PREDICTING COVID WITH 3 MILLION CITIZEN SCIENTISTS

COVID SYMPTOM STUDY APP

Tim Spector
@timspector

C-19 KING'S College LONDON ZOE

The COVID Symptom app: Predicting COVID-19

- 3.3 million users across the United Kingdom
- Predicts "Symptomatic COVID" via algorithm
- Can predict COVID using clusters of symptoms (as published in Nature Medicine)
- Aiding NHS and the Department of Health
- Perform real time research on risk factors

Not-for-profit initiative by health science company ZOE and King's College London

Why does itmatter?

With 3 million users we can accelerate testing, support contact tracing, expedite a safe lockdown release and will be able to detect second wave quickly by region.

Endorsed and amplified by

The Scottish Government
Riaghaltas na h-Alba

Llywodraeth Cymru
Welsh Government

British Heart Foundation

STAND UP TO CANCER™

twinsUK

GIG CYMRU NHS WALES

Royal College of Surgeons of England
ADVANCING SURGICAL CARE

American Cancer Society®

Nurses' Health Study

Royal College of Physicians

Tommy's
Together, for every baby

KING'S College LONDON

Longevity uk

JDRF IMPROVING LIVES. CURING TYPE 1 DIABETES.

DIABETES UK
KNOW DIABETES. FIGHT DIABETES.

Alzheimer's Research UK
Make breakthroughs possible

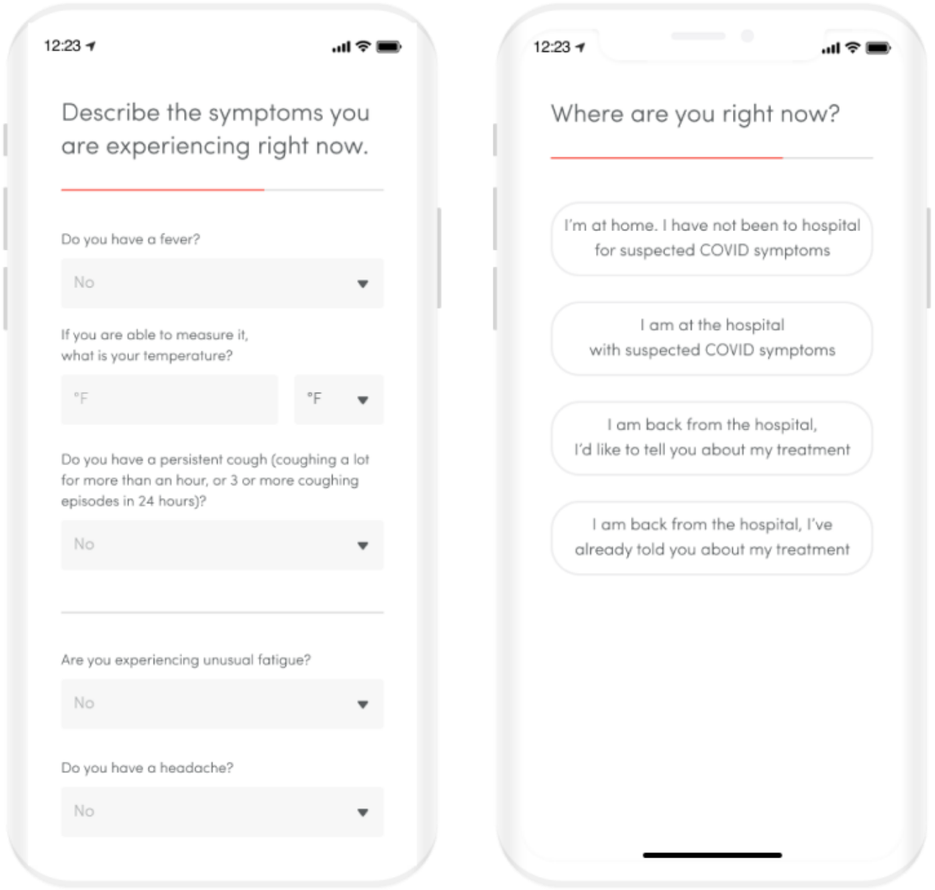
CANCER RESEARCH UK

VERSUS ARTHRITIS

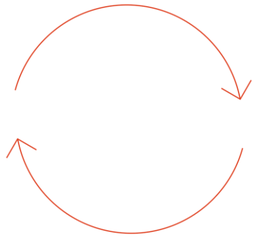
Kidney Care UK

CDRF
chronic disease research foundation

We can predict "Symptomatic COVID" using Machine Learning



Symptom clusters



Extrapolate to population

Days with symptoms

COVID Symptom Study

Model validation with testing from the Department of Health

Infectious users

Identified by the algorithm

Government testing

PCA / Swab testing at testing centres across the country

Model is tested and improved

When a user reports their results in the app, otherwise data is not shared with us

New prospective test of diagnostic algorithm planned compared to swab testing

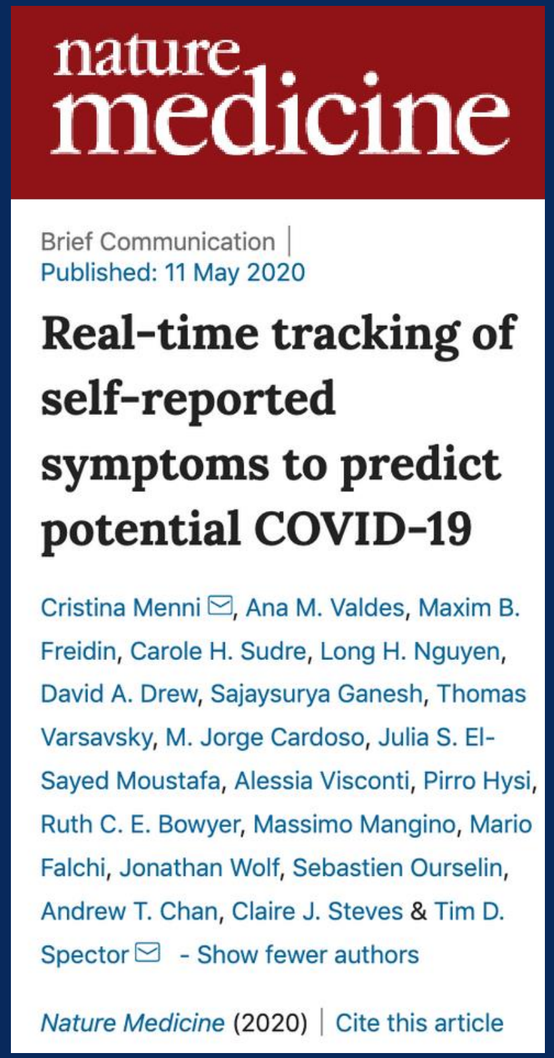
Subset of 600 Twins having antibody tests as part of BRC study

C-19

Department of Health & Social Care

KING'S College LONDON

Published scientific papers: 12+ more in pipeline



nature medicine

Brief Communication | Published: 11 May 2020

Real-time tracking of self-reported symptoms to predict potential COVID-19

Cristina Menni ✉, Ana M. Valdes, Maxim B. Freidin, Carole H. Sudre, Long H. Nguyen, David A. Drew, Sajaysurya Ganesh, Thomas Varsavsky, M. Jorge Cardoso, Julia S. El-Sayed Moustafa, Alessia Visconti, Pirro Hysi, Ruth C. E. Bowyer, Massimo Mangino, Mario Falchi, Jonathan Wolf, Sebastien Ourselin, Andrew T. Chan, Claire J. Steves & Tim D. Spector ✉ - Show fewer authors

Nature Medicine (2020) | Cite this article

Science

REPORT

Rapid implementation of mobile technology for real-time epidemiology of COVID-19

David A. Drew[1,*], Long H. Nguyen[1,*], Claire J. Steves[2,3], Cristina Menni[2], Maxim Freydin[2], Thomas Varsavsky[4], Carole H. Sudre[4], M. Jorge Cardoso[4], Sebastien Ourselin[4], Jonathan Wolf[5], Tim D. Spector[2,5,†], Andrew T. Chan[1,6,†,‡], COPE Consortium§

↵‡Corresponding author. Email: achan@mgh.harvard.edu

[1]*Clinical & Translational Epidemiology Unit, Massachusetts General Hospital and Harvard Medical School, 55 Fruit St., Boston, MA 02114, USA.*

[2]*Department of Twin Research and Genetic Epidemiology, King's College London, Westminster Bridge Road, London SE17EH, UK.*

[3]*Department of Ageing and Health, Guys and St. Thomas's NHS Foundation Trust, Lambeth Palace Road, London SE17EHIL, UK.*

[4]*School of Biomedical Engineering & Imaging Sciences, King's College London, 1 Lambeth Palace Road, London SE1 7EU, UK.*

[5]*Zoe Global Limited, 164 Westminster Bridge Road, London SE17RW, UK.*

[6]*Department of Immunology and Infectious Diseases, Harvard T.H. Chan School of Public Health, 665 Huntington Avenue, Boston, MA 02114, USA.*

↵* These authors contributed equally to this work.

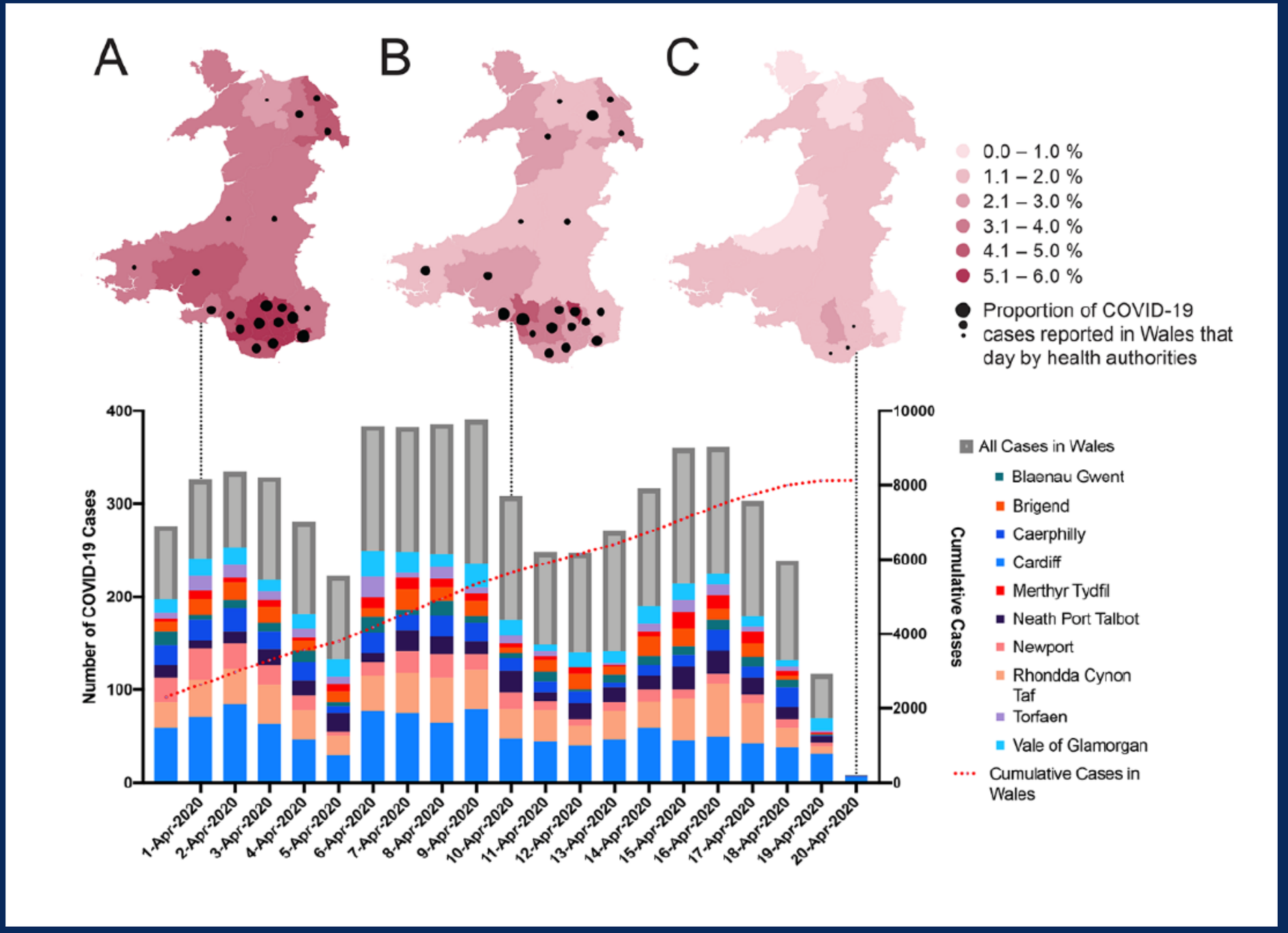
↵† These authors contributed equally to this work.

↵§ COPE Consortium members and affiliations are listed in the supplementary materials.

– Hide authors and affiliations

Science 05 May 2020:
eabc0473
DOI: 10.1126/science.abc0473

- Deprivation
- Genetics
- Obesity
- Smoking
- Health care workers
- Prediction of admissions
- HRT
- Vitamins


A
B
C
0.0 – 1.0 %
1.1 – 2.0 %
2.1 – 3.0 %
3.1 – 4.0 %
4.1 – 5.0 %
5.1 – 6.0 %
Proportion of COVID-19 cases reported in Wales that day by health authorities
Number of COVID-19 Cases
Cumulative Cases
0
100
200
300
400
2000
4000
6000
8000
10000
All Cases in Wales
Blaenau Gwent
Brigend
Caerphilly
Cardiff
Merthyr Tydfil
Neath Port Talbot
Newport
Rhondda Cynon Taf
Torfaen
Vale of Glamorgan
Cumulative Cases in Wales
1-Apr-2020
2-Apr-2020
3-Apr-2020
4-Apr-2020
5-Apr-2020
6-Apr-2020
7-Apr-2020
8-Apr-2020
9-Apr-2020
10-Apr-2020
11-Apr-2020
12-Apr-2020
13-Apr-2020
14-Apr-2020
15-Apr-2020
16-Apr-2020
17-Apr-2020
18-Apr-2020
19-Apr-2020
20-Apr-2020

Incidence rates across England over the last 14 days by region – based on DHSc swab tests

nhser19nm	reg_healthy	newly_sick	invited	tested	tested_positive	% newly sick	% invited	% tested	% tested positive	% +ve 95% lolim	% +ve 95% uplim
East of England	136305.0	11455.0	10411.0	2384.0	32.0	7.752436	90.886076	22.898857	1.342282	0.880345	1.804218
London	185214.0	14432.0	13076.0	2978.0	33.0	7.228795	90.604213	22.774549	1.108126	0.732150	1.484103
Midlands	138105.0	12009.0	10779.0	2388.0	44.0	7.999920	89.757682	22.154189	1.842546	1.303157	2.381935
North East and Yorkshire	115985.0	10301.0	9312.0	2125.0	37.0	8.156882	90.398990	22.820017	1.741176	1.185047	2.297306
North West	94747.0	8282.0	7487.0	1654.0	39.0	8.038513	90.400869	22.091625	2.357920	1.626674	3.089166
South East	233042.0	18626.0	16964.0	4329.0	51.0	7.401020	91.076989	25.518746	1.178101	0.856682	1.499521
South West	132133.0	10904.0	9899.0	2191.0	22.0	7.623202	90.783199	22.133549	1.004108	0.586637	1.421578
England	1035531.0	86009.0	77928.0	18049.0	258.0	7.668830	90.604472	23.161123	1.429442	1.256270	1.602614

Science

REPORTS

Cite as: D. A. Drew *et al.*, *Science* 10.1126/science.abc0473 (2020).

Rapid implementation of mobile technology for real-time epidemiology of COVID-19

David A. Drew[1]*, Long H. Nguyen[1]*, Claire J. Steves[2,3], Cristina Menni[2], Maxim Freydin[2], Thomas Varsavsky[4], Carole H. Sudre[4], M. Jorge Cardoso[4], Sebastien Ourselin[4], Jonathan Wolf[5], Tim D. Spector[2,5]†, Andrew T. Chan[1,6]†‡, COPE Consortium§

nature medicine

BRIEF COMMUNICATION

https://doi.org/10.1038/s41591-020-0916-2

Check for updates

Real-time tracking of self-reported symptoms to predict potential COVID-19

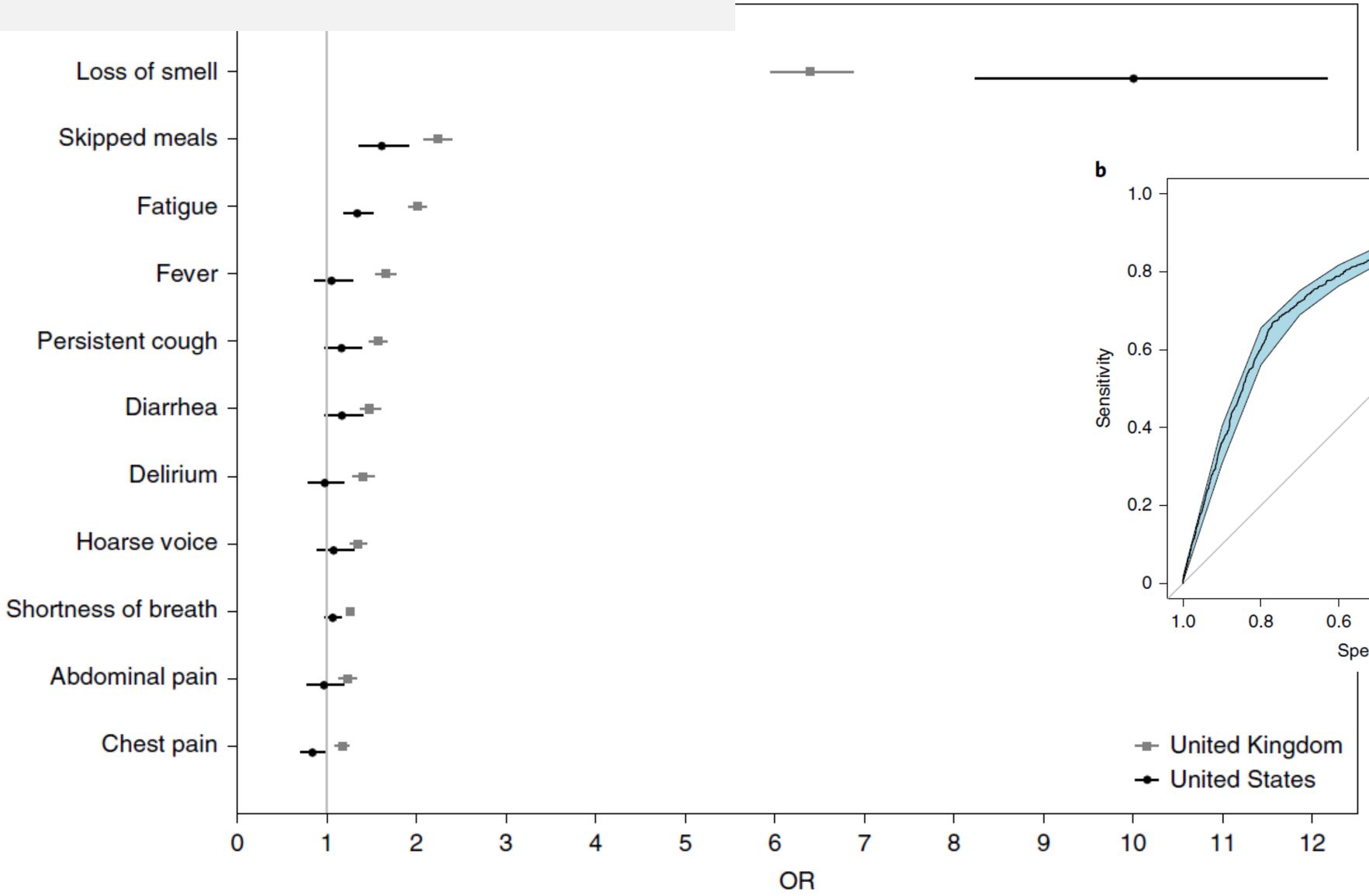
Cristina Menni[1,7]✉, Ana M. Valdes[1,2,7], Maxim B. Freidin[1], Carole H. Sudre[3], Long H. Nguyen[4], David A. Drew[4], Sajaysurya Ganesh[5], Thomas Varsavsky[3], M. Jorge Cardoso[3], Julia S. El-Sayed Moustafa[1], Alessia Visconti[1], Pirro Hysi[1], Ruth C. E. Bowyer[1], Massimo Mangino[1,6], Mario Falchi[1], Jonathan Wolf[5], Sebastien Ourselin[3], Andrew T. Chan[4], Claire J. Steves[1,8]

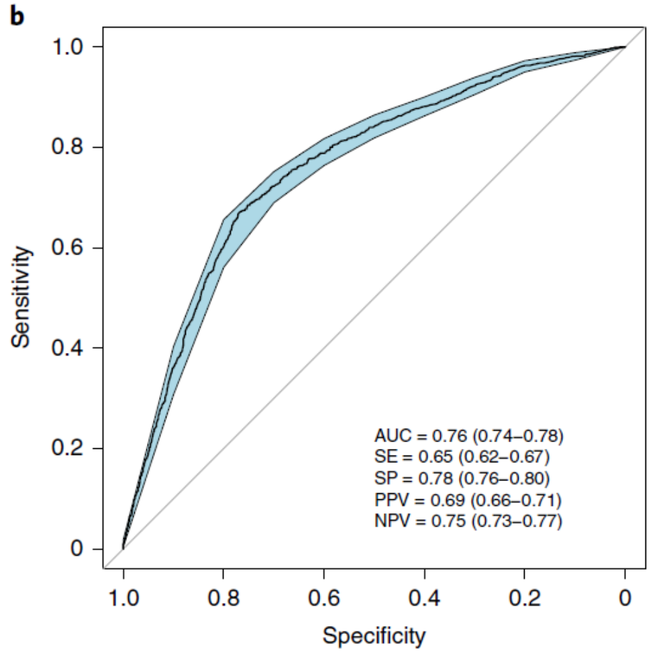
NATURE MEDICINE

BRIEF COMMUNICATION

Menni C et al Nat Med May 11 2020

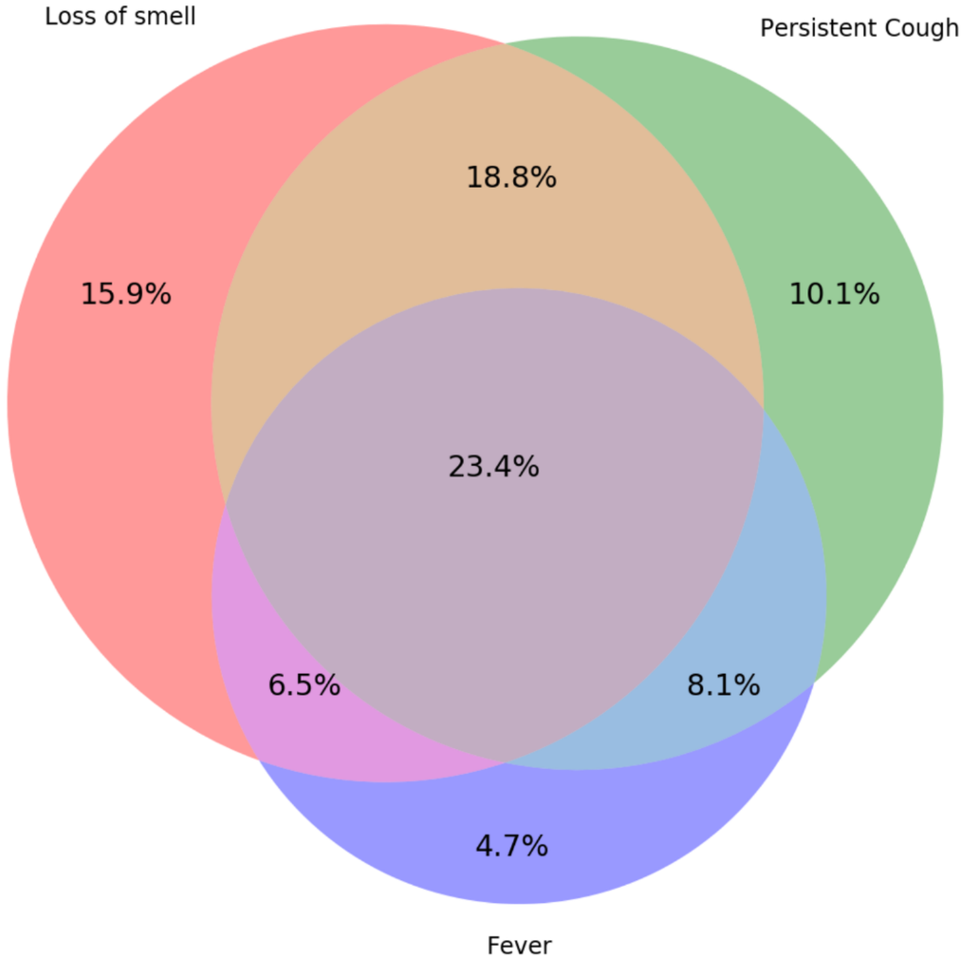
Symptoms predictive of a positive Covid-19 PCR test in 2.816 Million respondents in UK and USA



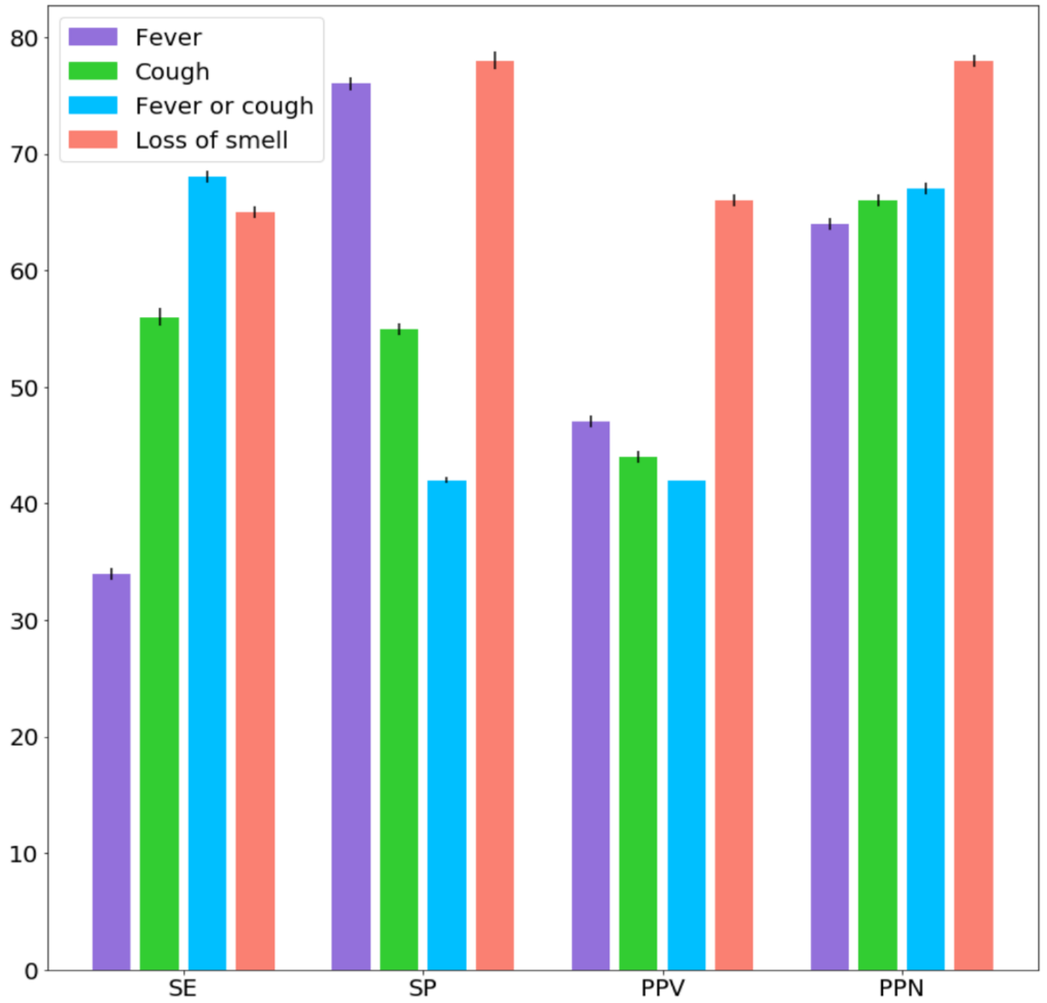


IS sense of smell important ?

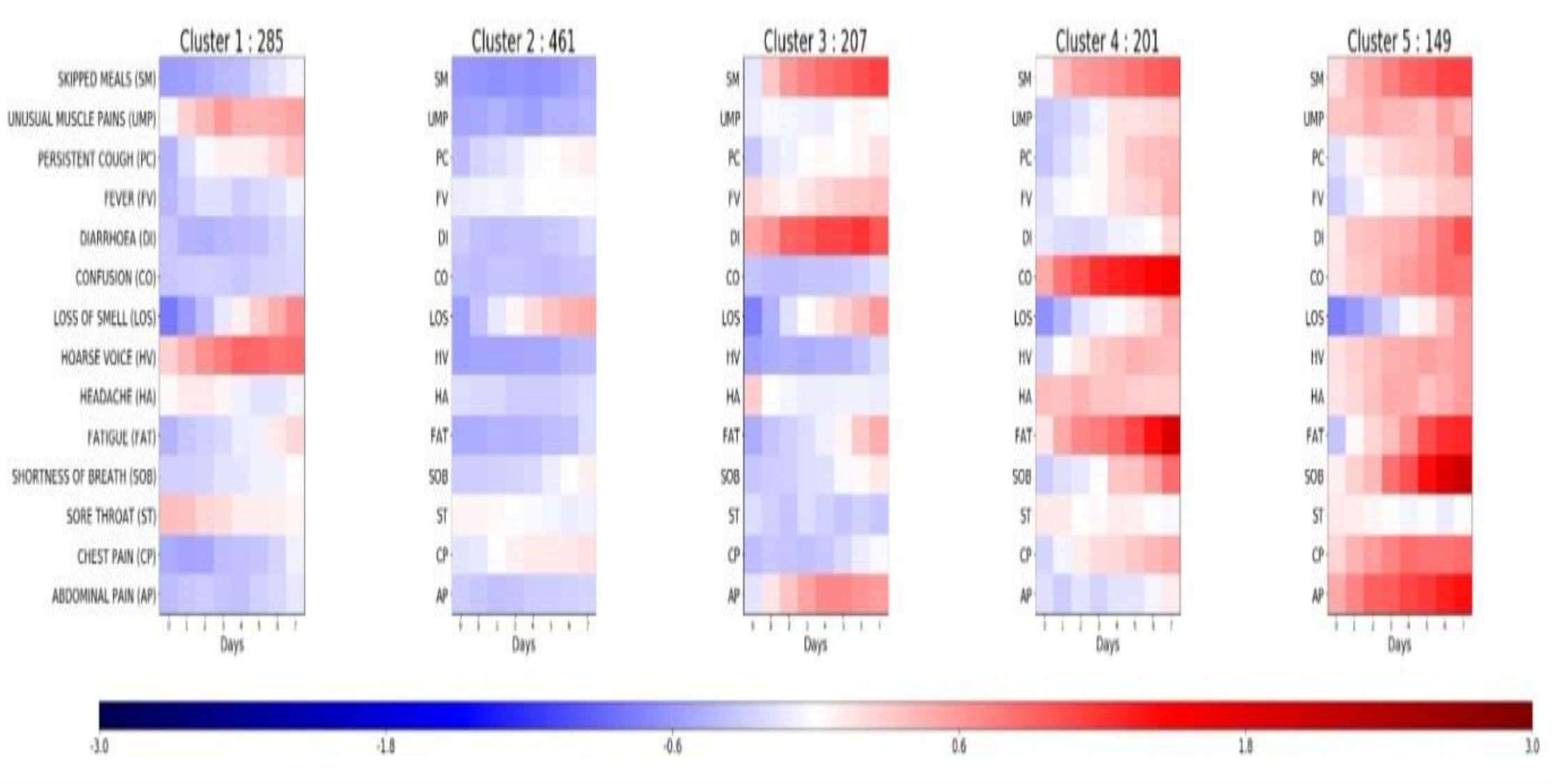
a)



b)



COVID subtypes – 5 clusters of increasing respirtory severity



Symptom duration on 2000 swab positives on whom we had daily data for 40 days