

# Bootcamp & Incubator on Understanding Health Behavior using Smartphones and Wearables

**Dates:** August 8-11, 2016

**Location:** Spinks Addition Teaching Lab, University of Saskatchewan, Saskatoon, SK, Canada

**Capacity:** Limited to 35 participants

**Fee:** \$480 for students & postdoctoral fellows, \$1440 for others (\$1000 per participant for groups of 3 or more).

**Website:** <http://tinyurl.com/SmartphonesForHealth2016>

**Registration:** Available soon.

**Contact:** [smartphonesforhealth2016@cs.usask.ca](mailto:smartphonesforhealth2016@cs.usask.ca)

## Purpose

Acquisition of evidence-based understanding of human health behavior and exposure to environments forms a central focus of health research, and a critical prerequisite for effective health policy. The use of mobile devices to study health behavior via cross-linked sensor data and on-device self-reporting and crowdsourcing have been demonstrated to provide important insights that traditional techniques cannot. However, design, delivery and analysis of mobile data studies requires skills rarely developed in training in the health sciences.

This tutorial introduces public health researchers and practitioners to tools, practical skills and the conceptual background required to collect and analyze mobile data on health behavior, and assists participants in getting started in applying such techniques to studies and applications of specific interest to them. This tutorial will include hands-on work with novel and standard tools and techniques.

This event includes both a classroom curriculum (featuring much hands-on work) and an incubator designed to help students craft and test out study designs, survey instruments, and sensor-based data collection mechanisms for their specific data collection priorities. Both portions of the event will make heavy use of the Ethica smartphone- and wearable-based data collection system (the latest generation version of the longstanding iEpi epidemiological data collection system).

## Intended Audience

This workshop is targeted at professionals from a variety of health fields including health researchers, health service delivery, public health workers, health decision makers, and any health professionals or modellers seeking empirical behavioural data.

## Classroom Teaching

Lectures and step-by-step hands-on tutorials will be provided on conceptual foundations, mechanics & best practices. Topics are anticipated to include the following, with details of coverage of these and additional topics depending on participant interests expressed via pre-study surveys:

- Behavioural and physiological sensing via smartphones and paired devices (smartwatches, weight scales, etc.)
- On-device questionnaires, crowdsourcing mechanisms

- Case studies from diverse health areas
- Effective study design
  - Recruitment, including discussion of recruitment needs in diverse population types
  - Smartphones as surveillance, smartphones as interventions
  - Securing community buy-in and support
  - Privacy and confidentiality
    - Ensuring operation within ethical research guidelines, and working with Institutional Review Boards/Research Ethics Boards
    - Ensuring security and confidentiality
    - Support for ongoing and retroactive participant opt-out
    - Addressing privacy concerns via retaining data in escrow for contingent use
  - Design of effective survey instruments
    - Size, frequency and participant burden tradeoffs
    - Using contextually triggered instruments: Opportunities, strengths and risks
    - Supporting, Eligibility, entry, ecological momentary assessments (EMAs), study completion and opt-out questionnaires
    - Capturing skip patterns and conditional questions in survey instruments
    - Using per-question completion timing information
    - Multi-page vs. single page questionnaires
    - Enabling multimedia responses (photos, audio)
  - Supporting informed consent, both remote and in-person
  - Participant incentives
    - Participant access to own data
    - Operating studies with and without incentives
    - Non-monetary incentives
    - Community-based sharing of data
  - Recruiting networks: Study design, practical and ethical considerations
  - How much data is enough?
  - Different needs in in-patient and population surveillance
  - Budgeting a study: Cost economics of running smartphone-based studies
  - The data backhaul (WiFi vs. Cell data networks): Impacts on reporting and monitoring timeliness, financial impact on study, tradeoffs across populations.
- Study management and operation
  - Working with participant-owned and study-provided mobile devices, including special needs with low-socioeconomic status populations
  - Retention
  - Monitoring adherence/involvement
  - Database structure and retrieval
- Cross-leveraging smartphone-collected data with traditional and other electronic data sources
- Data Analysis
  - Models for sense-making: Hierarchies of data analysis needs (the data analysis pipeline)
  - Routine reporting via website-based analytics
  - Using cross-linked data from multiple smartphone and federated measurement modalities

- Data filtering, pruning and conditioning
- Dealing with missing data
- Use of smartphone-collected data with biostatistical analysis (e.g., survival, recurrent event, multiple regression, and other analyses)
- Machine learning-based classification & inference
- Understanding intervention effects across multiple causal pathways
- Integration of data with dynamic models
- Geospatial behavior and GIS
- Prospects for use of data with behavioral and choice modeling
- Visualization (Tableau, R and other tools)
- Tools for large-scale data analysis: R, Anaconda, Spark

## **Incubator**

The “incubator” side of the event will further leverage the extensive experience of the instructor and teaching assistants to provide ongoing advice, guidance, tips and hands-on assistance as participants build, explore, test, and refine their own study designs, survey and crowdsourcing instruments, sensor data collection mechanisms addressing their surveillance needs. Guided by instructors and interdisciplinary team of TAs, participants will have the opportunity to design a prototype data collection experiment, and to acquire, visualize and analyze the collected data using current tools and techniques.