Data Studio

1:30–3:00pm, Wednesday, 13 April 2022
Conference Room X393, Medical School Office Building, 1265 Welch Road, Stanford, CA
Videoconference: https://stanford.zoom.us/j/92154339367?pwd=T2ZpSXlGdWxFTHNKZ1ptclF1ZFErUT09
Password: 761452

Investigator: **Ann Hsing** Stanford Prevention Research Center

Title: **Well-being and Heart-Rate-Variability-derived Stress Levels: A Pilot Study of Continuous Real-time Data Capture Through Wearable Technology**

Summary:

The Data Studio Workshop brings together a biomedical investigator with a group of experts for an in-depth session to solicit advice about statistical and study design issues that arise while planning or conducting a research project. This week, the investigator(s) will discuss the following project with the group.

The Stanford WELL for Life Study (WELL) carried out a pilot study in July 2021 to capture beat-to-beat heart rate continuously over a 60-day period from 120 study participants. Participants also filled out a 21-item well-being survey daily. We used heart rate variability (HRV) to derive stress levels and sleep quality for each participant. The goal of this pilot study is to correlate well-being with the biometric HRV-derived stress levels and to assess the feasibility of scaling up and integrating wearable technology into our ongoing cohort study for objective measures of sleep and stress. We hypothesize that HRV-derived stress levels are associated with self-perception of well-being as measured by the overall WELL score composed of 7 domains.

In this short longitudinal pilot study, we obtained repeated measurements of continuous biometric and daily self-reported data from the same participants over 5–7 weeks. We used HRV to derive 7 day-part stress levels, including morning, noon, afternoon, evening, sleep, 24-hour, and daily average, per day for 60 days for each participant. If there is no missing data, each individual would have $7 \times 60 = 420$ data points for the 60-day study period. HRV has time, frequency, and non-linear domains. Using these approaches, we derived 10 HRV-related stress variables, including mean RR, SDNN, and RMSSD (time-domain variables), VLF, LF, HF, LF, and HF (frequency-domain variable), and DFAa1, DFAa2, MSE (non-linear domain variables). Thus, an enormous amount of data for each individual (4,200 data points for the stress variable alone).

Questions:

The statistical questions we would like to address during the workshop are as follows:

1. Handling of missing data
2. How to manage repeated measurements over 40-60 days for each individual?
3. Best way to calculate intra-person variation over time
4. Best approach to handle the HRV-stress variable: per day, per week,
5. Changes in stress levels (delta)?
6. Best way to model these variables to evaluate the relationship between HRV-derived stress variable and well-being

Zoom Meeting Information

```
Join from PC, Mac, Linux, iOS or Android:
  https://stanford.zoom.us/j/92154339367?pwd=T2ZpSXlGdWxFTHNKZ1ptclF1ZFErUT09
  Password: 761452

Or iPhone one-tap (US Toll):
  +18333021536,,92154339367# or
  +16507249799,,92154339367#

Or Telephone:
    Dial: +1 650 724 9799 (US, Canada, Caribbean Toll) or
          +1 833 302 1536 (US, Canada, Caribbean Toll Free)
    Meeting ID: 921 5433 9367
    Password: 761452

    International numbers available: https://stanford.zoom.us/u/adRrsFkYeE
    Meeting ID: 921 5433 9367
    Password: 761452

    SIP: 92154339367@zoomcrc.com
    Password: 761452
```

For more information about Data Studio:

http://med.stanford.edu/dbds/resources/data-studio.html