

Take a Hacking at COVID-19

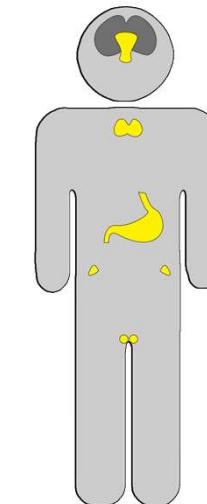
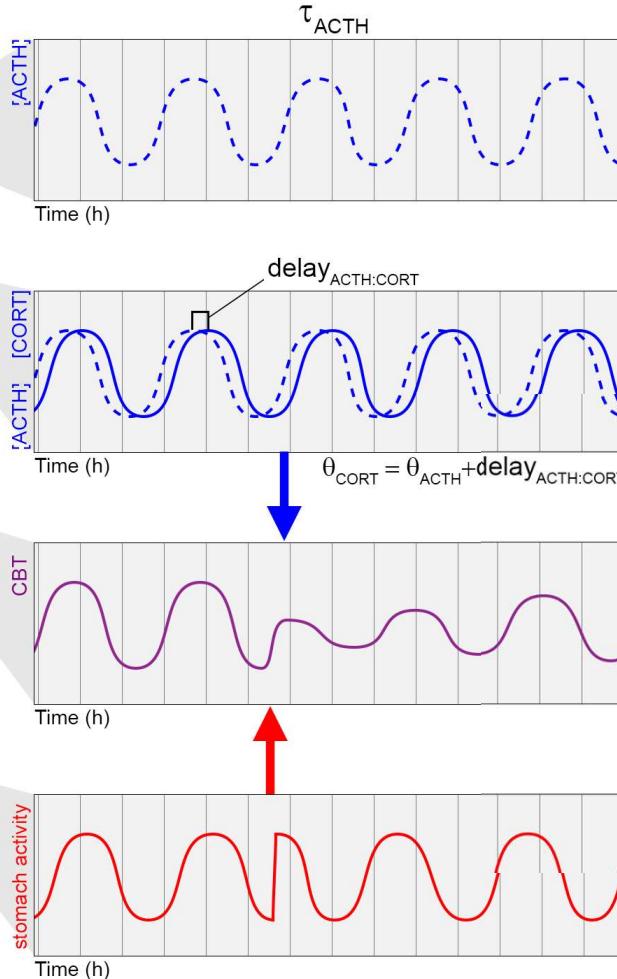
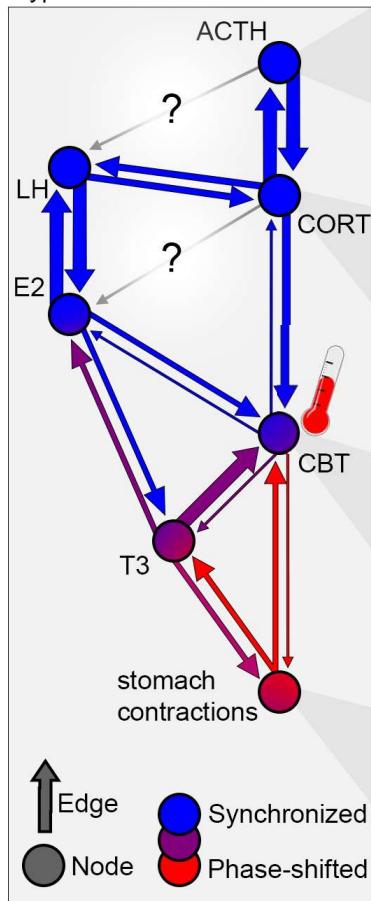
**The Information Reformation,
democratizing discovery**

Benjamin Smarr, PhD
Assistant Professor, Bioengineering,
and the Halicioğlu Data Science Institute, UCSD



Physiology is a weakly-coupled oscillator network

Hypothetical network model.



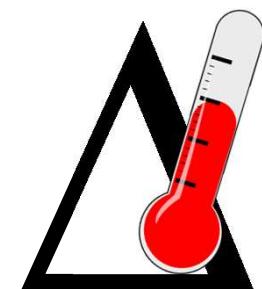
Thyroid

Gut

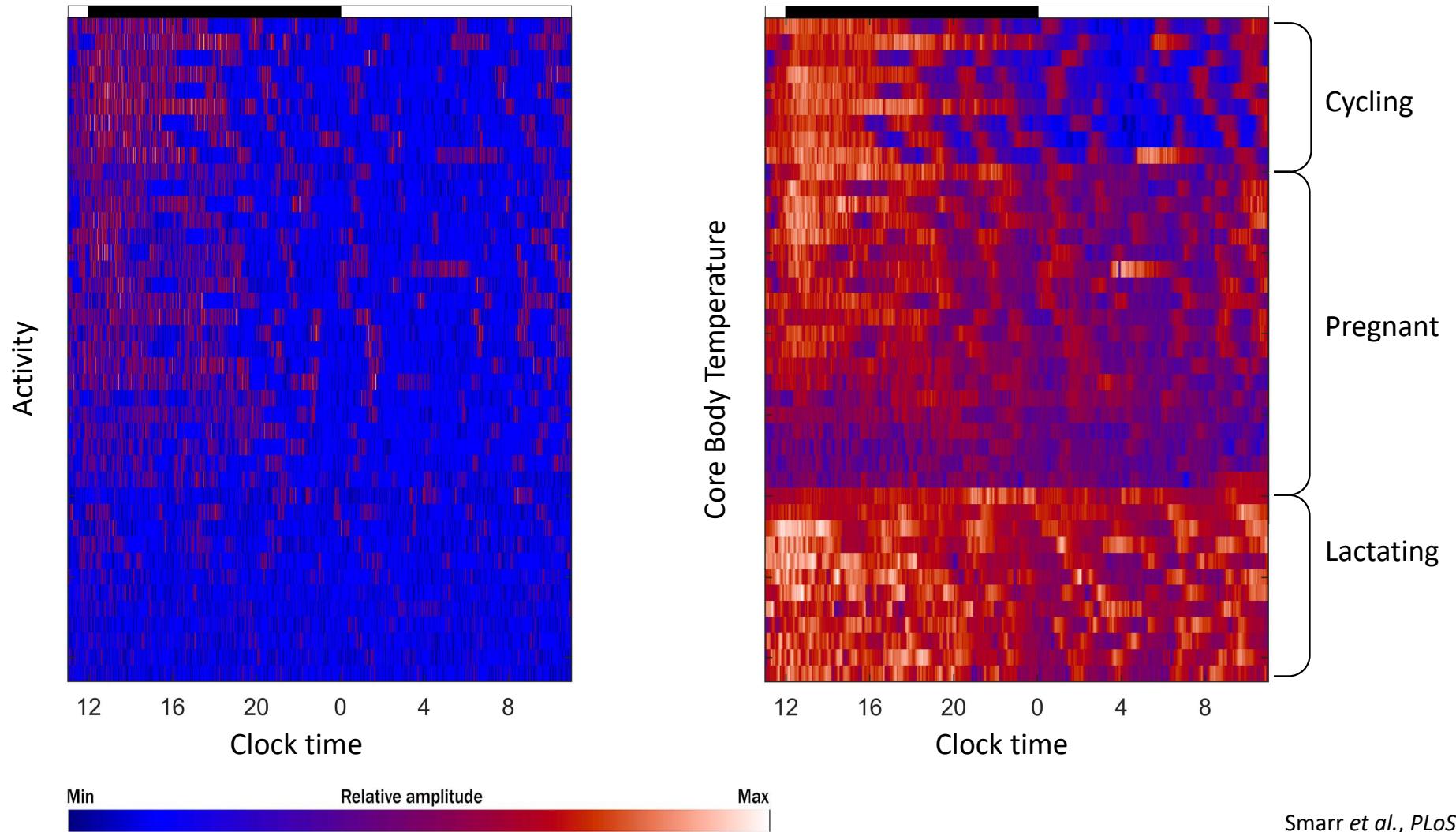
Gonads

*Hypothal'
Pituitary*

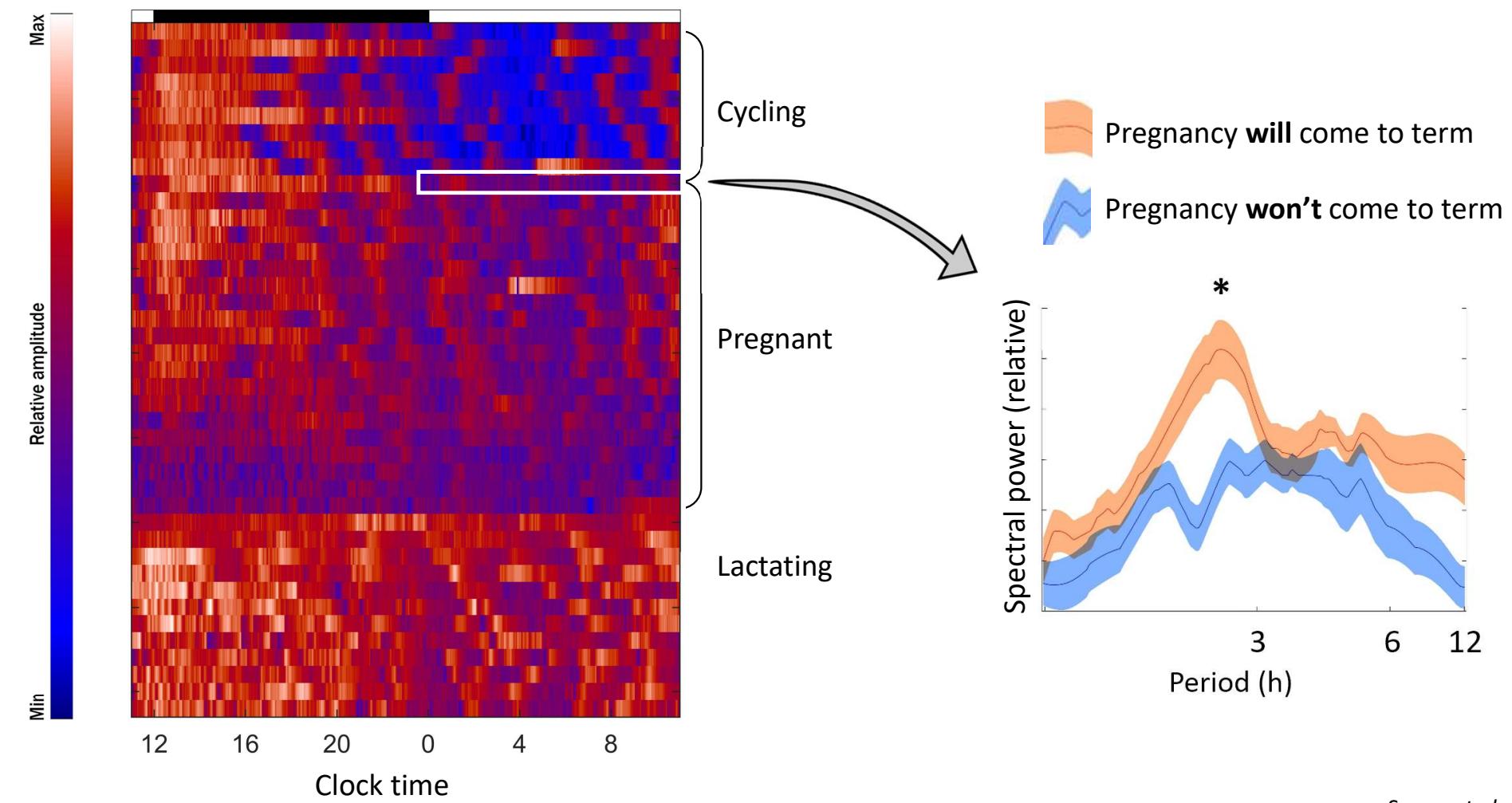
Adrenals



Modality and Individual Matter.

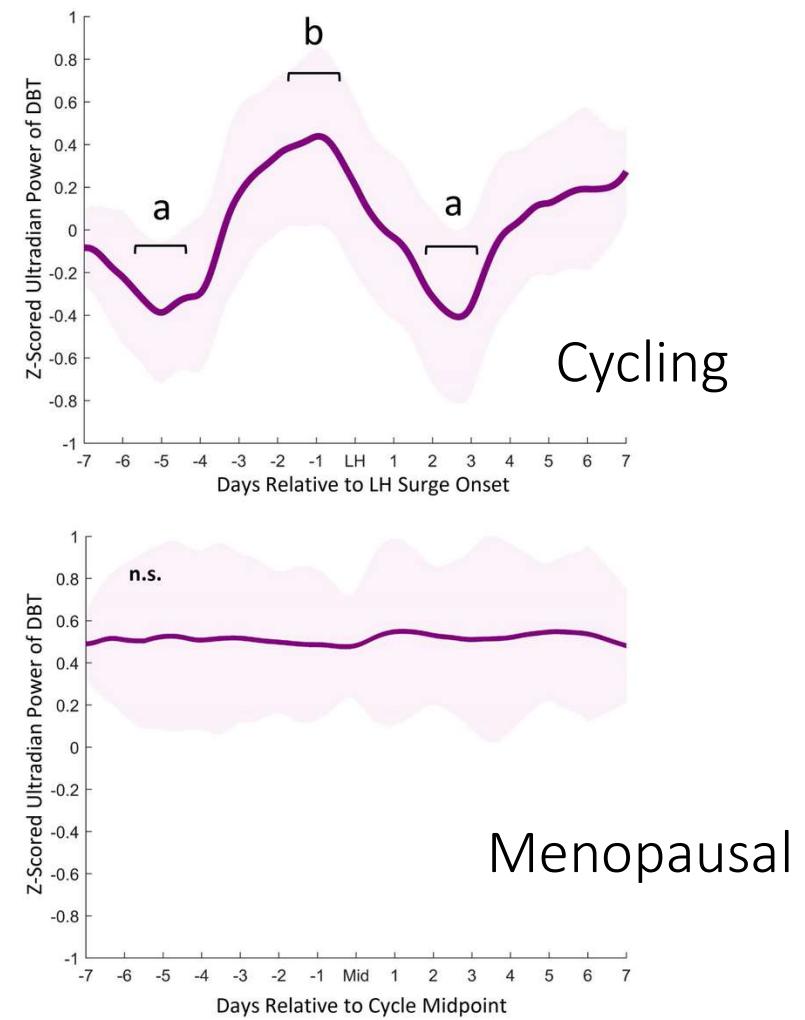
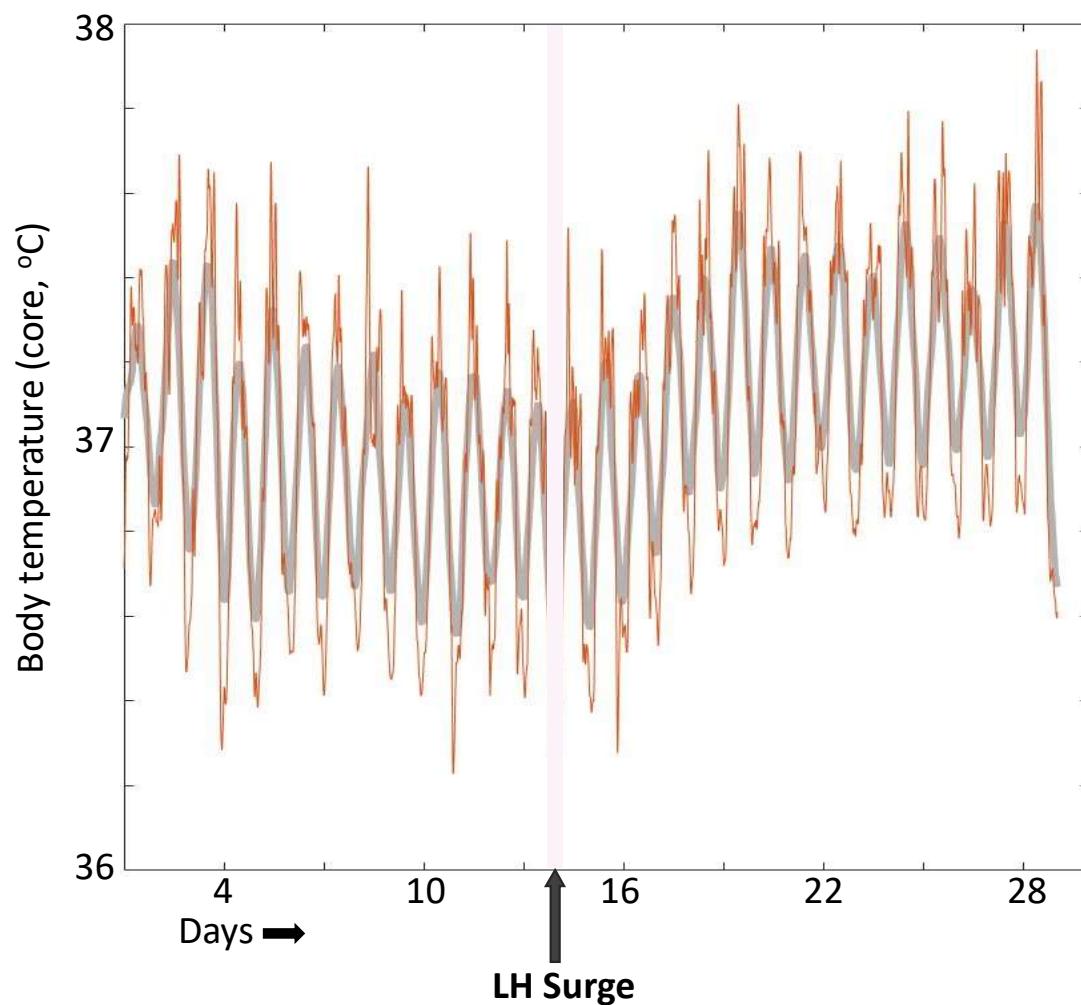


“Ultradian Rhythms” Predict Pregnancy Outcome.

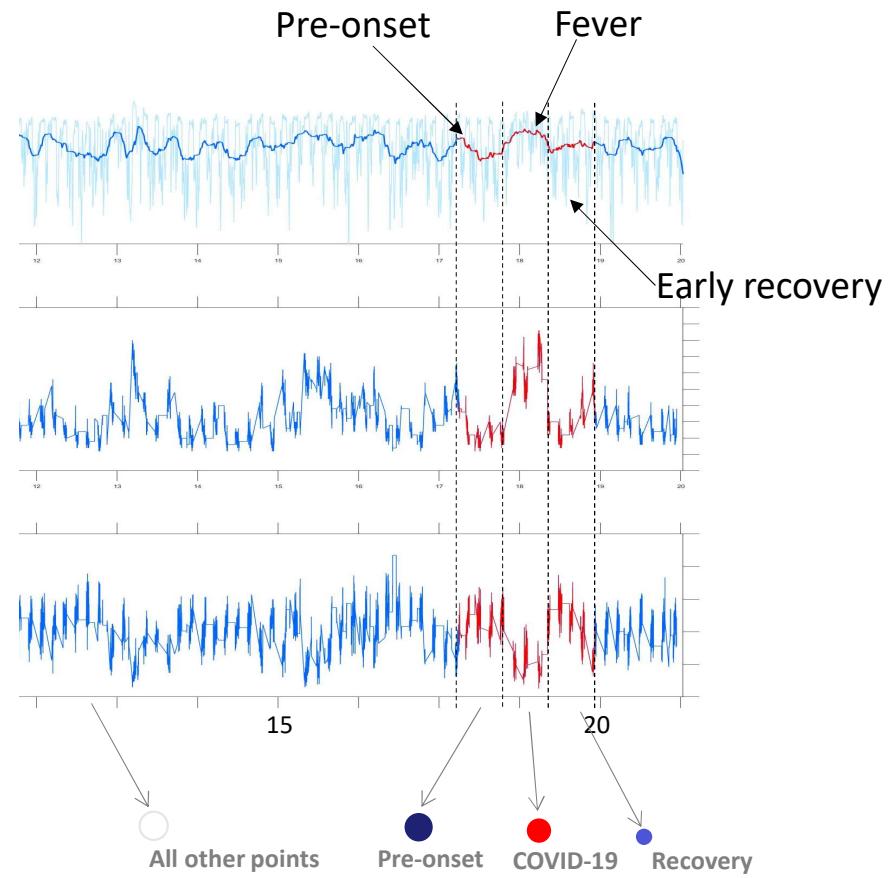
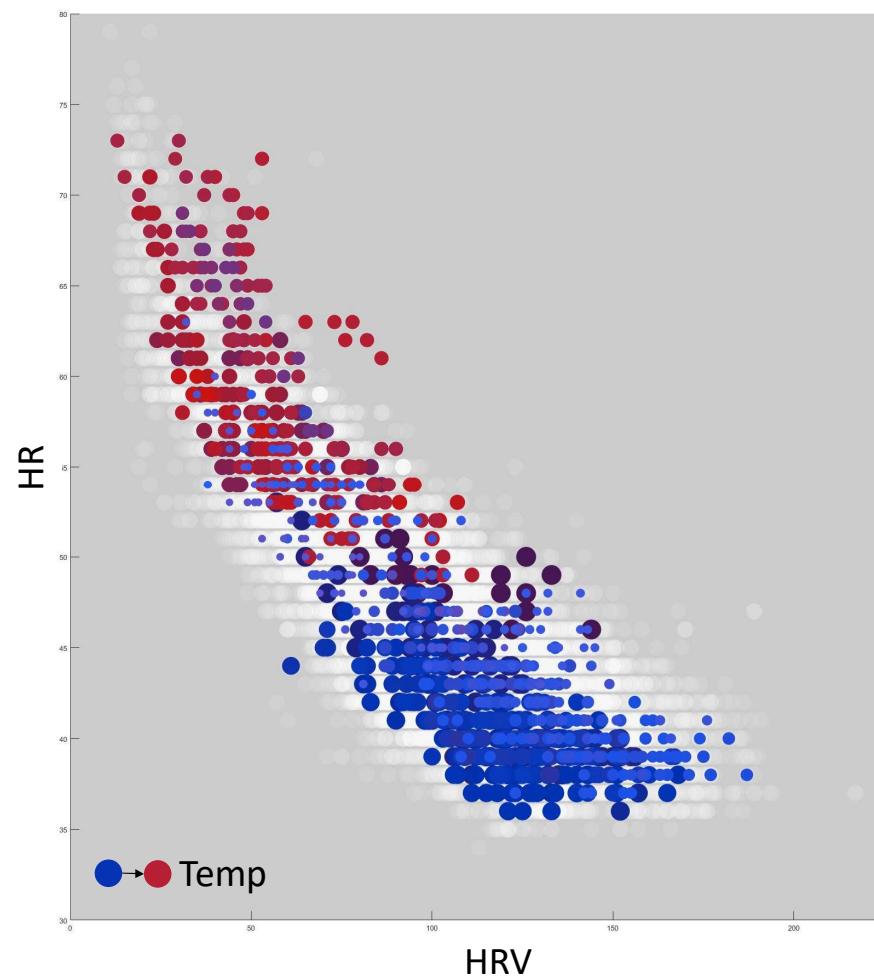




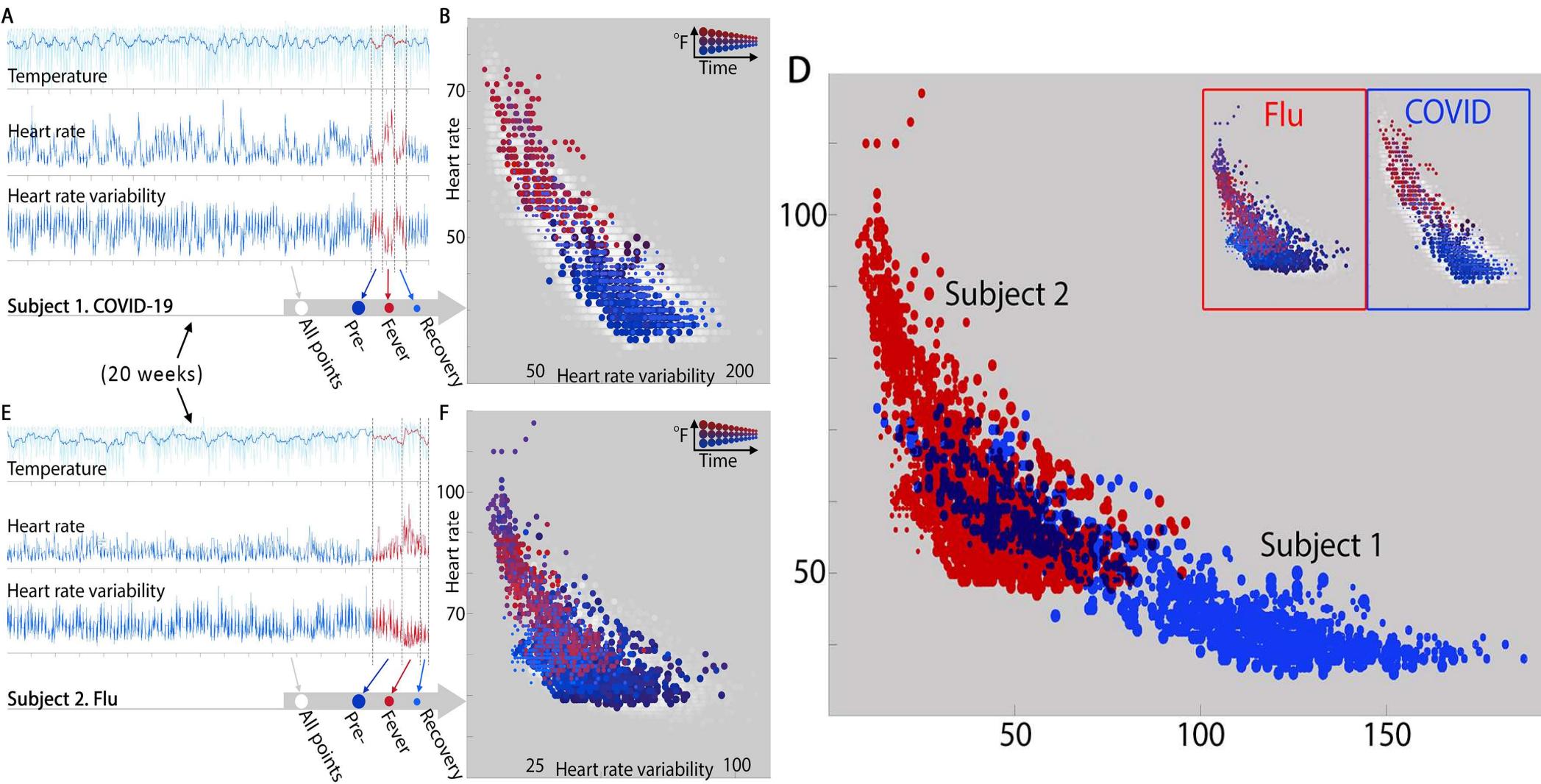
Overlapping timescales contextualize interpretation



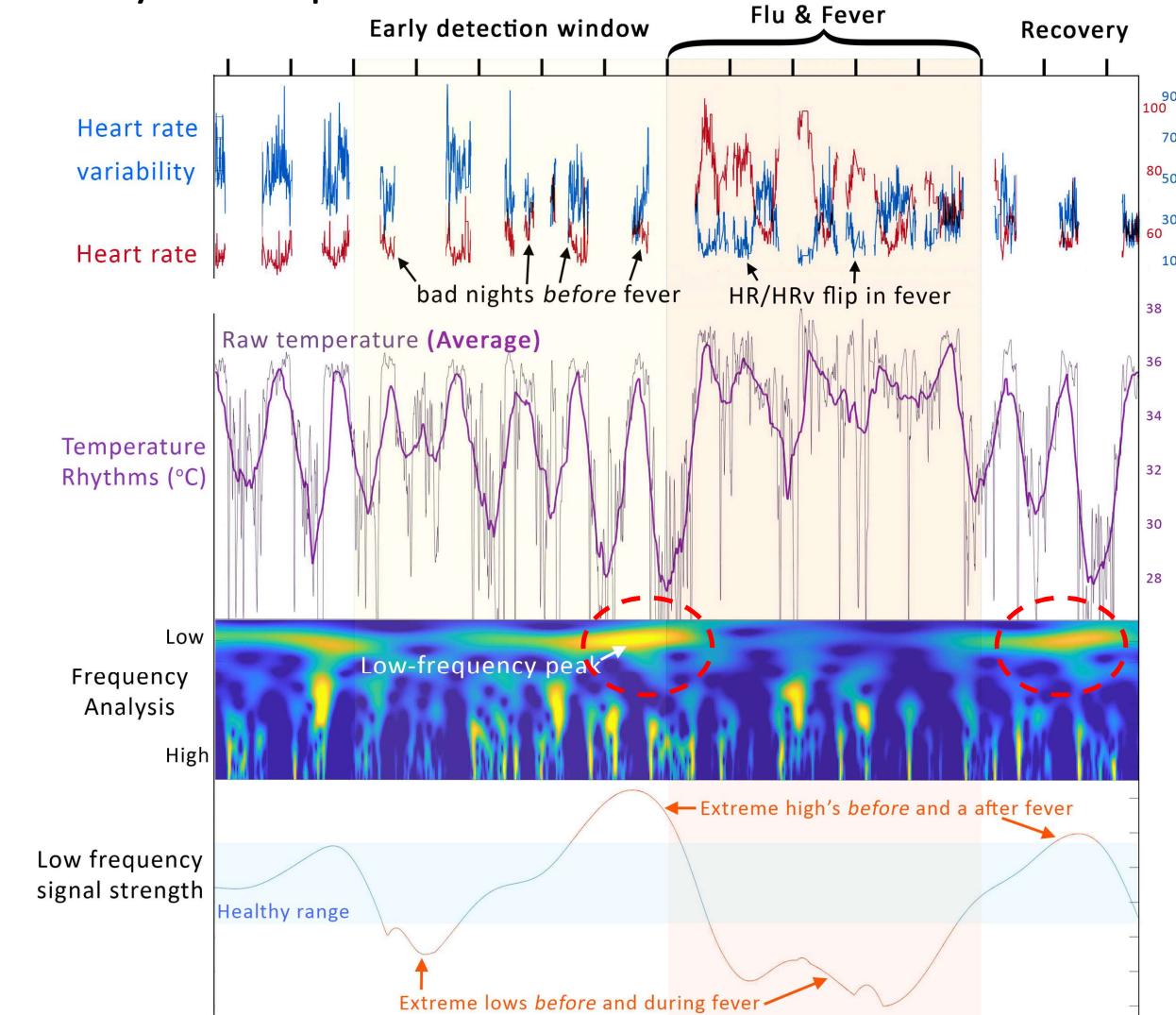
Multimodal mapping of COVID



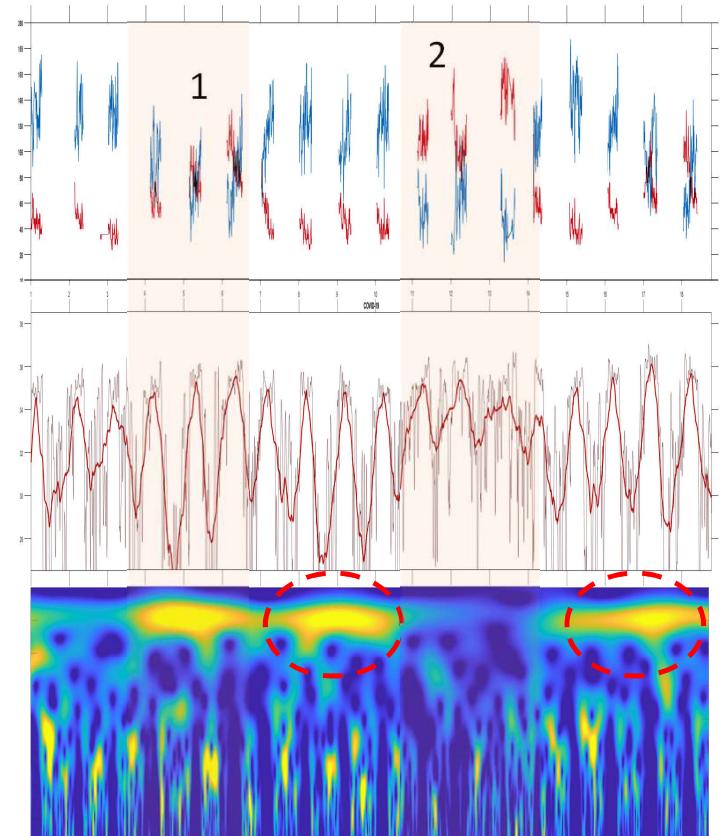
Patterns can be similar when people aren't



Early comparison: Flu v COVID-19

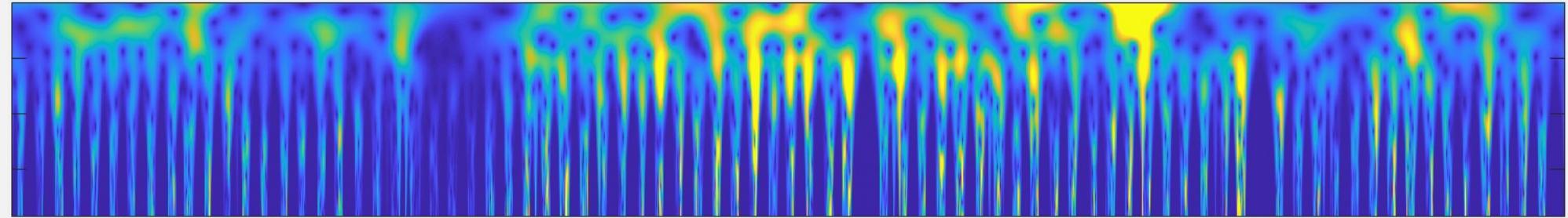
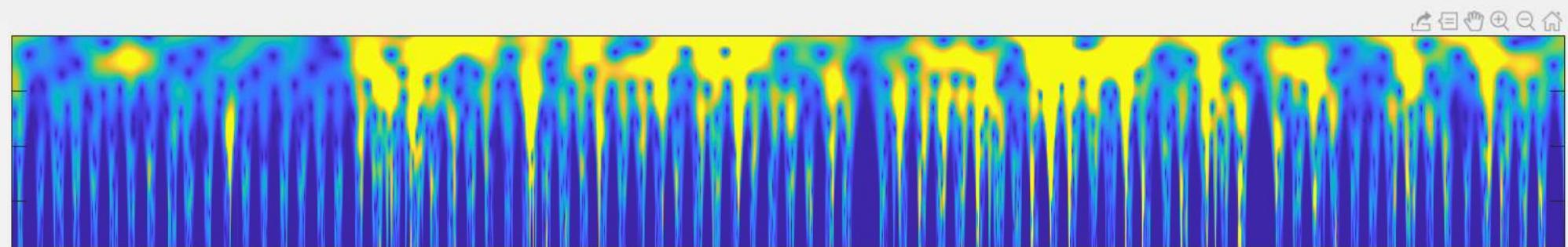
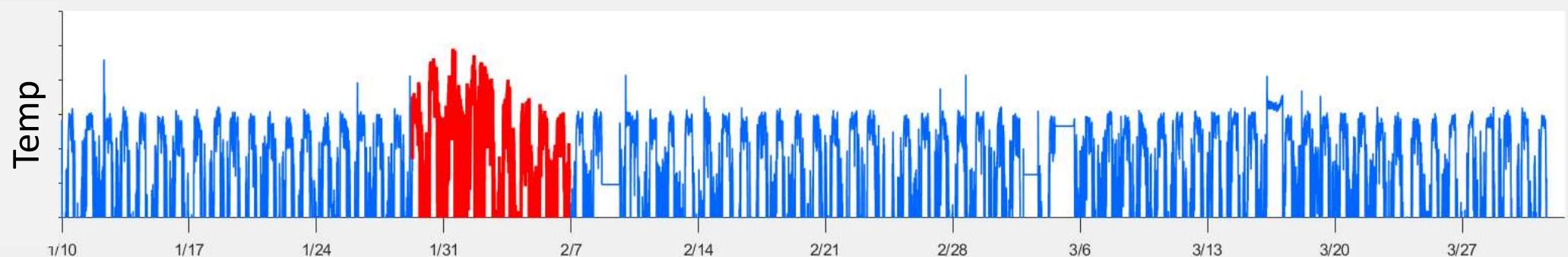


Mild COVID-19 similar to Flu

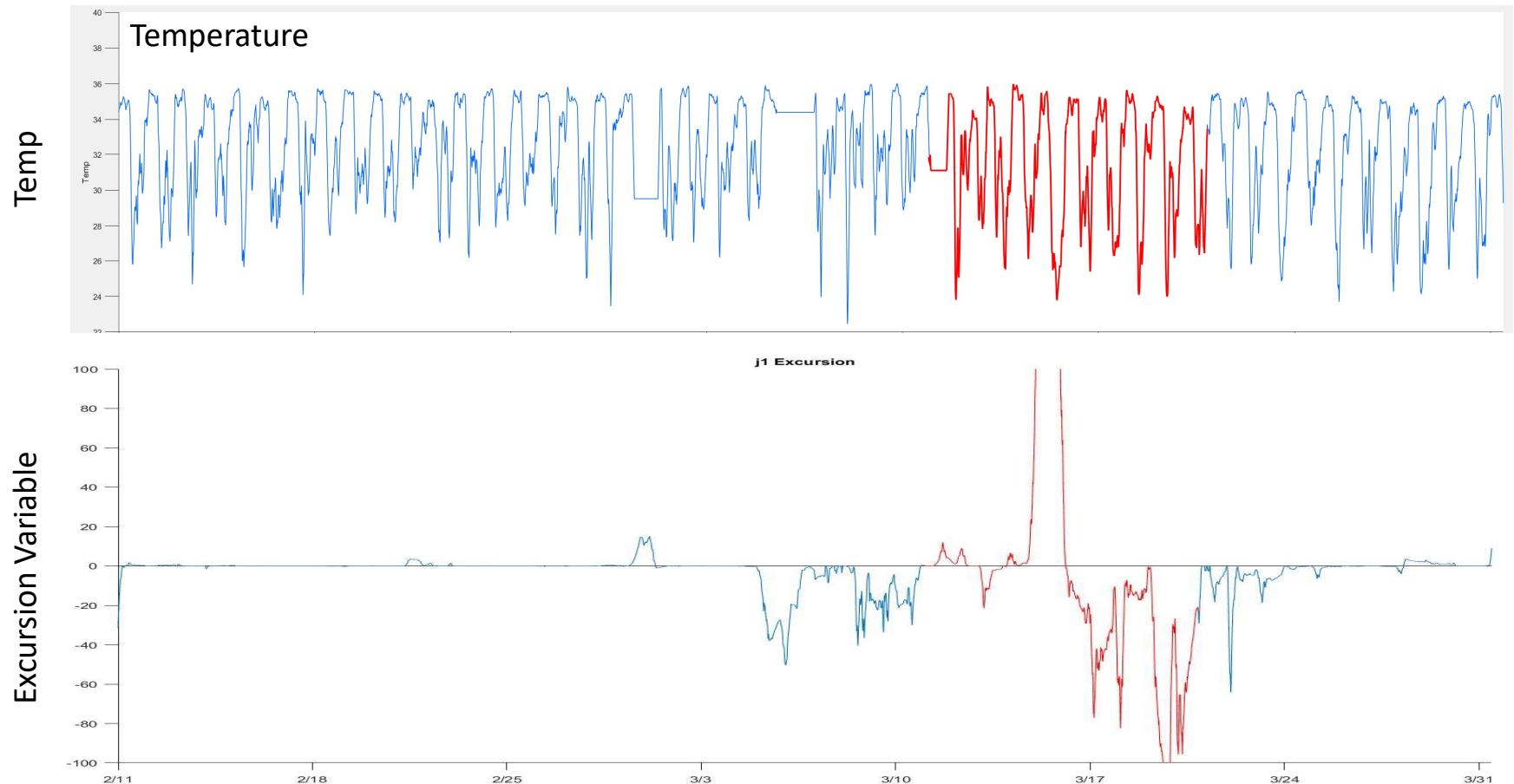


Severe flu shows signs days in advance.
Stress (1) doesn't, but mild COVID-19 (2) does too.

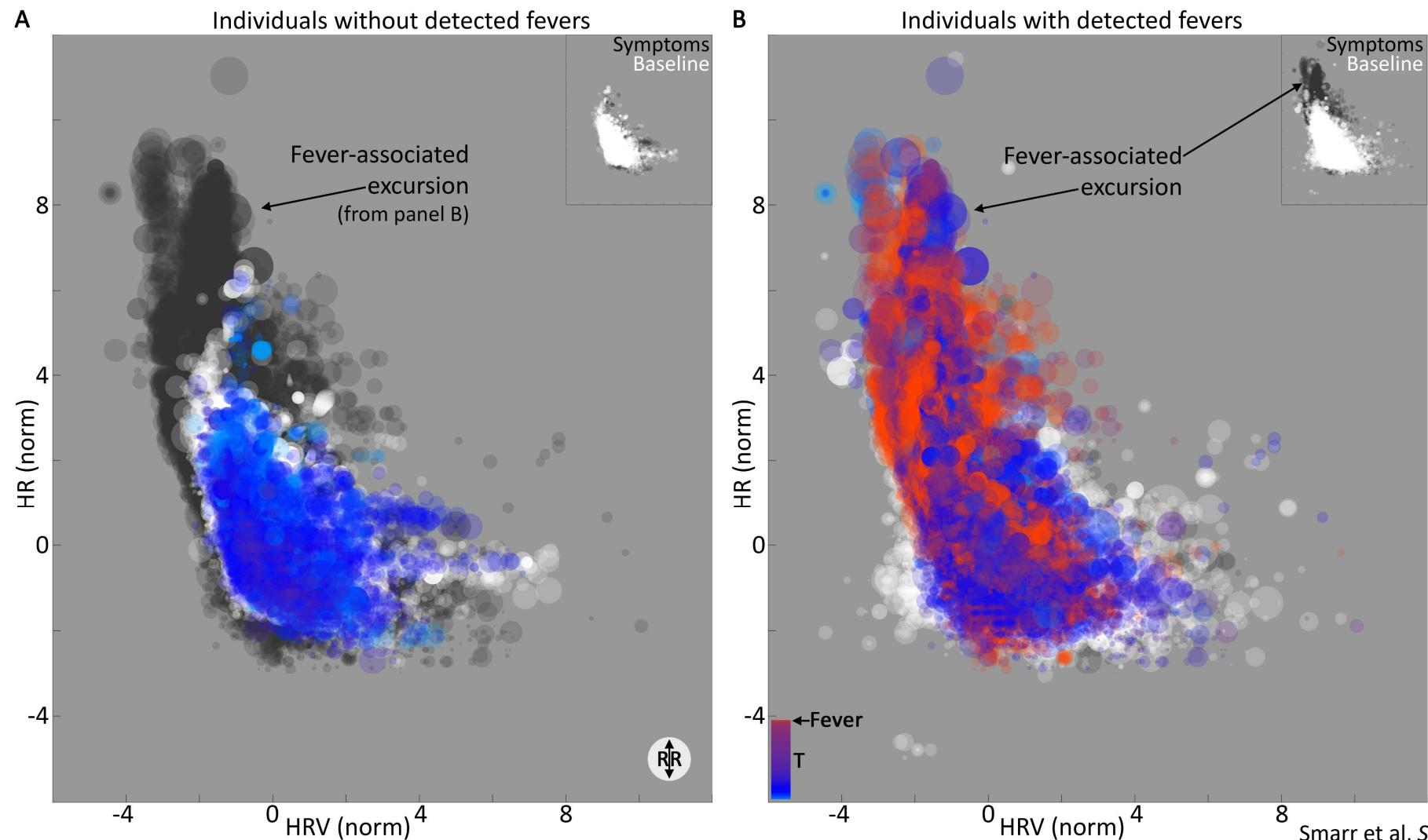
Example of detecting early... and late



Not everyone looks the same!

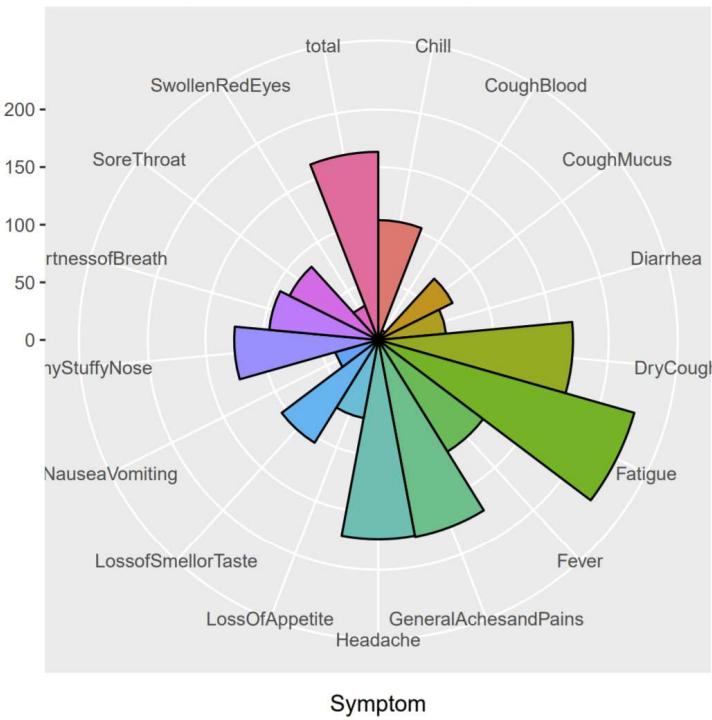


Fever is clear, but multimodal correlations aren't great



We also get symptom data (and more)

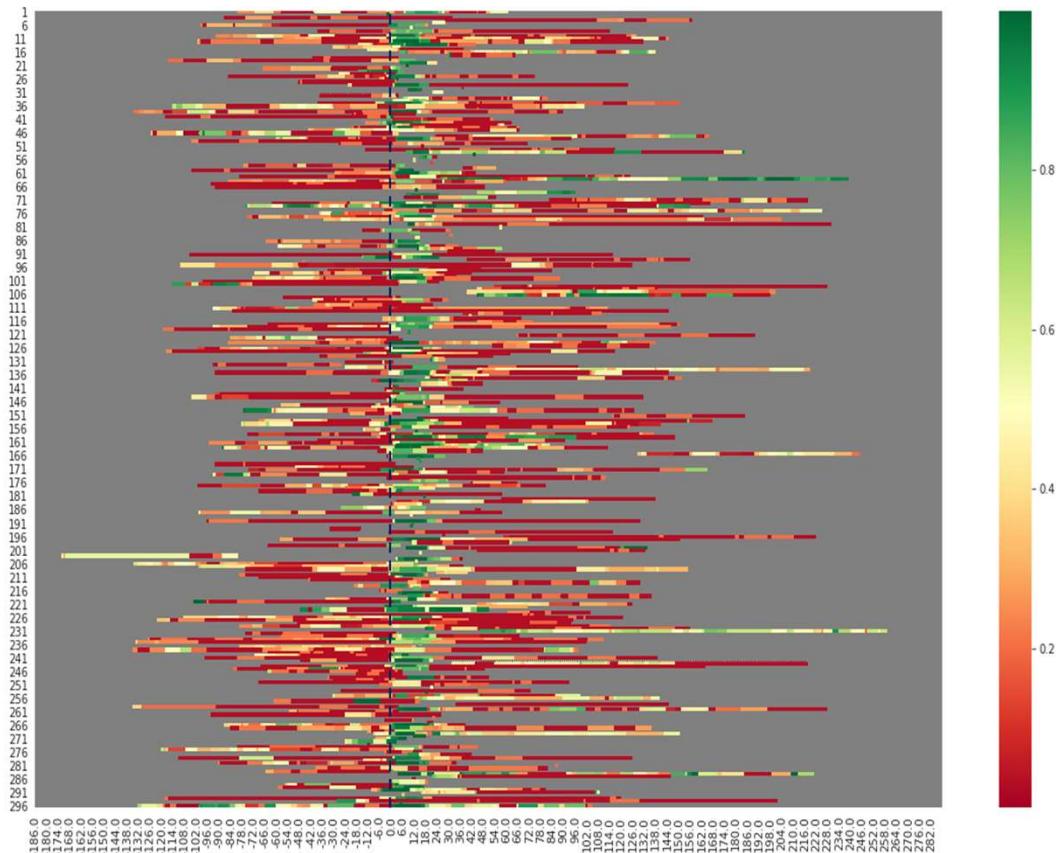
COVID – Symptoms on Day of Diagnosis



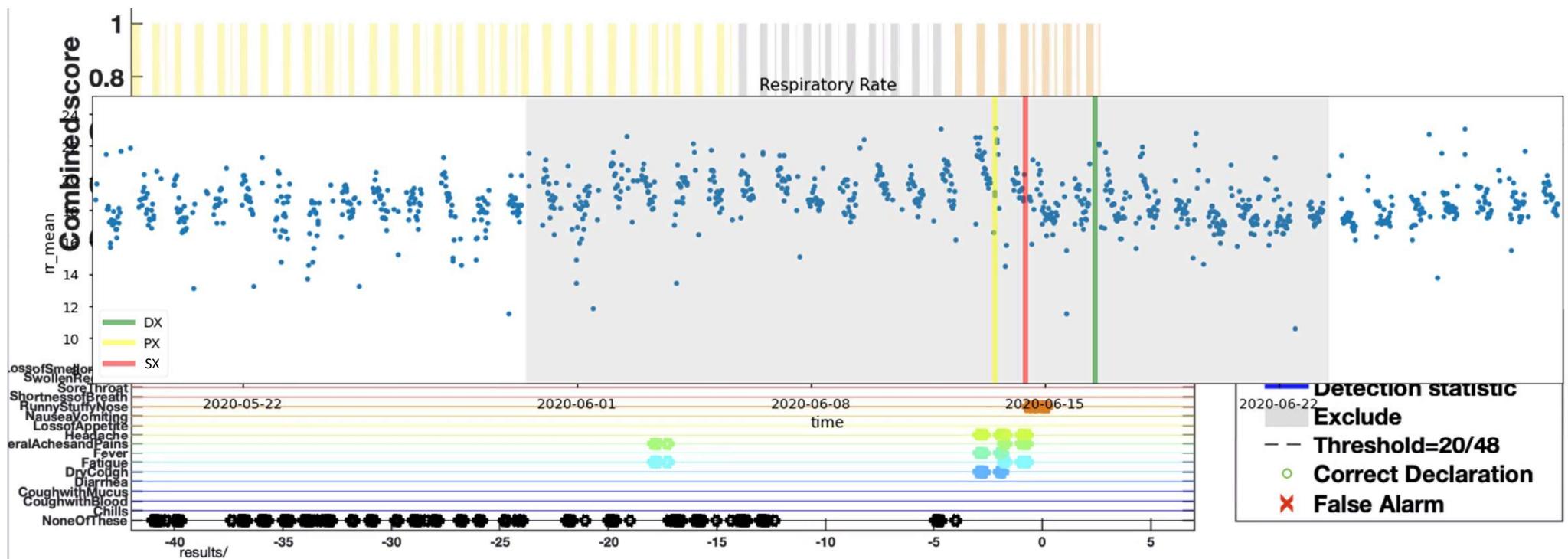
Symptom

- Chill
- CoughBlood
- CoughMucus
- Diarrhea
- DryCough
- Fatigue
- Fever
- GeneralAchesandPains
- Headache
- LossOfAppetite
- LossofSmellorTaste
- NauseaVomiting
- RunnyStuffyNose
- ShortnessofBreath
- SoreThroat
- SwollenRedEyes
- total

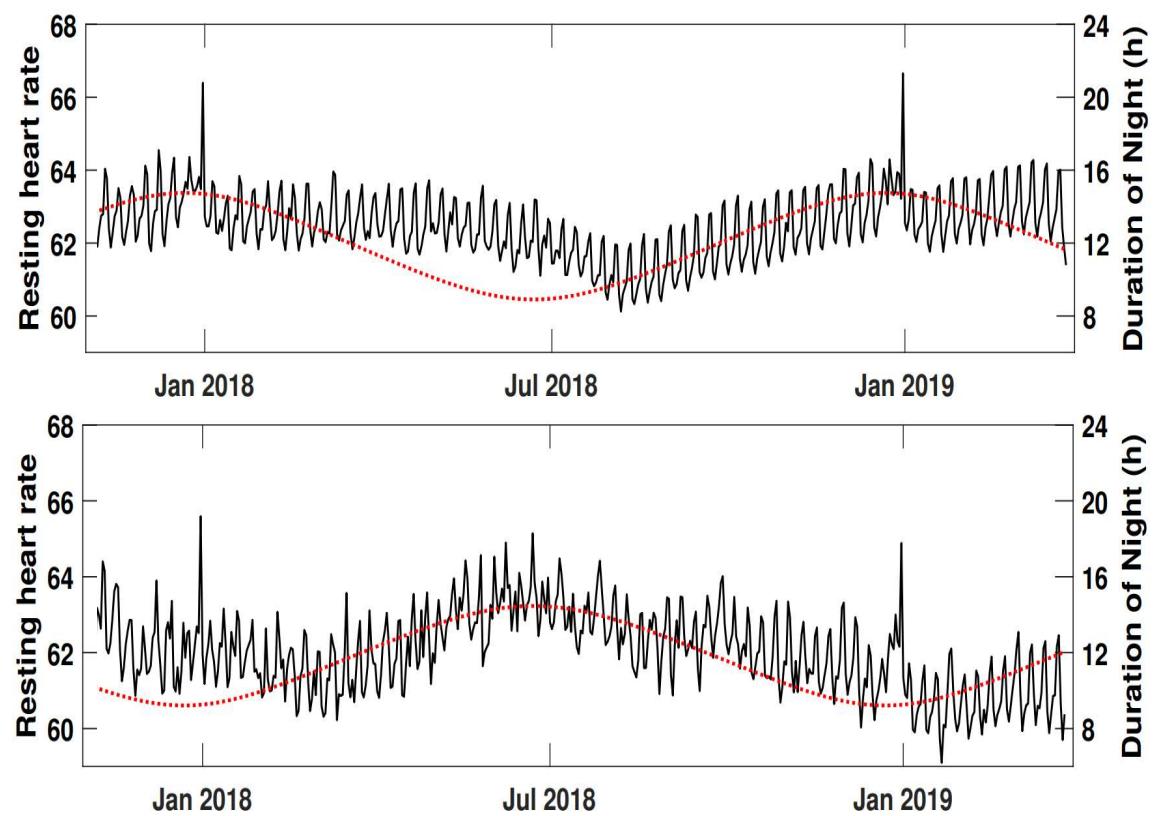
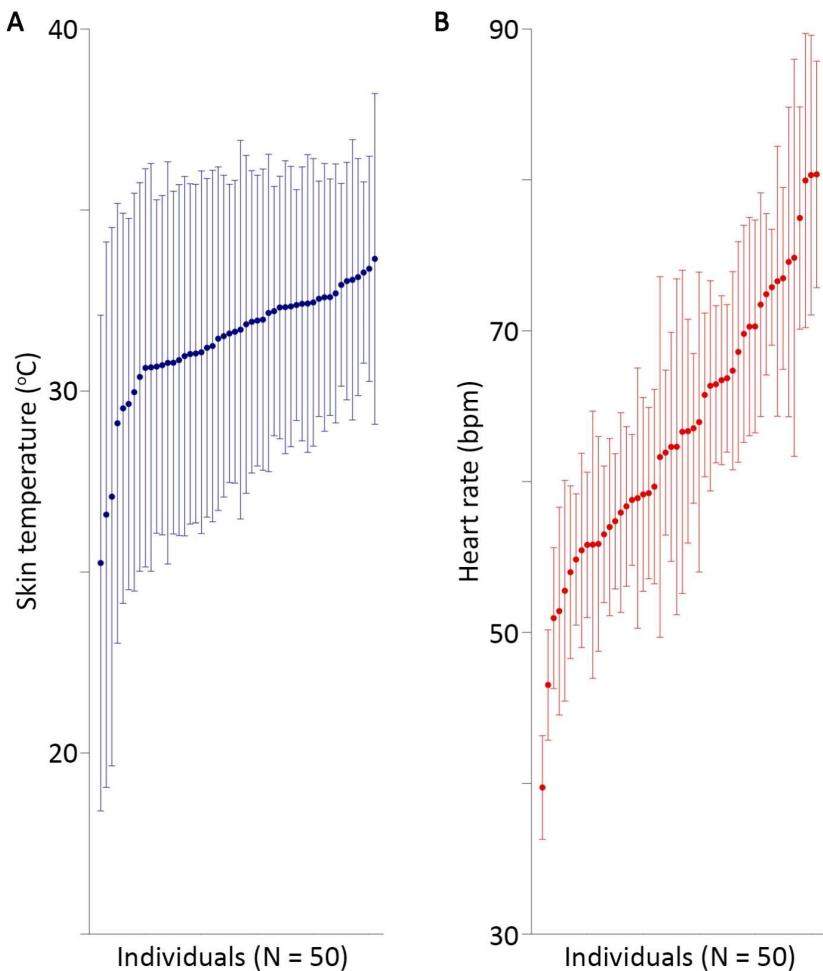
Prob. of COVID vs. offset from dx_date



Training using PRESAGED (but we want to build new models!)

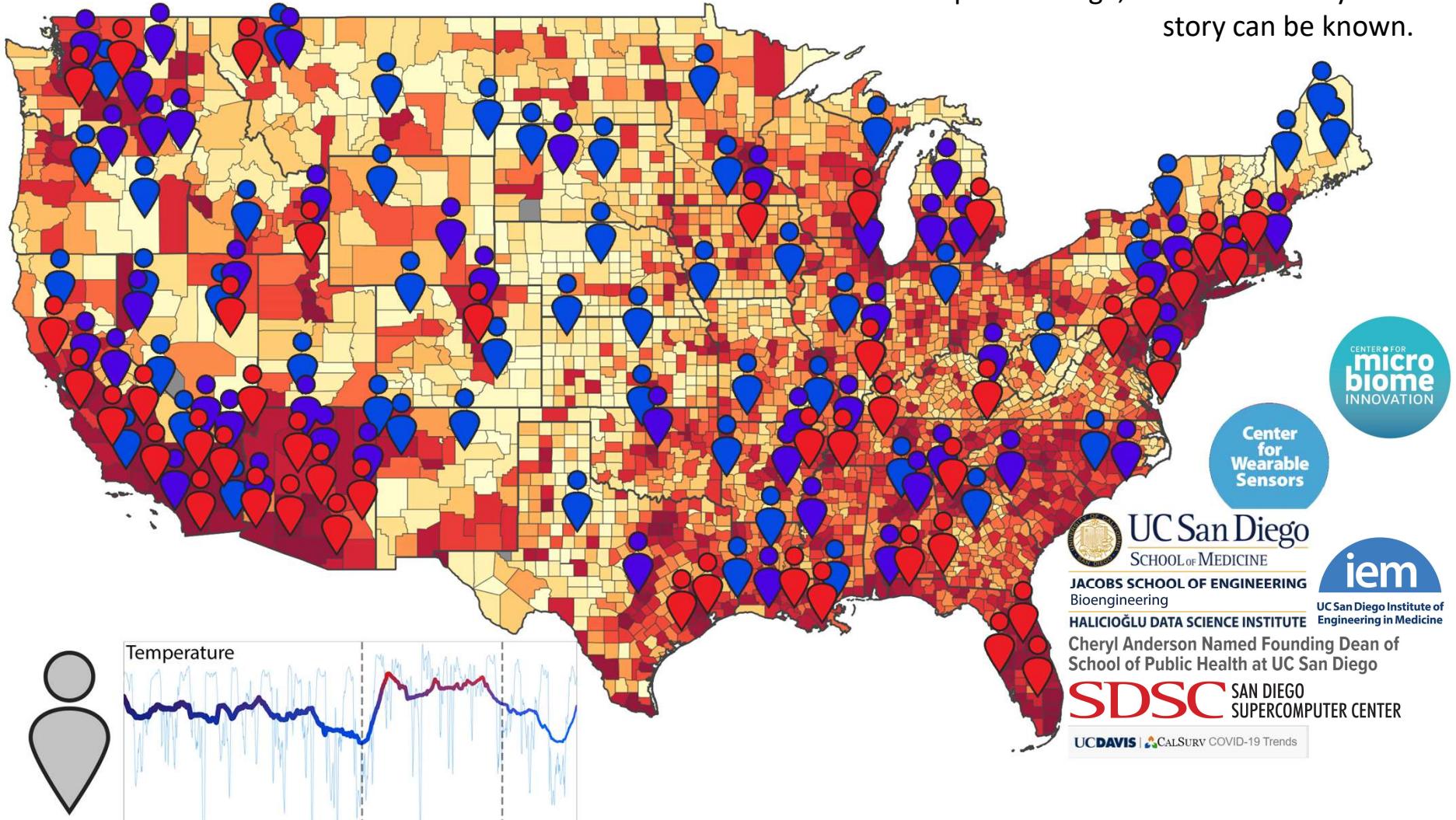


Limitation comes from people being different...
An opportunity to understand physiological diversity!



Public health, down to the individual.

Working with communities to ensure safe, equal coverage, and enable everyone's story can be known.



TemPredict

UCSF Health | ŌURA

UC San Diego
JACOBS SCHOOL OF ENGINEERING
Bioengineering



National Institute of
Environmental
Health Sciences



Quantified Self



Thank you!