhD; Michelle Sarche, PhD)*

Funded by the National Institute of Mental Health of the National Institutes of Health, we are supporting a team of Scientific researchers at the Colorado School of Public Health to adapt an evidence-based intervention to reduce alcohol exposed pregnancy among urban American Indian and Alaska Native (AIAN) young women for widespread dissemination using a mobile app.

Mother’s Milk Messaging: evaluation of a bilingual app to support initiation and exclusive breastfeeding in new mothers (MMM)

*(PI: Maya Bunik, MD)*

Funded by the Kellogg Foundation, this project seeks to facilitate uptake of and sustained breastfeeding for first time mothers, with a particular effort to reach out to African American and Latina mothers. The project aims to reduce disparities in Breastfeeding among these groups and to extend the benefits of breastfeeding to their infants through an interactive mobile app with instructional videos, a social support group and motivational text messaging.

Optimizing a mobile application to support cardiovascular rehabilitation

*(CR Nudge)*

*(PI: Pamela Peterson, MD)*

Although we know that rehabilitation for patients with cardiovascular disease is effective, patients do not always participate, especially minorities, younger adults, women and those with lower levels of education. In this project funded by the National Heart Lung and Blood Institute, mHealth Impact is partnering with Denver Health and Hospital Authority to investigate whether enhancing a mobile application (app) designed to support home-based cardiac rehab can improve enrollment in and adherence to cardiac rehab among diverse patients.
Engaging disadvantaged patients in sharing patient generated health data and patient reported outcomes through health information technology (the COTS Health IT project)

(Pi: Susan L. Moore, PhD)

Patient engagement is particularly critical to achieving good chronic disease self-management. This is especially important for disadvantaged patients, who are disproportionately affected by chronic disease. Funded by the Agency for Healthcare Research and Quality, this study will test the hypothesis that low-income, disadvantaged patients can provide high-quality patient-generated health data and patient-reported outcomes through commercial off-the-shelf (COTS) health information technologies, and that these data can be used to improve healthcare quality and delivery.

Social convoy palliative care (Convoy-Pal) mobile health for older adults with advanced heart failure

(Pi: Jennifer Dickman Portz, PhD)

Funded through the National Institute for Aging (NIA) K76 Paul B. Beeson Emerging Leaders Career Development Award in Aging, this project seeks to develop, refine, and test the efficacy of Convoy-Pal in integrating family and other caregivers in digitally-supported palliative care to promote symptom management and quality of life among older adults with advanced heart failure.

Building a novel medication adherence mHealth application for adolescents and young adult liver transplant recipients

(Pi: Pooja Mehta, MD)

Young people with liver transplants who don’t take medications correctly are at high risk for transplant rejection and graft loss. Funded by the American Association for the Study of Liver Diseases, we are working closely with clinician researchers at Children’s Colorado Hospital to create a prototype mobile health app to support improved medication adherence for liver transplant recipients in this population. The inherent principles underlying the app’s operation are also anticipated to be translatable to improve medication adherence for patients experiencing other disease states.

We R Native, a technology-based resource for mental health among American Indian and Alaska Native Youth

(Pi: Stephanie Craig, PhD)

In response to a growing mental health crisis among young people nationally, we are partnering with The Northwest Portland Area Indian Health Board to rigorously evaluate an adaptation of We R Native – a holistic, multimedia health resource for youth that reaches over 5,000 daily viewers across its diverse social and mobile media messaging channels—to help users connect with mental health resources.
mHealth Impact is working with MEE (Motivational Educational Entertainment) Productions Inc. to evaluate the impact of an interactive web-based social marketing campaign and advocacy training platform, “Be Present,” targeting youth suicide prevention in Ohio.

Telemedicine offers the potential to increase hospice care provider productivity and to reduce the cost of care delivery without compromising the quality of care. Federal regulations for Medicare require that a licensed provider recertify that a patient is eligible to continue receiving hospice services after the first six months (180 days), and then again every two months (60 days) after that. The mHealth Impact Lab has partnered with TRU Community Care, a Colorado-licensed, Medicare and Medicaid-certified, nonprofit health care organization to explore the feasibility of conducting hospice reauthorization visits via telemedicine.

The mHealth Impact Lab conducted two projects on behalf of phactMI, a not-for-profit collaborative consortium of pharmaceutical company medical information professionals with the goal of improving the provision of up-to-date medical information at the point of care to health care providers to achieve better informed prescriber decision-making.

Innovation is essential to advancing the impact of mobile and digital health. Over the course of the past year, the mHealth Impact Lab provided consultation and support for 14 projects at various stages of development at the CARE Innovation Center at UCHealth, in partnership with CU Innovations, to promote clinical validation of digital health technologies in the health care setting.
## Available Services

### Idea Generation and Visualization

We help quickly determine reactions to new ideas for digital health solutions. Model development is an initial and iterative process with organizational stakeholders and end users in face-to-face and virtual discussions to identify salient, engaging, and feasible interface and design features.

### Content and Prototype Testing

We help assess UX/UI design quality, usability, navigability, and consumer interests and preferences. Methods include tracking in-app behaviors and focused group discussion among intended users for real-time testing of products in person or online.

### Pilot Testing and Efficacy Trials

We provide support for proof-of-concept tests, feasibility studies, and controlled or pragmatic trials of mobile and health solutions, using both traditional and innovative study designs and methods.

### Research Support Services

We offer methodological consultation and expertise in IRB submissions for mobile and digital health projects.

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**www.mhealthimpactlab.com**

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