

# Susan Murphy

Professor of Statistics, Harvard University



Dr. Murphy and her lab develop data analysis methods and experimental designs to improve real time sequential decision-making in mobile health, in particular methods and algorithms that can be deployed on wearable devices, to deliver individually tailored treatments. Her lab developed the micro randomized trial for use in developing mobile health interventions; this trial design is in use across a broad range of health areas. In these trials each participant can be randomized or rerandomized 100's of times. Examples of micro-randomized trials that are completed or are in the field can be found at [www.methodology.psu.edu/ra/adap-inter/mrt-projects#proj/adap-inter/mrt-projects#proj](http://www.methodology.psu.edu/ra/adap-inter/mrt-projects#proj/adap-inter/mrt-projects#proj).

Dr. Murphy is a member of the US National Academy of Sciences and of the US National Academy of Medicine. In 2013 she was awarded a MacArthur Fellowship for her work on experimental designs to inform sequential decision making. She is a Fellow of the College on Problems in Drug Dependence, a Member of the International Statistical Institute, a Fellow of the American Statistical Association and a Fellow of the Institute of Mathematical Statistics. She is a former co-editor of the Annals of Statistics and delivered the IMS Wald Lectures in 2015. She is currently the President of the Bernoulli Society.

October 29 and 30, 2018 The Fields Institute, Room 230

**General Lecture: Oct 29, 3:30-4:30 pm**  
**Improving Health Mobile Interventions**

Mobile devices along with wearable sensors facilitate our ability to deliver supportive behavioral treatments to users anytime and anywhere. These treatments can include a wide variety of content such cognitive, behavioral, social and motivational support. These interventions are being developed and employed across a variety of health fields, including to improve medication adherence, encourage physical activity and healthier eating as well as to support recovery in addictions. Critical questions in the optimization of mobile health interventions include: "Does the user benefit from a particular type of mobile health notification or text message?" and "Does the user's current context such as location, time, mood impact the usefulness of the mobile health notification. In this talk we discuss the micro-randomized trial design and associated data analyses for use in optimizing mobile health interventions. We illustrate the ideas with the micro-randomized trials across a variety of fields.

**Specialized Lecture: Oct 30, 3:30-4:30 pm**  
**Challenges in Developing Learning Algorithms to Personalize Treatment in Real Time**

A formidable challenge in designing sequential treatments is to determine when and in which context it is best to deliver treatments Consider treatment for individuals struggling with chronic health conditions. Operationally designing the sequential treatments involves the construction of decision rules that input current context of an individual and output a recommended treatment. That is, the treatment is adapted to the individual's context; the context may include current health status, current level of social support and current level of adherence for example. Data sets on individuals with records of time-varying context and treatment delivery can be used to inform the construction of the decision rules. There is much interest in personalizing the decision rules, particularly in real time as the individual experiences sequences of treatment. Here we discuss our work in designing online "bandit" learning algorithms for use in personalizing mobile health interventions

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