

Using wearables to detect infections:

a co-created & community-led pandemic response

2021-05-04

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data from wearables



- (resting) heart rate
- body temperature
- respiratory rate
- sleep duration + 'quality'
- oxygen saturation

pre-COVID use: Influenza surveillance

CATEGORY: DIGITAL MEASURES

CONDITION: INFLUENZA

SOURCE: INTERNATIONAL SOCIETY FOR DISEASE SURVEILLANCE CONFERENCE 2019

Influenza Surveillance Using Wearable Mobile Health Devices

Ben Bradshaw, Kevin Konty, Ernesto Ramirez, Wei-Nchih Lee, Alessio Signorini, Luca Foschini



March 2020 hits:



University of California
San Francisco



ROBERT KOCH INSTITUT



- Large number of academic studies on wearables for early COVID-19 detection launches
- Largely similar to earlier Influenza approach

Wearables “Warn” of COVID-19

Academic Research + Wearables

= Hope and Hype

UC San Diego
Scripps Research

UCSF

Stanford
University

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“90% accuracy anticipating symptoms up to 3 days in advance”

For all of these:

- No feedback to participants.
- No data shared.
- No support for individual learning and sense making

Using Wearables for *Personal Science*

doing personal science – together

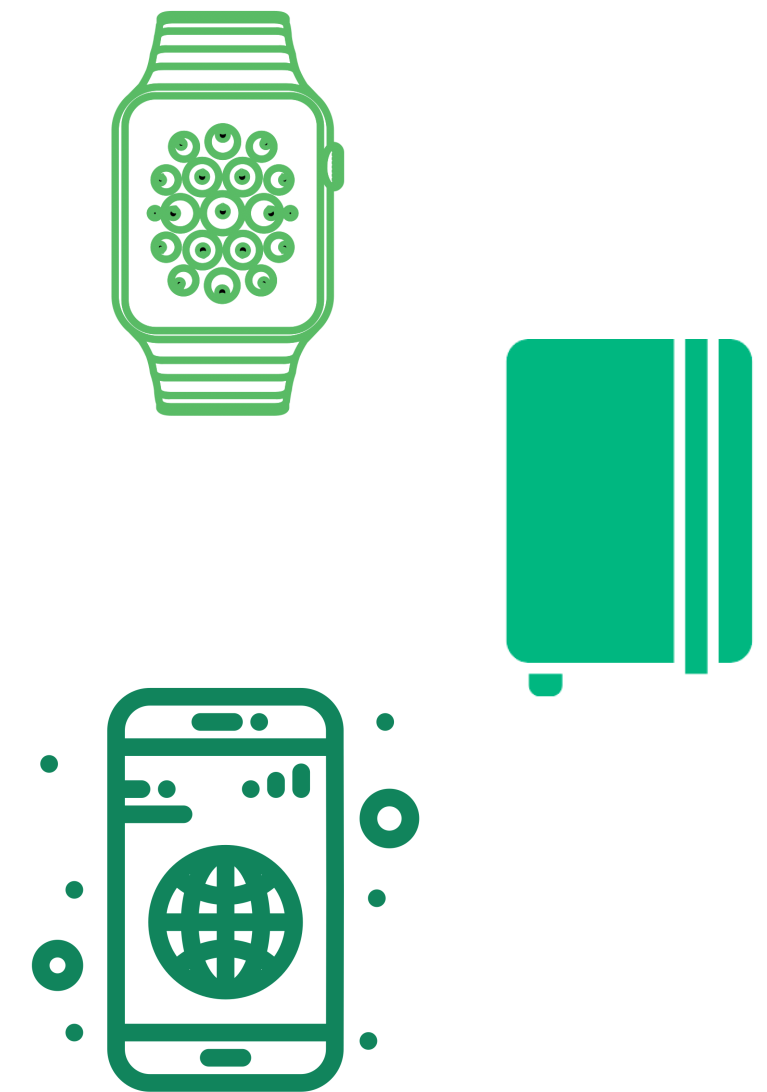
What is *Personal Science*?

Using empirical methods to answer *personal* questions such as:

Is this fiber really indigestible and will not raise my blood glucose?

What is triggering my arrhythmias?

Does my transitional hormone therapy influence my mood?



Starting from *The Keating Memorial* doing personal science – together



Notes & video from our self-research kickoff

🕒 February 10, 2020 📁 Open Humans, Self-research 🗣️ Mad Price Ball

In case you missed it: we took notes & recorded our kickoff webinar for the **Keating Memorial Self Research** activity last week!

On Thursday we'll have "open office hours" to offer **free expert support** for people getting started with questions and ideas about what they want to do. The meeting is at 10am PST / 6pm GMT on February 13 (Thursday).



QUANTIFIED SELF
SELF KNOWLEDGE THROUGH NUMBERS

Shifting our focus

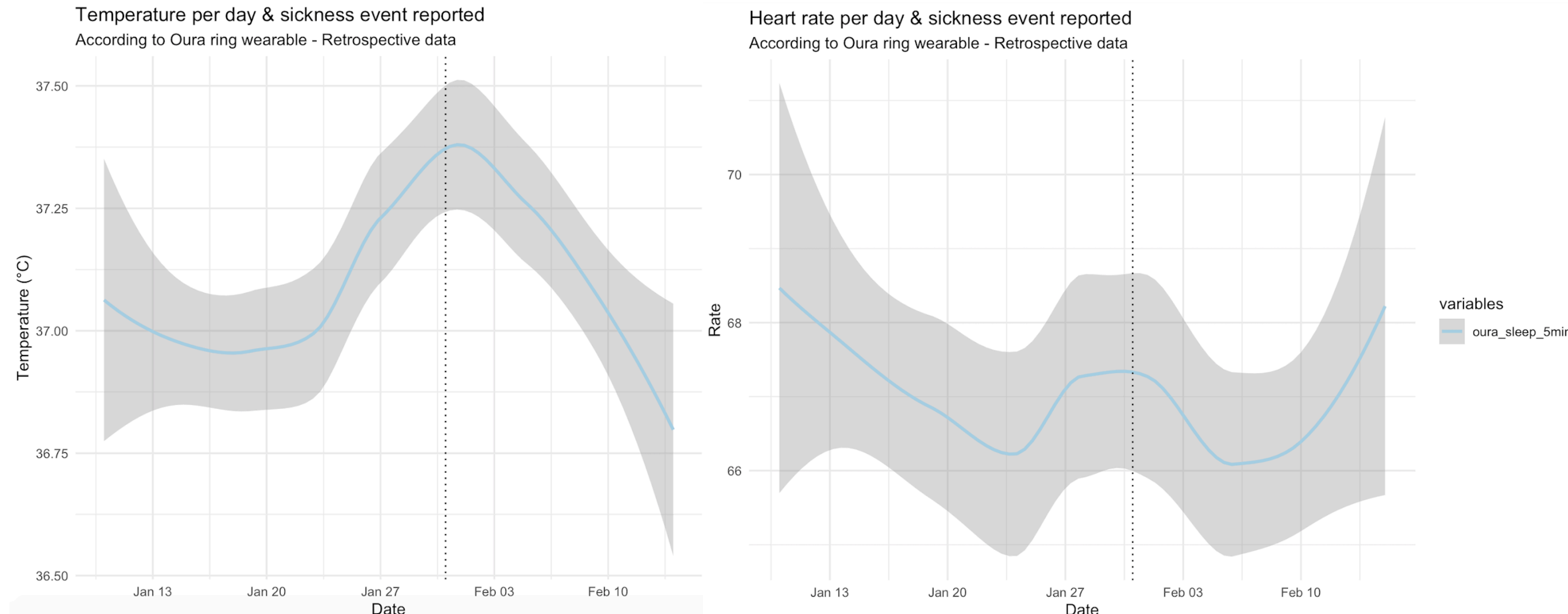
answering a collective question



during one of the
Open Humans community calls

**Can we use our wearables
individually to see when
we're having an infection?**

collective analyses on retrospective data



Seems to work, but:

- remembering when one was sick in the past **is hard!**
- Want to track specific symptoms!
- Monitoring continuously would be more useful

Quantified Flu: a second prototype

introducing on-going symptom reports

Report Symptoms

Report no symptoms

To what extent do you experience the following symptoms?

	None	A little	Somewhat	Quite a bit	Very much
Respiratory					
Cough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cough with mucus (phlegm)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced sense of smell (anosmia)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Runny or stuffy nose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sore throat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shortness of breath	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gastrointestinal					
Diarrhea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nausea or vomiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Systemic					
Chills and sweats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fatigue and malaise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Headache	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Muscle pains and body aches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

sent via daily email checkins

UC San Diego

Scripps Research

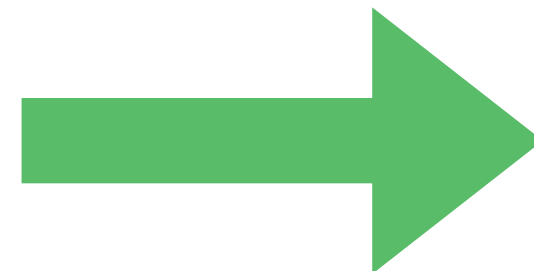
UCSF



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Remixing
symptom report
forms from existing
studies



Quantified Flu: a second prototype

introducing on-going symptom reports & data sharing

Public symptom tracking reports

Interested in analyzing this data yourself? Each symptom tracking report has data available via JSON endpoints. You can use this page's own JSON endpoint to automate data retrieval from these: </report/public.json>

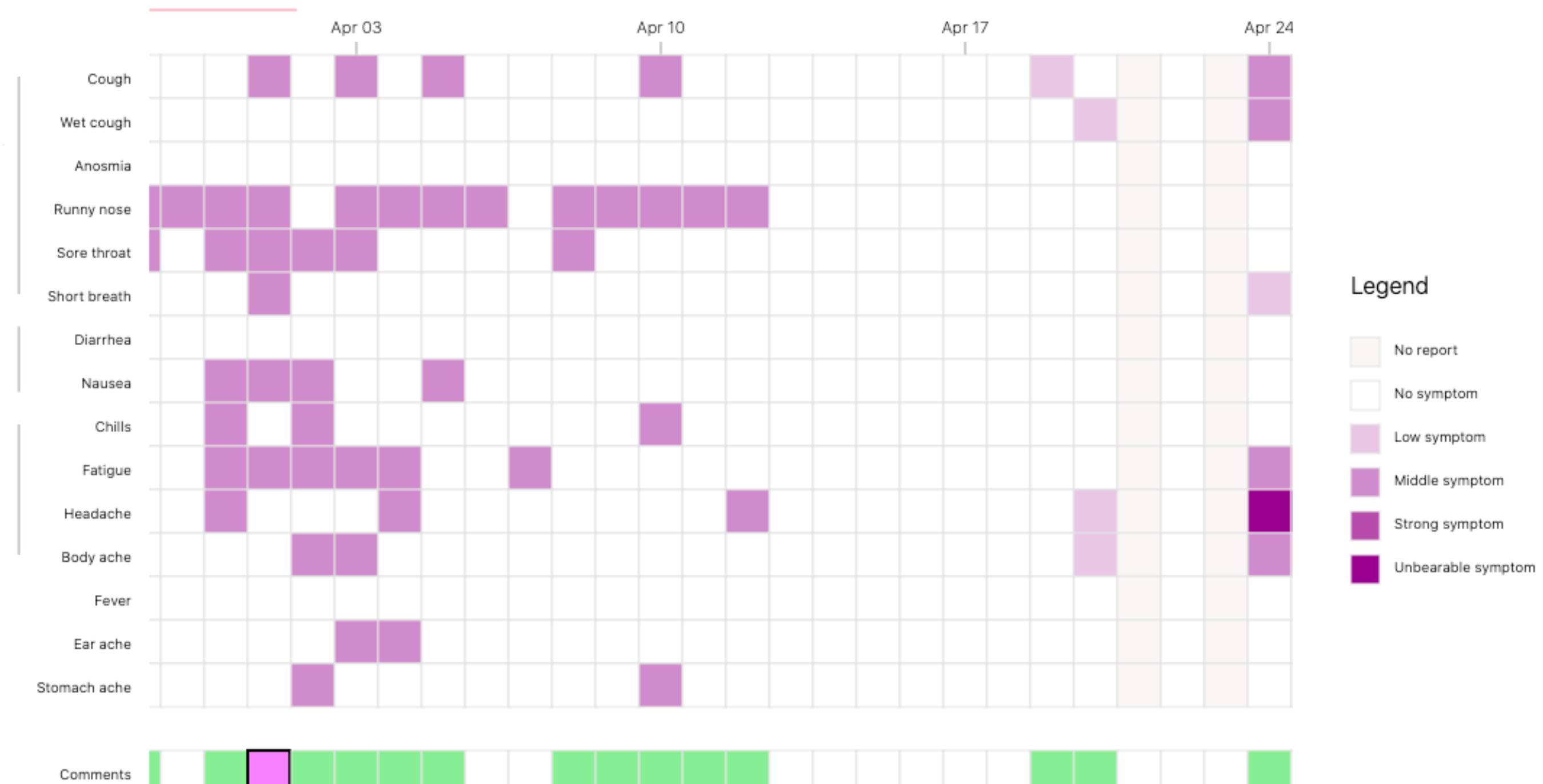
Please share your visualizations and discoveries with us! People are excited to hear what you've done – we'd love to share what others have done. (One place to connect is the [#quantifiedflu channel](#) in the Open Humans community Slack. You can use this site to create an account in the Slack: slackin.openhumans.org)

Thank you for sharing your data! Your data is part of this data set. This data sharing is optional; you can manage this in your [account settings](#).

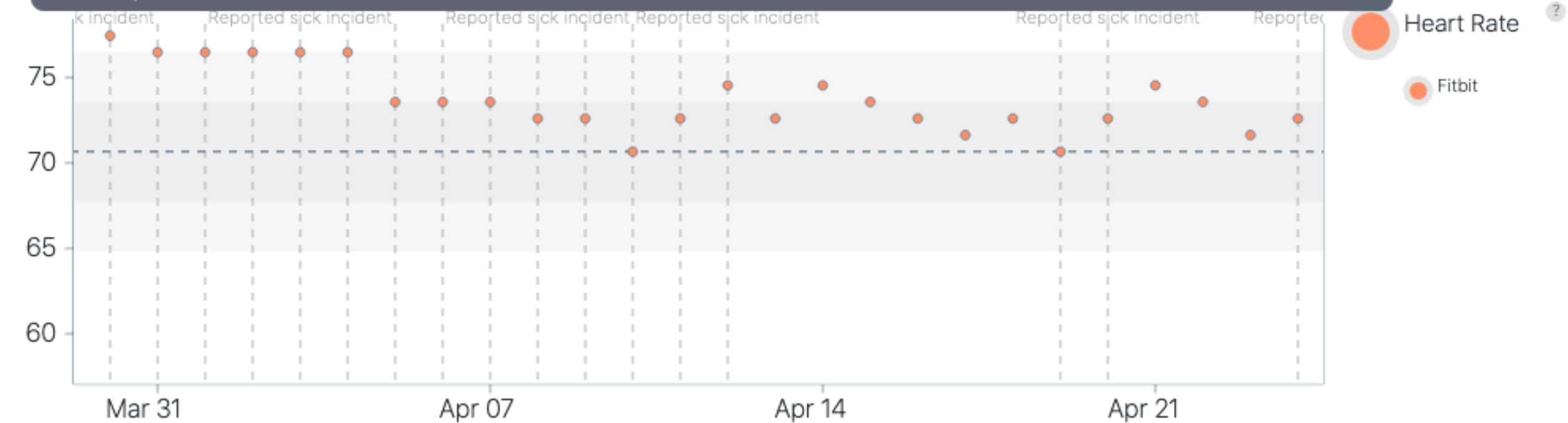
Click the links below to explore symptom reports.

Date	Member	Reports	Sick Incident	Data sources
Apr 08, 20 - Dec 16, 20	20012370	158	0	No connected data sources
Jul 08, 20 - Apr 30, 21	64808915	294	3	Fitbit
Aug 11, 20 - Apr 29, 21	06397219	184	0	Fitbit
Jun 24, 20 - Apr 29, 21	87138362	258	0	Apple watch Oura
Mar 25, 20 - Apr 28, 21	49855651	365	16	Fitbit

Heatmap of Symptom reports
Study on 190 days - start the Mar 26, 2020
Last update - Dec 01, 2020

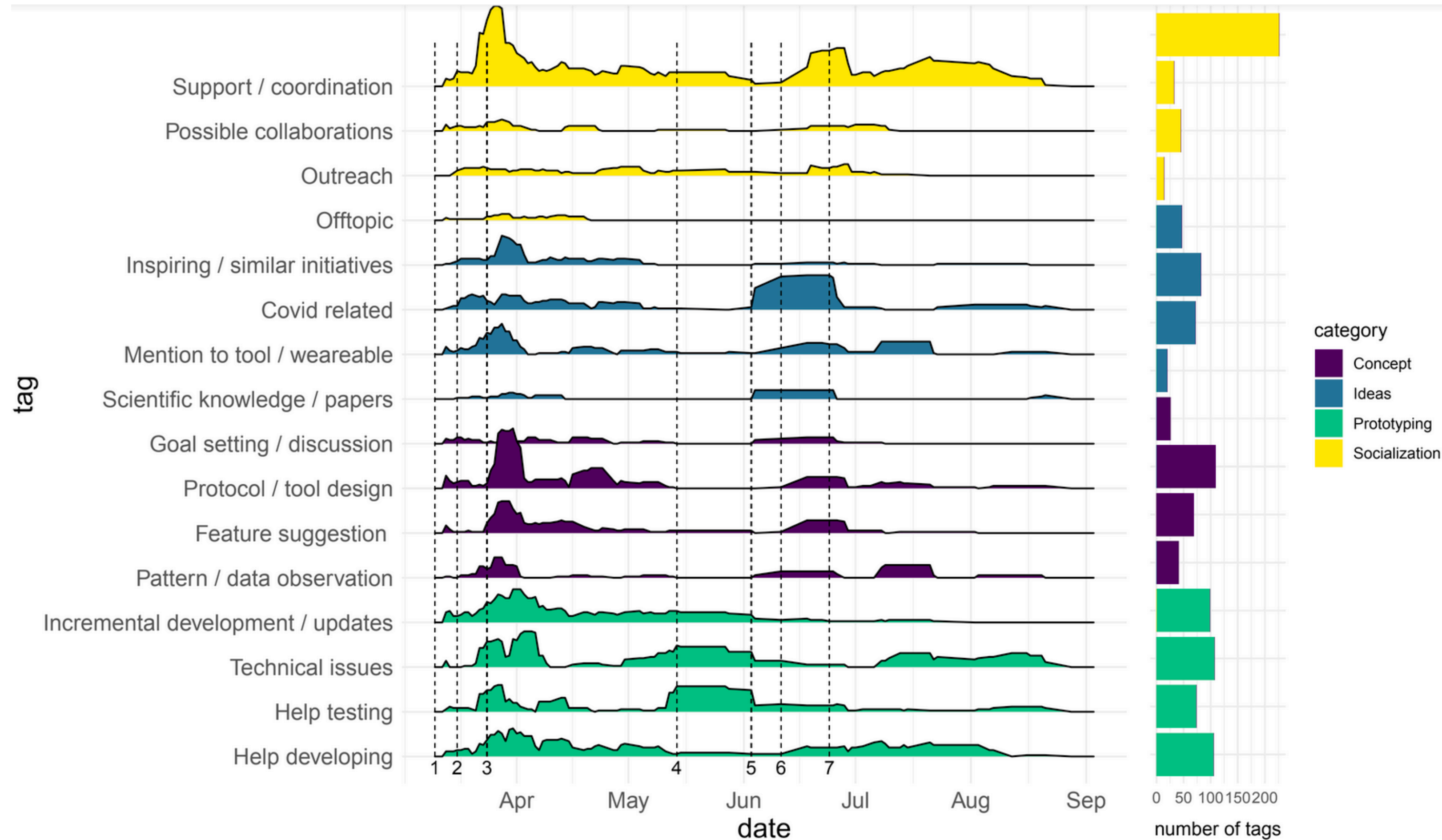


Comments : Every year I get sinus infection that moves into my chest.... and the cough is smokers cough..... because I've been smoking more since being out of work
Date : Apr 01, 2020



Co-creating Quantified Flu

by the community for the community



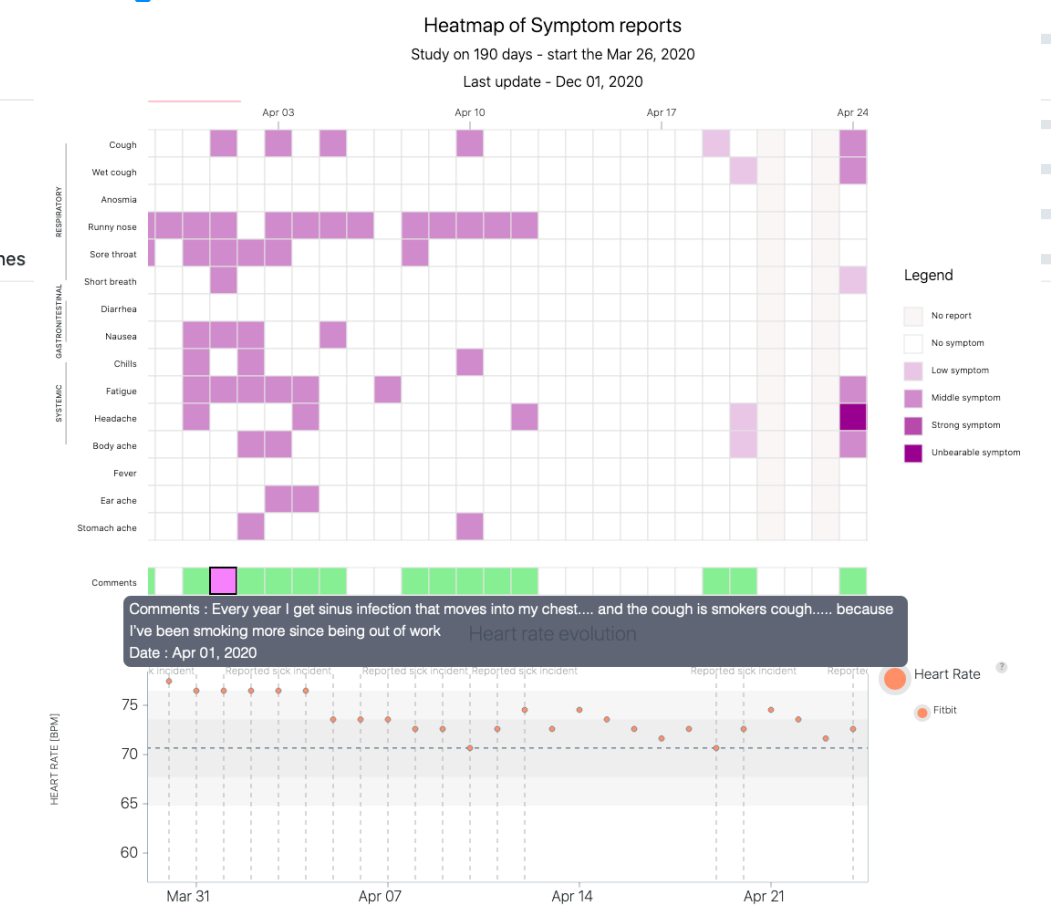
- 1: First community call
- 2: Adding retrospective symptom reports
- 3: Adding on-going (prospective) symptom reports
- 4: Apple Watch support released
- 5: Symptom Heatmap released
- 6: Garmin support released
- 7: Respiratory Rate support released

Report Symptoms

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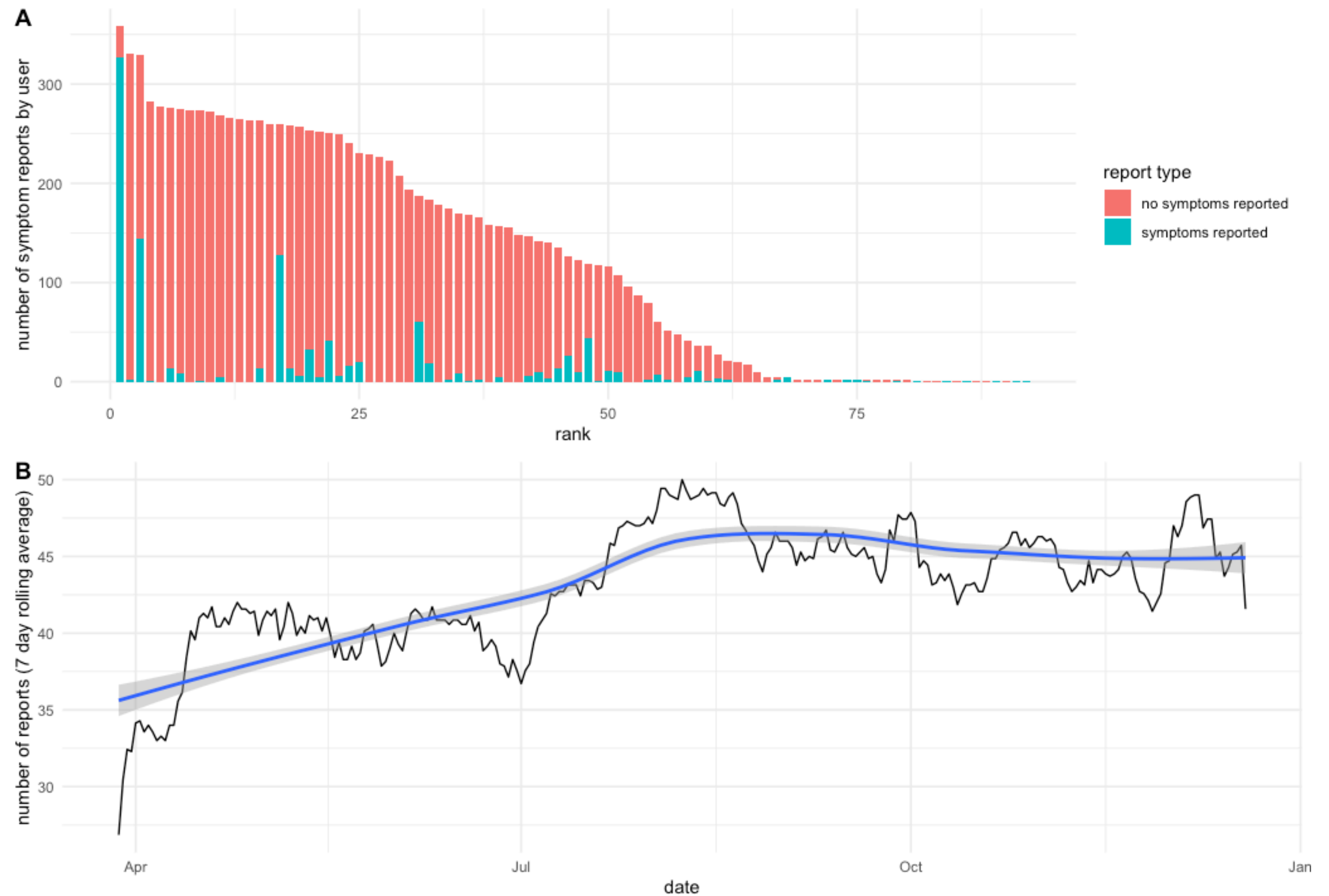
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Runny or stuffy nose	●				
Sore throat	●				
Shortness of breath	●				
Gastrointestinal					
Diarrhea	●				
Nausea or vomiting					
Systemic					
Chills and sweats					
Fatigue and malaise					
Headache					
Muscle pains and body aches					



Why co-creating?

Improving *user fit*

- in typical mHealth applications: **limited sustained use**, <2% returning users in extreme cases
- >50% of QF users use it daily for >3 months!



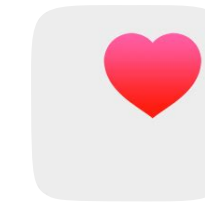
tl;dr: Quantified Flu

- **not** epidemiology, but about generating **personal insights** & learning, **try at quantifiedflu.org**
- **community**-launched and -created,
 - leads to high user fit & great continued user engagement/use
- individuals can **opt-in** to make their data **publicly available**

read more at:
<https://tinyurl.com/qf-preprint>



contributors



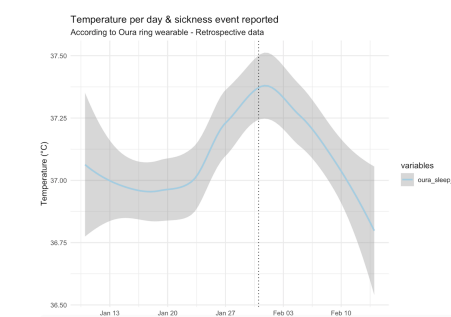
Lukasz Baldy



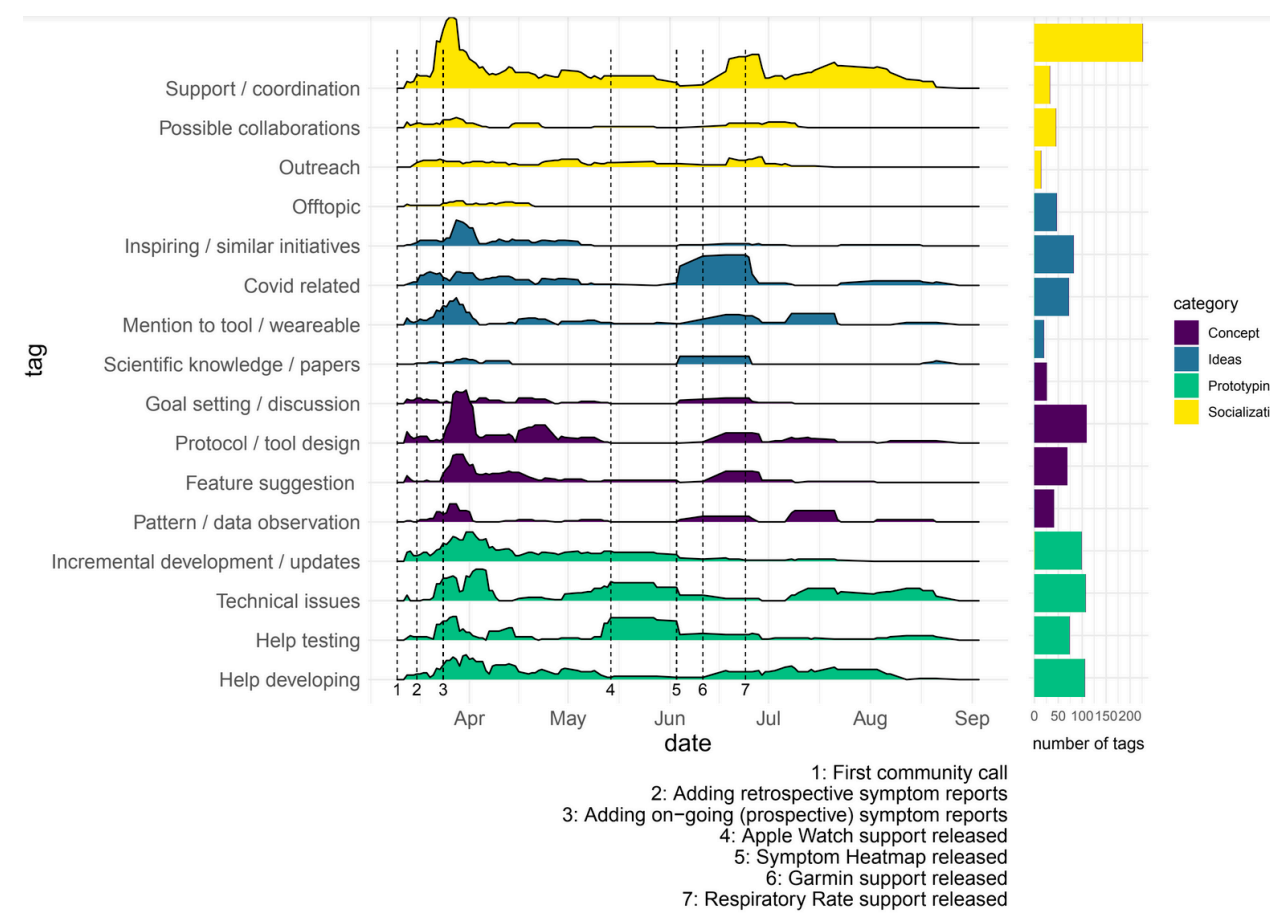
Karolina Alexiou



Konstantin Vdovkin



Ilona Bussod & Melvin Fribourg

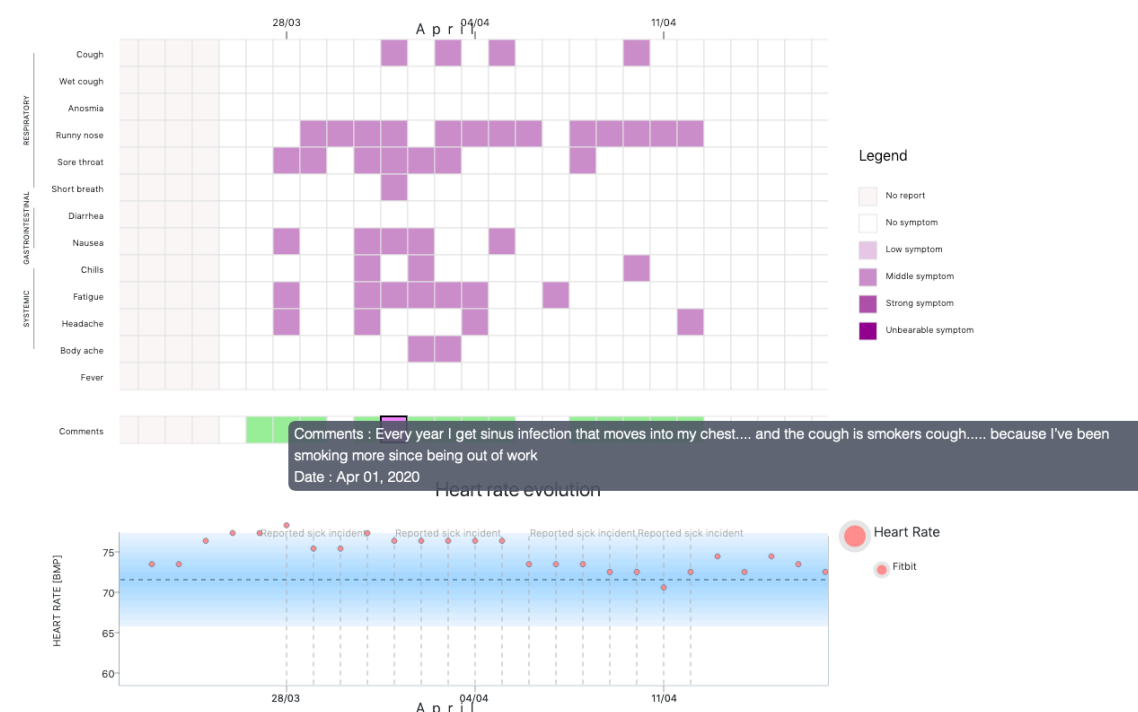


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Mad Ball
Gary Wolf
Katarzyna Wac
Enric Senabre

Basile Morane

& ~200 users!



In a similar vein: *Transbiome*

excuse the pitch!



<https://goteo.cc/transbiome>