

Global health research challenges – and opportunities

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Climate change, nutrition and health: global challenges and potential solutions

6 May 2021



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3 research challenges

-
- Representation
 - Transportability
 - Speed
-

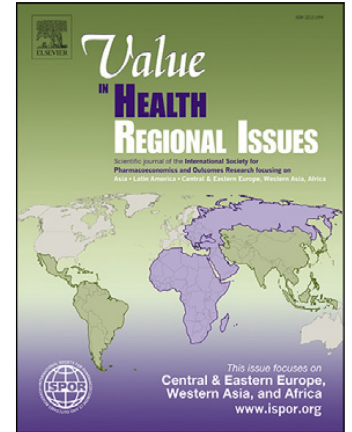


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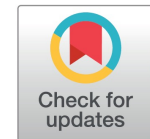


Preference-Based Assessments

The Value of a Statistical Life-Year in Sub-Saharan Africa: Evidence From a Large Population-Based Survey in Tanzania









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RESEARCH ARTICLE

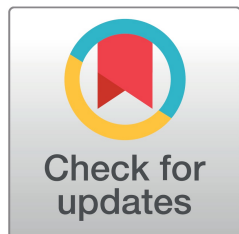
Community health workers to improve uptake of maternal healthcare services: A cluster-randomized pragmatic trial in Dar es Salaam, Tanzania

Pascal Geldsetzer¹, Eric Mboggo^{2*}, Elysia Larson³, Irene Andrew Lema², Lucy Magesa², Lameck Machumi², Nzovu Ulenga², David Sando¹, Mary Mwanyika-Sando⁴, Donna Spiegelman^{1,5,6,7}, Ester Mungure¹, Nan Li¹, Hellen Siril², Phares Mujinja⁸, Helga Naburi^{9,10}, Guerino Chalamilla^{2†}, Charles Kilewo¹¹, Anna Mia Ekström^{9,12}, Dawn Foster^{13,14}, Wafaie Fawzi^{1,5,6}, Till Bärnighausen^{1,15,16}

RESEARCH ARTICLE

Direct provision versus facility collection of HIV self-tests among female sex workers in Uganda: A cluster-randomized controlled health systems trial

Katrina Ortblad^{1*}, Daniel Kibuuka Musoke², Thomson Ngabirano³, Aidah Nakitende², Jonathan Magoola³, Prossy Kayiira³, Geoffrey Taasi⁴, Leah G. Barresi⁵, Jessica E. Haberer⁶, Margaret A. McConnell¹, Catherine E. Oldenburg^{7,8,9}, Till Bärnighausen^{1,10,11}



1 Department of Global Health and Population, Harvard T.H. Chan School of Public Health, Boston, Massachusetts, United States of America, **2** International Research Consortium, Kampala, Uganda, **3** Uganda Health Marketing Group, Kampala, Uganda, **4** Ugandan Ministry of Health, Kampala, Uganda, **5** Department of Epidemiology, Harvard T.H. Chan School of Public Health, Boston, Massachusetts, United States of America, **6** Department of General Internal Medicine, Massachusetts General Hospital, Boston, Massachusetts, United States of America, **7** Francis I. Proctor Foundation, University of California, San Francisco, San Francisco, California, United States of America, **8** Department of Ophthalmology, University of California, San Francisco, San Francisco, California, United States of America, **9** Department of Epidemiology & Biostatistics, University of California, San Francisco, San Francisco, California, United States of America, **10** Africa Health Research Institute, KwaZulu-Natal, South Africa, **11** Heidelberg Institute of Public Health, University of Heidelberg, Heidelberg, Germany

HIV

A stepped-wedge randomized trial and qualitative survey of HIV pre-exposure prophylaxis uptake in the Eswatini population

Pascal Geldsetzer^{1,2*}, Kate Bärnighausen^{2,3}, Anita Hettema⁴, Shannon A. McMahon^{2,5}, Shona Dalal⁶, Rachel P. Chase², Catherine E. Oldenburg^{7,8,9}, Stefan Kohler², Simiao Chen², Phiwayinkhosi Dlamini⁴, Mxolisi Mavuso⁴, Allison B. Hughey⁴, Sindy Matse¹⁰, Till Bärnighausen^{2,11,12*}

Clinical trials have shown that antiretroviral drugs used as pre-exposure prophylaxis (PrEP) are highly effective for preventing HIV acquisition. PrEP efforts, including in sub-Saharan Africa, have almost exclusively focused on certain priority groups, particularly female sex workers, men having sex with men, pregnant women, sero-discordant couples, and young women. As part of a PrEP demonstration project involving the general population at six primary health care facilities in Eswatini (formerly Swaziland), we conducted a randomized trial of a health care facility-based PrEP promotion package designed to increase PrEP uptake. Over the 18-month study duration, 33.6% (517 of 1538) of adults identified by health care workers as being at risk of acquiring HIV took up PrEP, and 30.0% of these individuals attended all scheduled appointments during the first 6 months after initiation of PrEP. The PrEP promotion package was associated with a 55% (95% confidence interval, 15 to 110%; $P = 0.036$) relative increase in the number of individuals taking up PrEP, with an absolute increase of 2.2 individuals per month per health care facility. When asked how PrEP uptake could be improved in 217 accompanying in-depth qualitative interviews, interviewees recommended an expansion of PrEP promotion activities beyond health care facilities to communities. Although a health care facility-based promotion package improved PrEP uptake, both uptake and retention remained low. Expanding promotion activities to the community is needed to achieve greater PrEP coverage among adults at risk of HIV infection in Eswatini and similar settings.

3 research challenges

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-

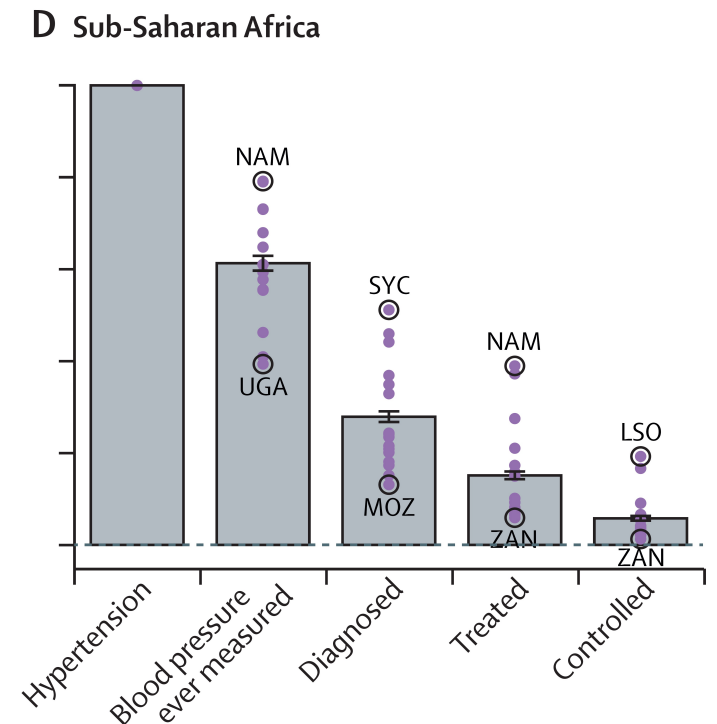
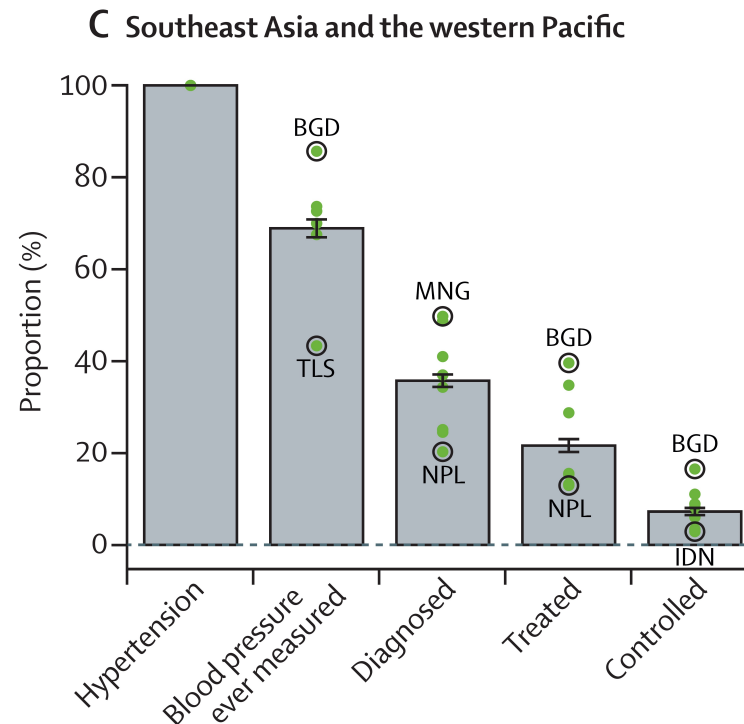
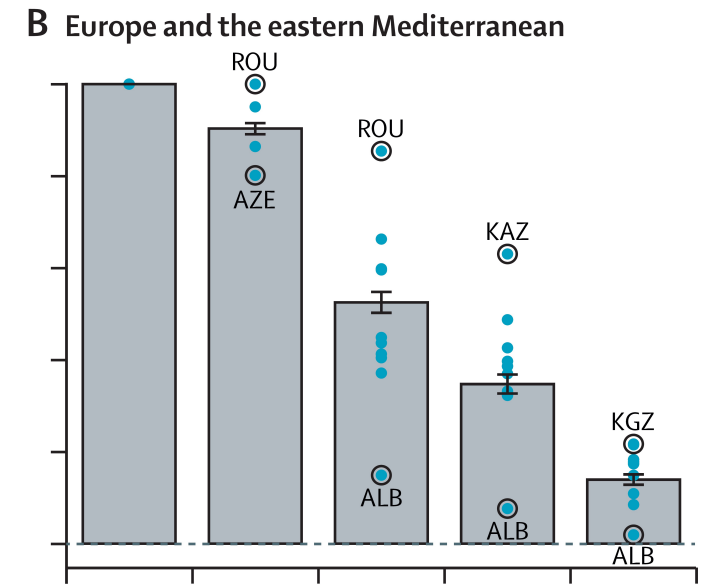
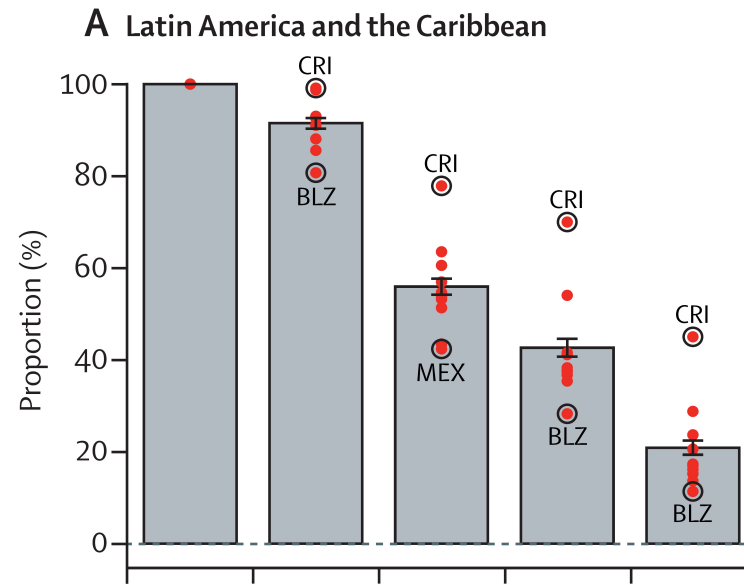
What does the hypertension care cascade look like around the globe?

CONDITIONAL PROBABILITIES

$N = 1,100,507$ adults
44 nationally representative population surveys in low- and middle-income countries

Geldsetzer et al. *Lancet* 2019

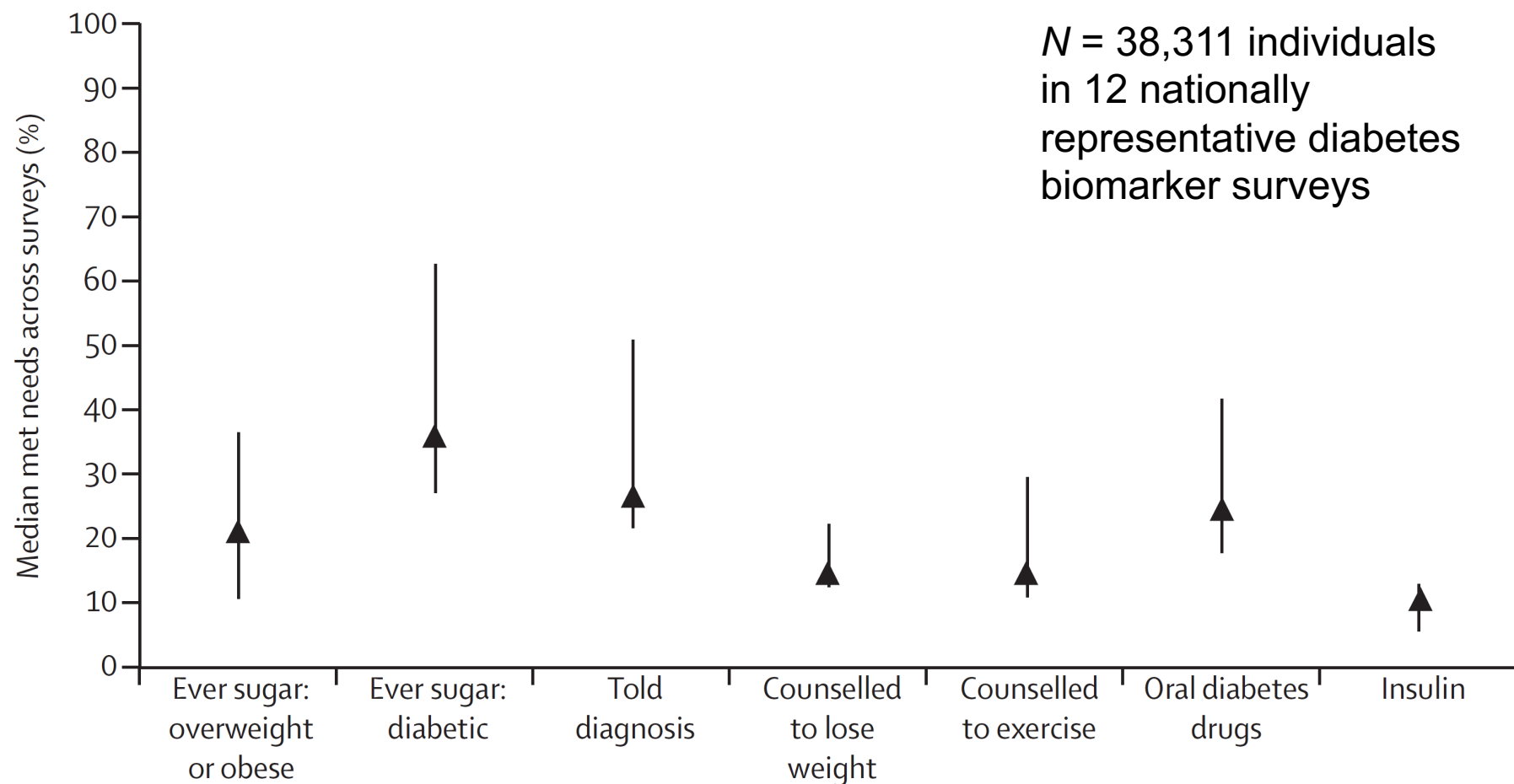
THE LANCET



For diabetes, losses are large across all cascade stages

NATIONALLY
REPRESENTATIVE
POPULATION-BASED
BIOMARKER
SURVEYS

THE LANCET
Diabetes & Endocrinology



Manne-Goehler, Atun, Stokes, Goehler, Houinato, Houehanou, Hambou, Mbenza, Sobnqwi, Balde, Mwangi, Gathecha, Ngugi, Wesseh, Damasceno, Lunet, Bovet, Labadarios, Zuma, Mayige, Kagaruki, Ramaiya, Agoudavi, Guwatudde, Bahendeka, Mutungi, Geldsetzer, Levitt, Salomon, Yudkin, Vollmer, Bärnighausen

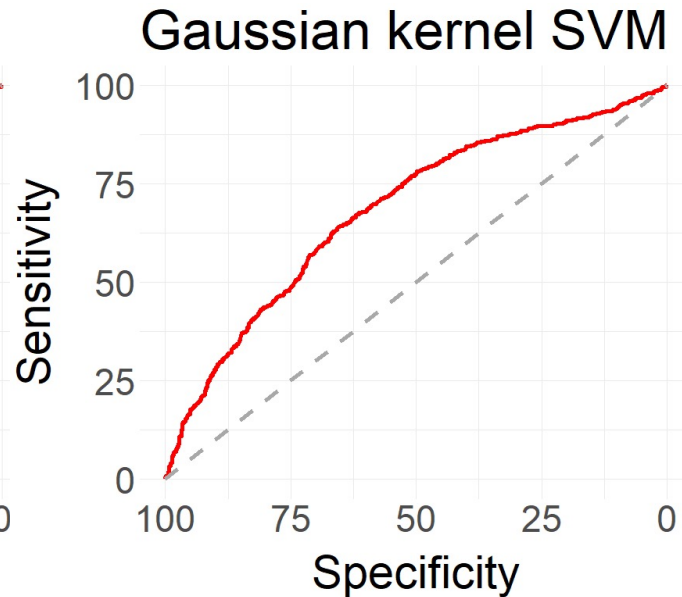
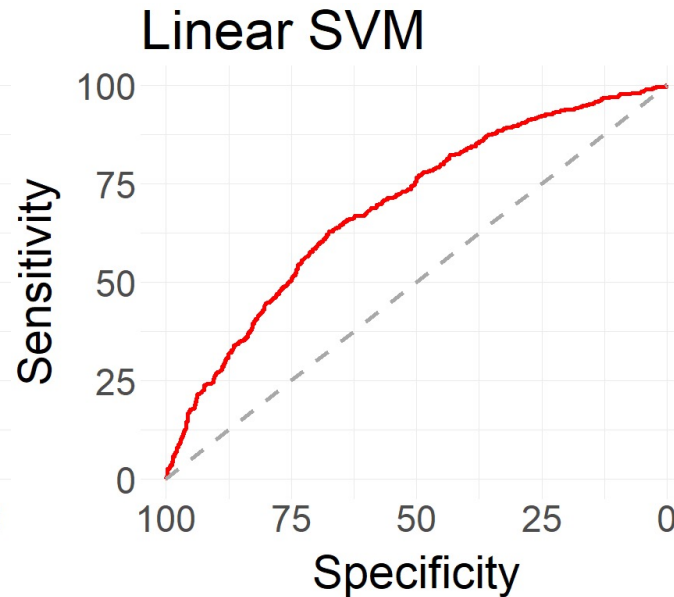
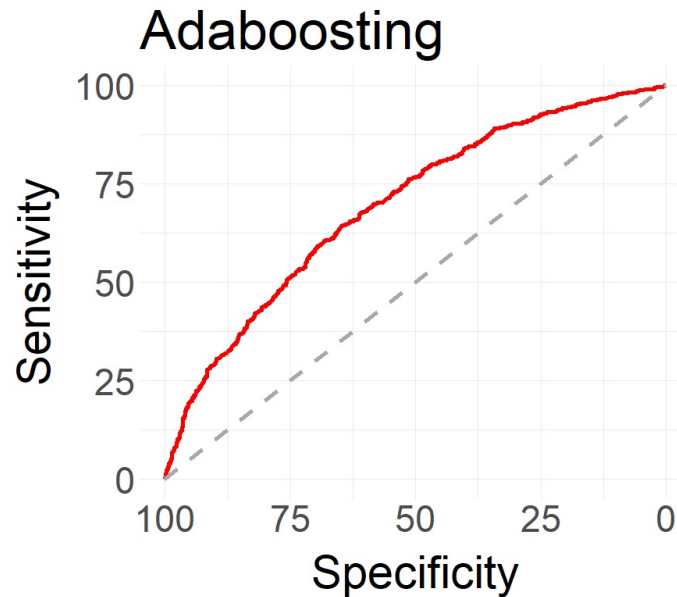
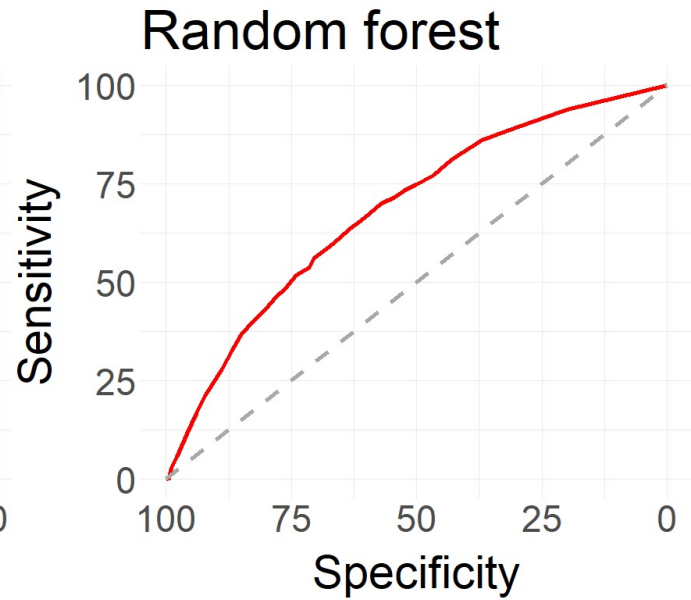
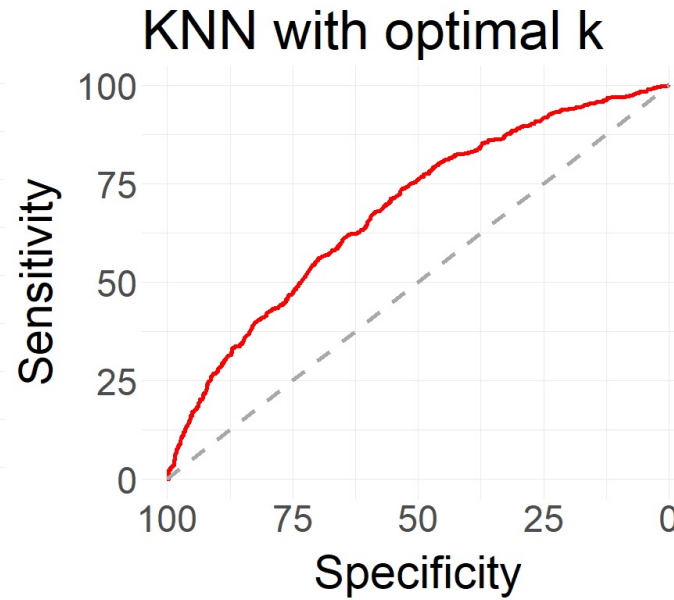
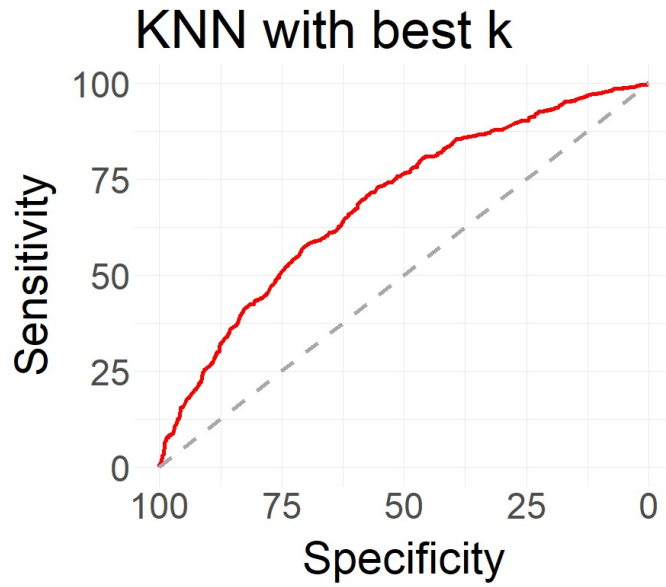
Lancet Diabetes & Endocrinology 2017

Who suffers from hyper-tension?

TESTING – ROC

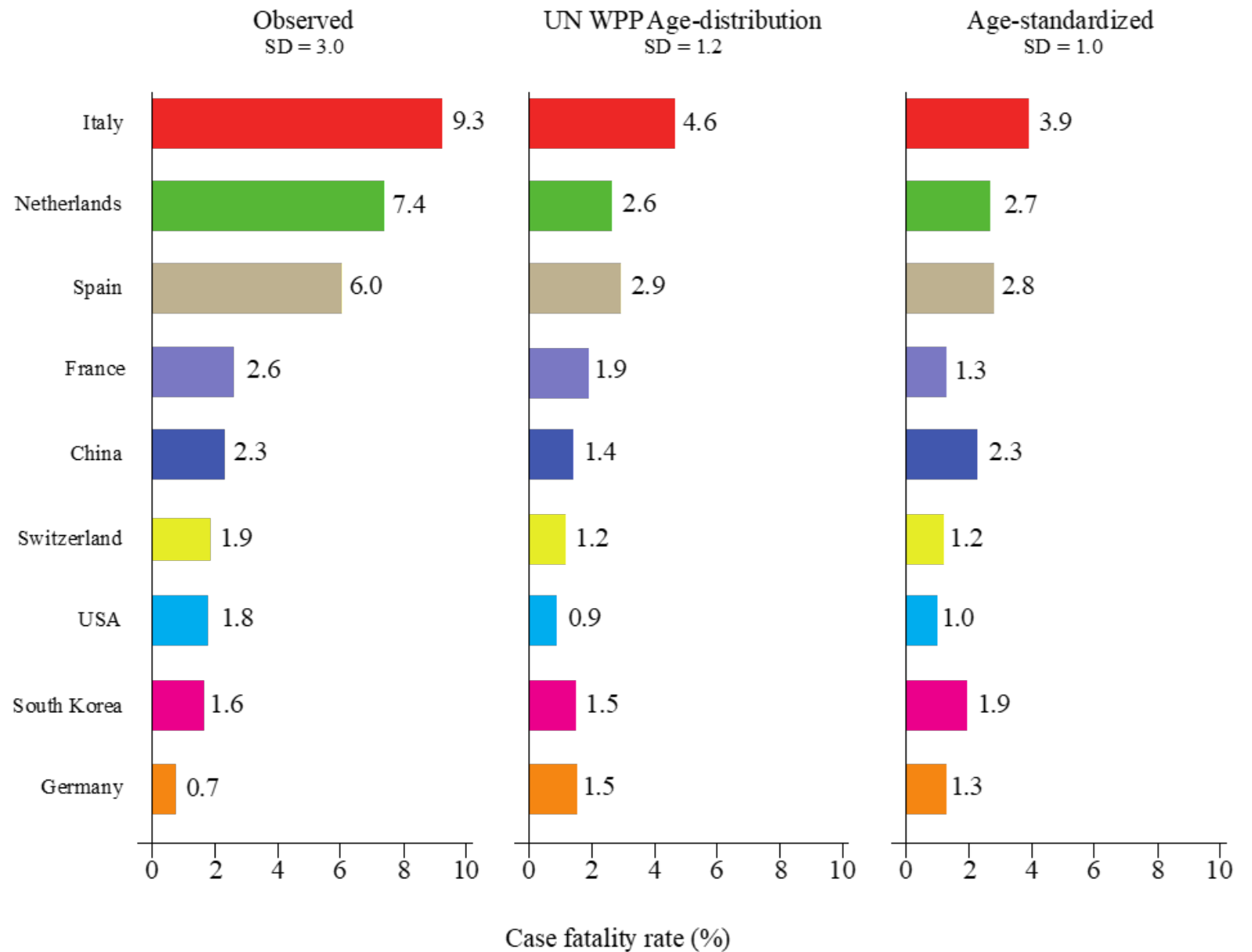
$N = 871,231$
adults in 76
countries

Nationally
representative
surveys



Age differences explain part of the COVID-19 mortality gradient

CASE-FATALITY RATE
WITH AGE ADJUSTMENT
AND STANDARDIZATION



OPEN

Climate and the spread of COVID-19

Simiao Chen^{1,2,12}, Klaus Prettnner^{3,4,12}, Michael Kuhn^{4,5}, Pascal Geldsetzer^{1,6},
Chen Wang^{2,7,8,9}✉, Till Bärnighausen^{1,2,10,13} & David E. Bloom^{11,13}✉

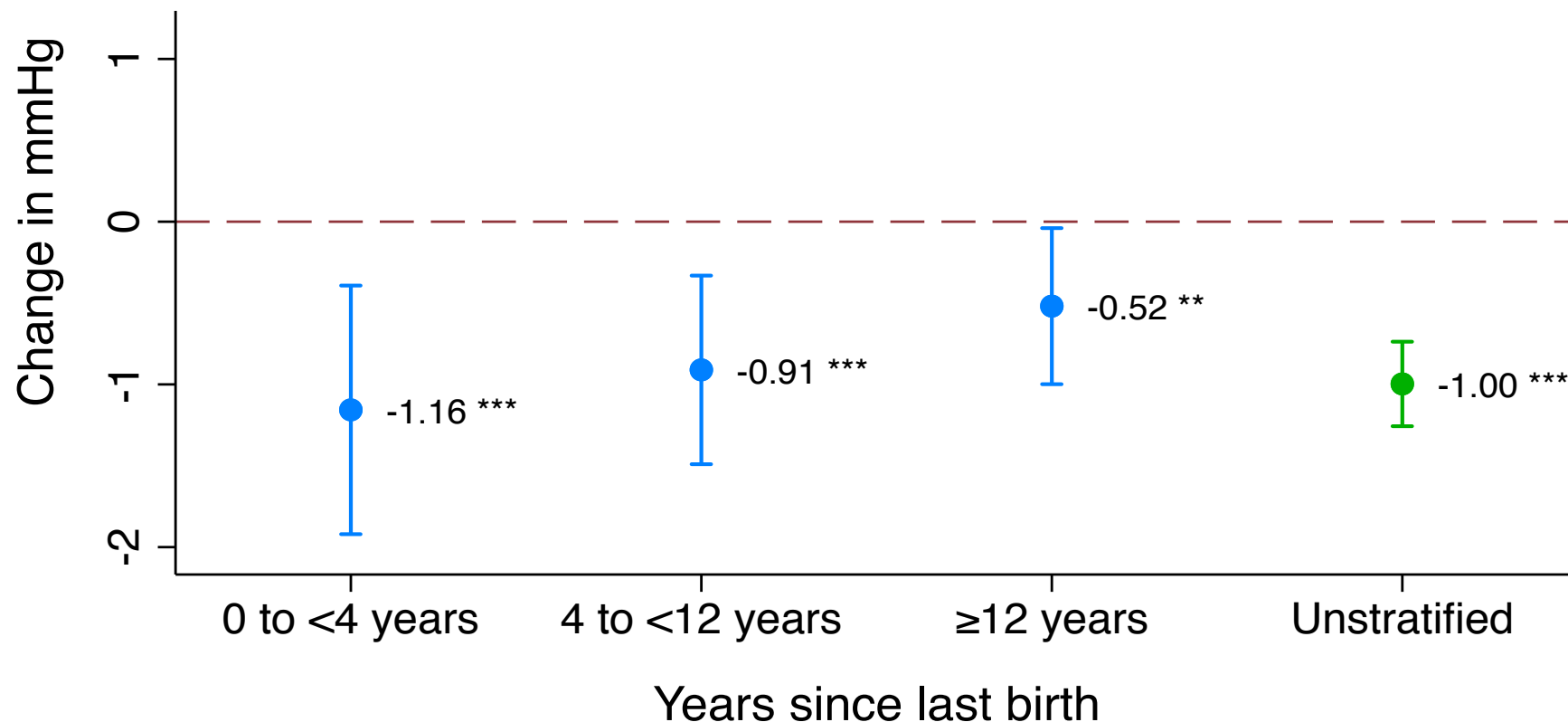
Visual inspection of world maps shows that coronavirus disease 2019 (COVID-19) is less prevalent in countries closer to the equator, where heat and humidity tend to be higher. Scientists disagree how to interpret this observation because the relationship between COVID-19 and climatic conditions may be confounded by many factors. We regress the logarithm of confirmed COVID-19 cases per million inhabitants in a country against the country's distance from the equator, controlling for key confounding factors: air travel, vehicle concentration, urbanization, COVID-19 testing intensity, cell phone usage, income, old-age dependency ratio, and health expenditure. A one-degree increase in absolute latitude is associated with a 4.3% increase in cases per million inhabitants as of January 9, 2021 (p value < 0.001). Our results imply that a country, which is located 1000 km closer to the equator, could expect 33% fewer cases per million inhabitants. Since the change in Earth's angle towards the sun between equinox and solstice is about 23.5°, one could expect a difference in cases per million inhabitants of 64% between two hypothetical countries whose climates differ to a similar extent as two adjacent seasons. According to our results, countries are expected to see a decline in new COVID-19 cases during summer and a resurgence during winter. However, our results do not imply that the disease will vanish during summer or will not affect countries close to the equator. Rather, the higher temperatures and more intense UV radiation in summer are likely to support public health measures to contain SARS-CoV-2.

3 research challenges

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What is the impact of child bearing and rearing on maternal blood pressure?

NATIONALLY REPRESENTATIVE INSTRUMENTAL VARIABLE ANALYSIS AMONG 444,611 MOTHERS IN INDIA



Teufel, Geldsetzer,
Sudharsanan,
Subramanyam,
Yapa, De Neve,
Vollmer,
Bärnighausen
(submitted) 2020

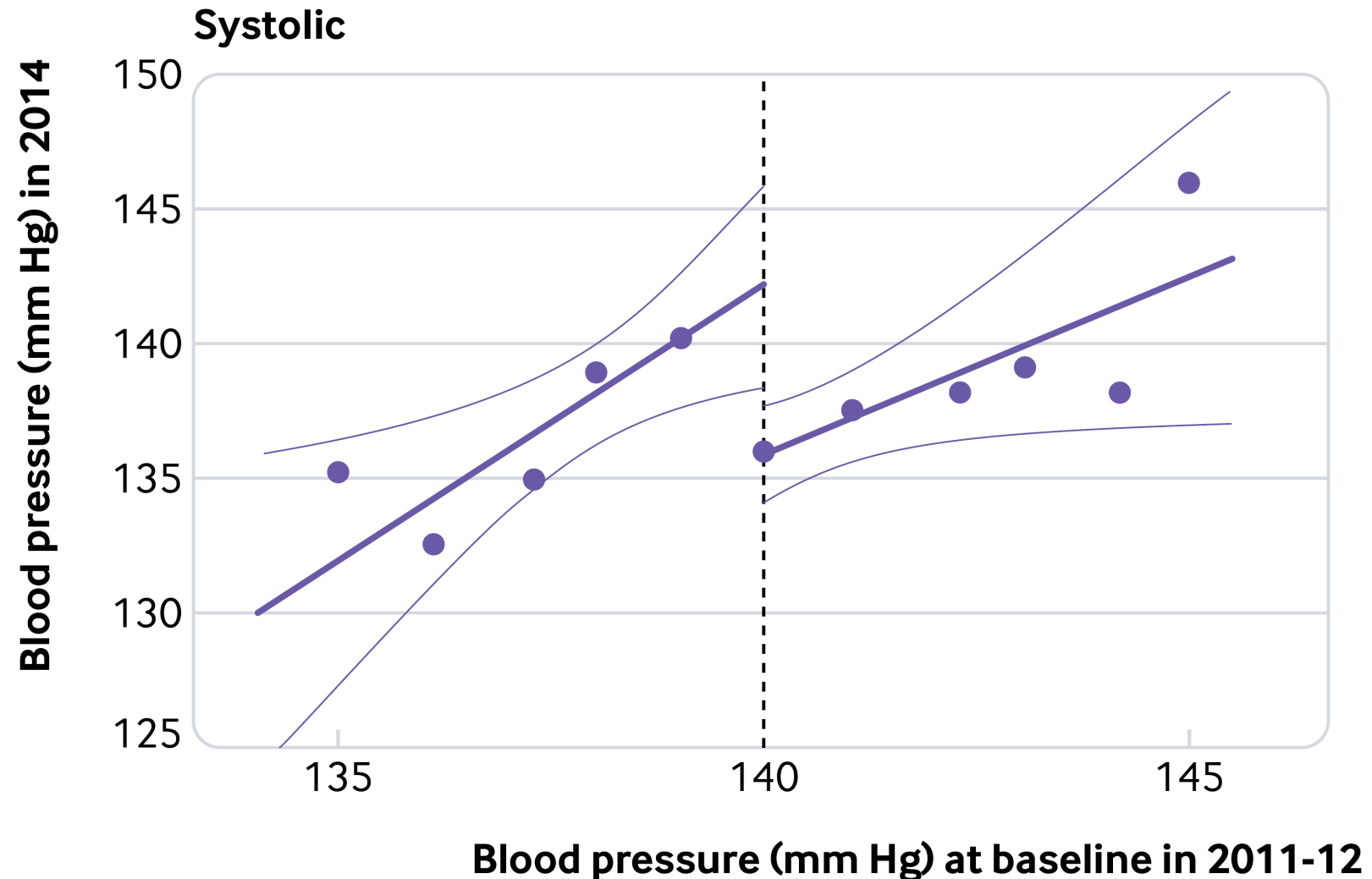
Do lay health workers who screen blood pressure in homes reduce blood pressure in China?

PROSPECTIVE RDD, 2012-2014

Nationally representative sample of 3,899 very elderly adults (≥ 60 y/a) who had previously undiagnosed hypertension

Chen, Sudharasan, Liu, Feng,
Geldsetzer, Bärnighausen *BMJ* 2019

BMJ



3 research challenges

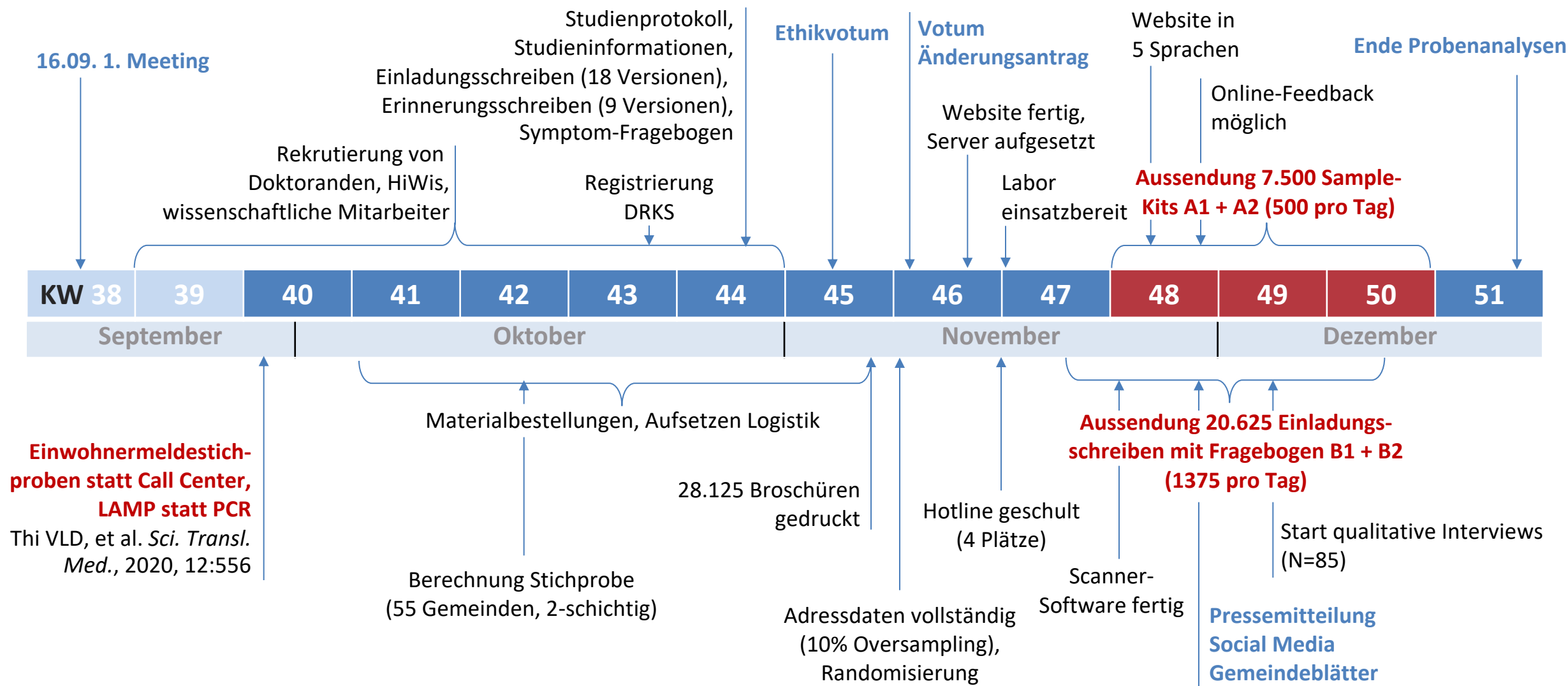
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- Representation
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Science can be fast

TIMELINE VIRUSFINDER STUDY

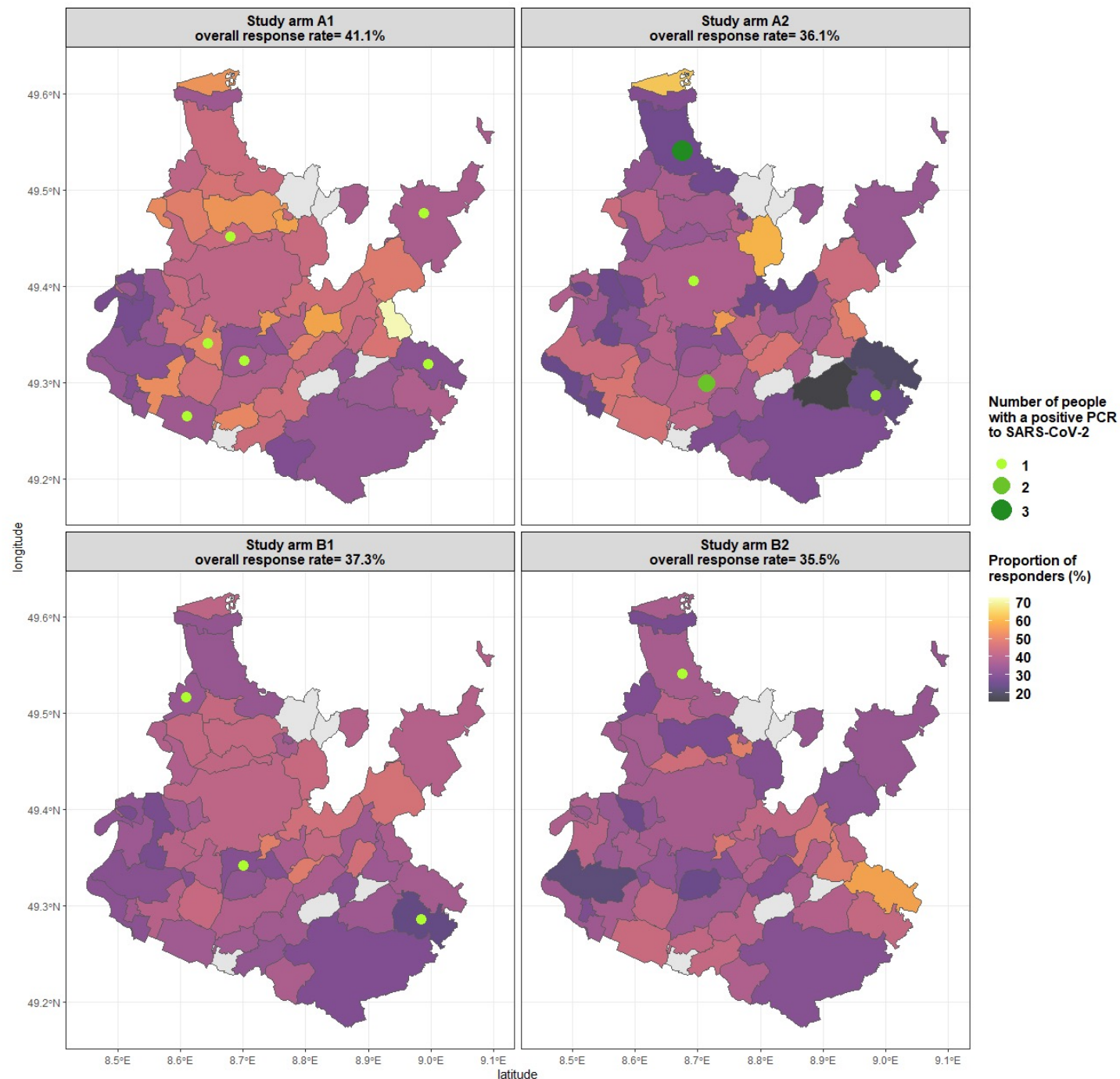
B-FAST

bundesweites forschungsnetz
angewandte surveillance und testung



Public health participation is low, but engagement form matters

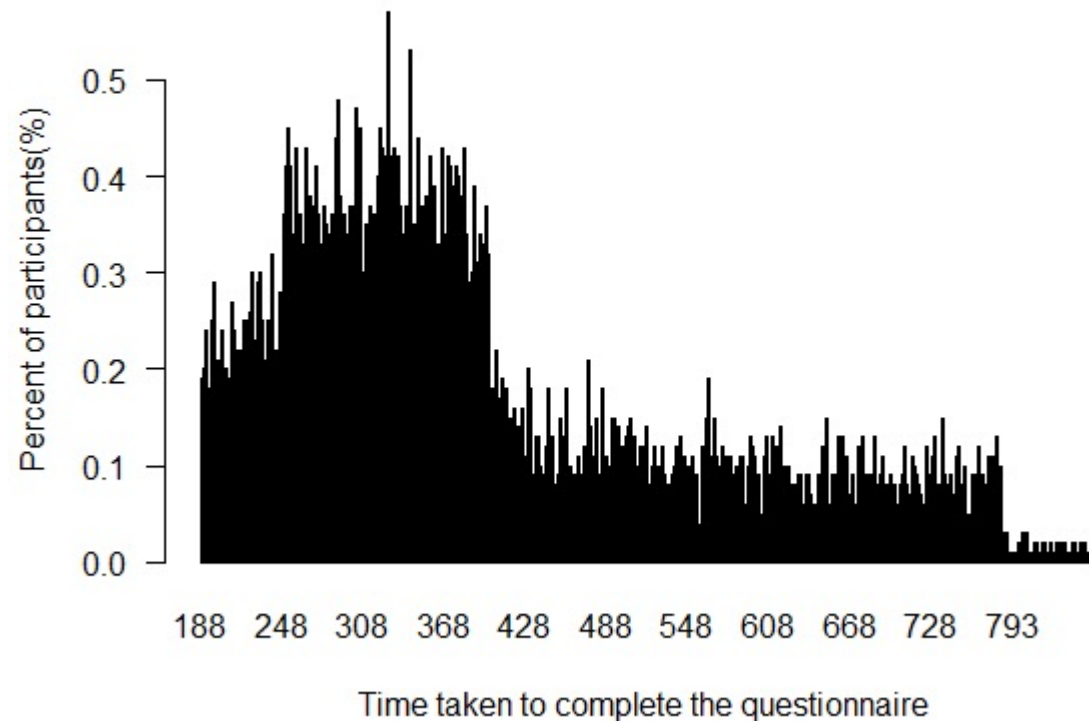
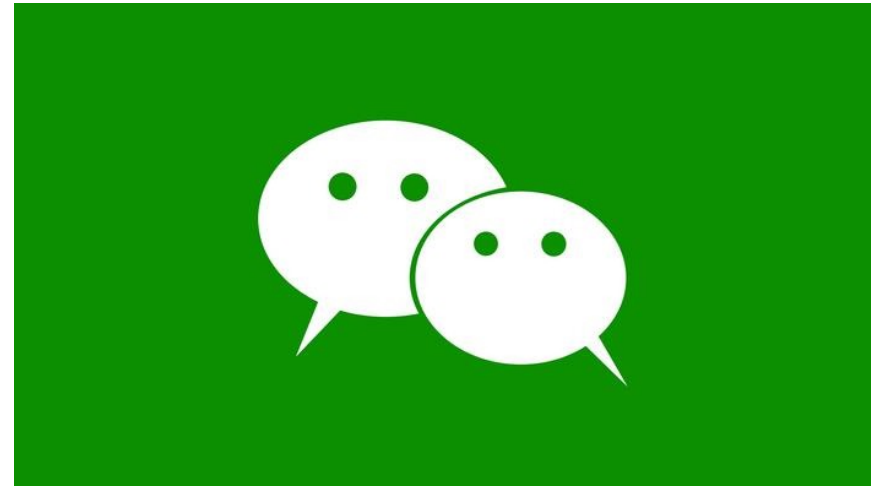
VIRUSFINDER STUDY, FIRST RESULTS



We asked WeChat users to respond to a short COVID-19 survey

POPULATION- RERPRESENTATIVE ONLINE SURVEY

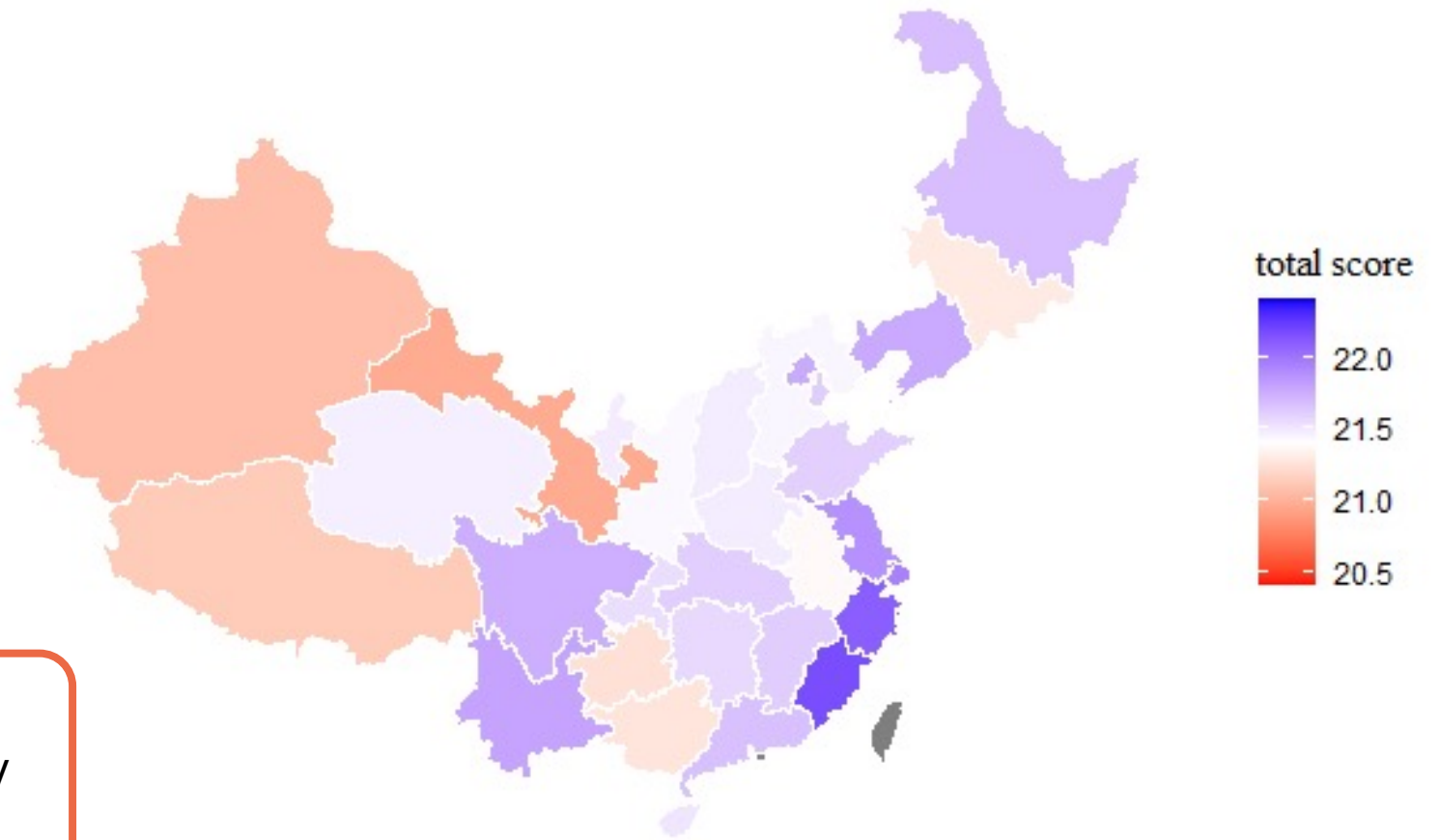
- **Sample size:** 10,000 adults
- **Design:** cross-sectional online survey administered by KuRun Data
- **Funders:** Alexander von Humboldt Foundation and PUMC/CAMS



COVID-19 misconceptions differ widely across Chinese provinces

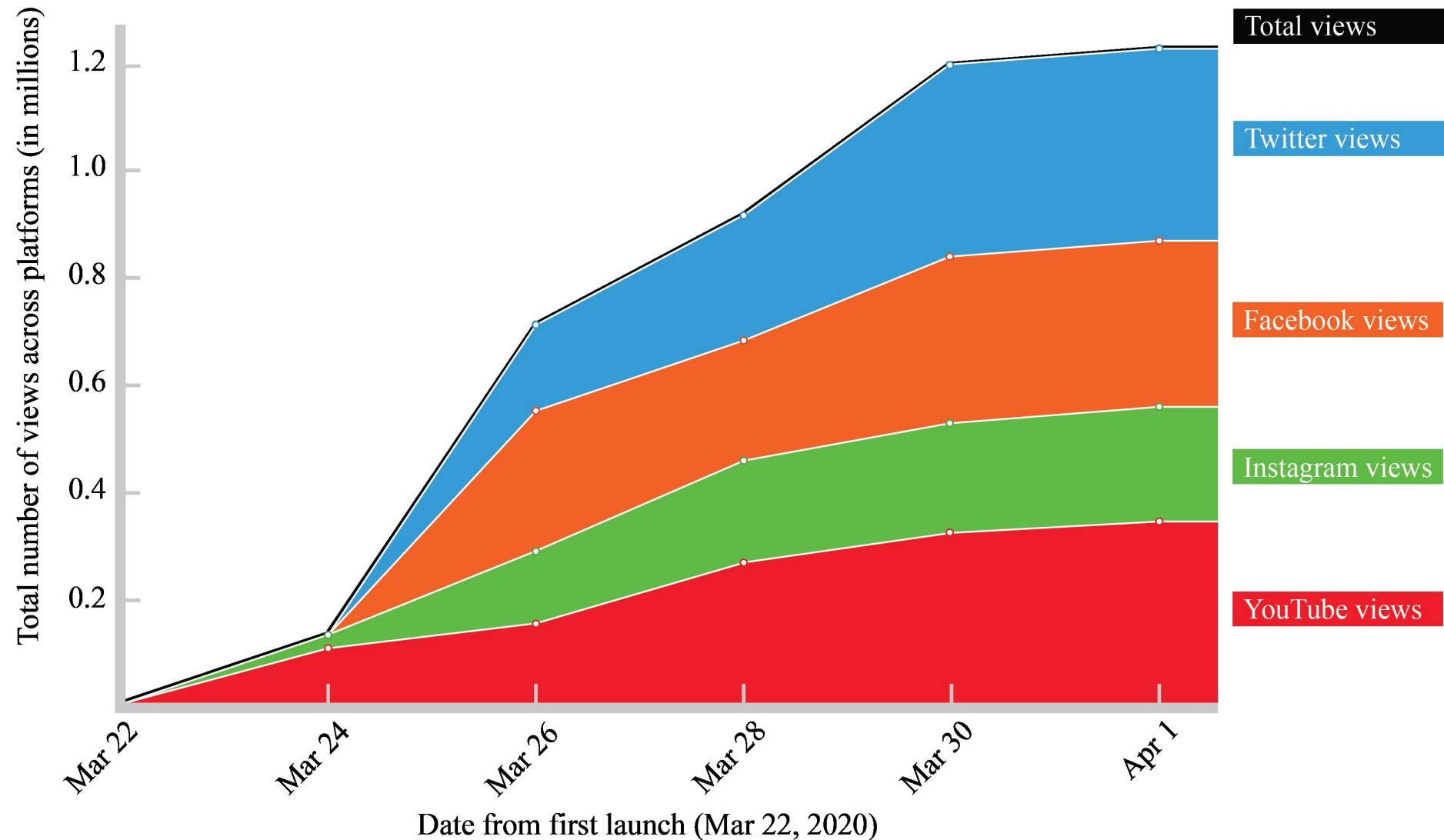
POPULATION-
REPRESENTATIVE ONLINE
SURVEY

- **Sample size:** 10,000 adults
- **Design:** cross-sectional online survey administered by KuRun Data
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How can we quickly reach many?

COVID VIDEO VIEWS

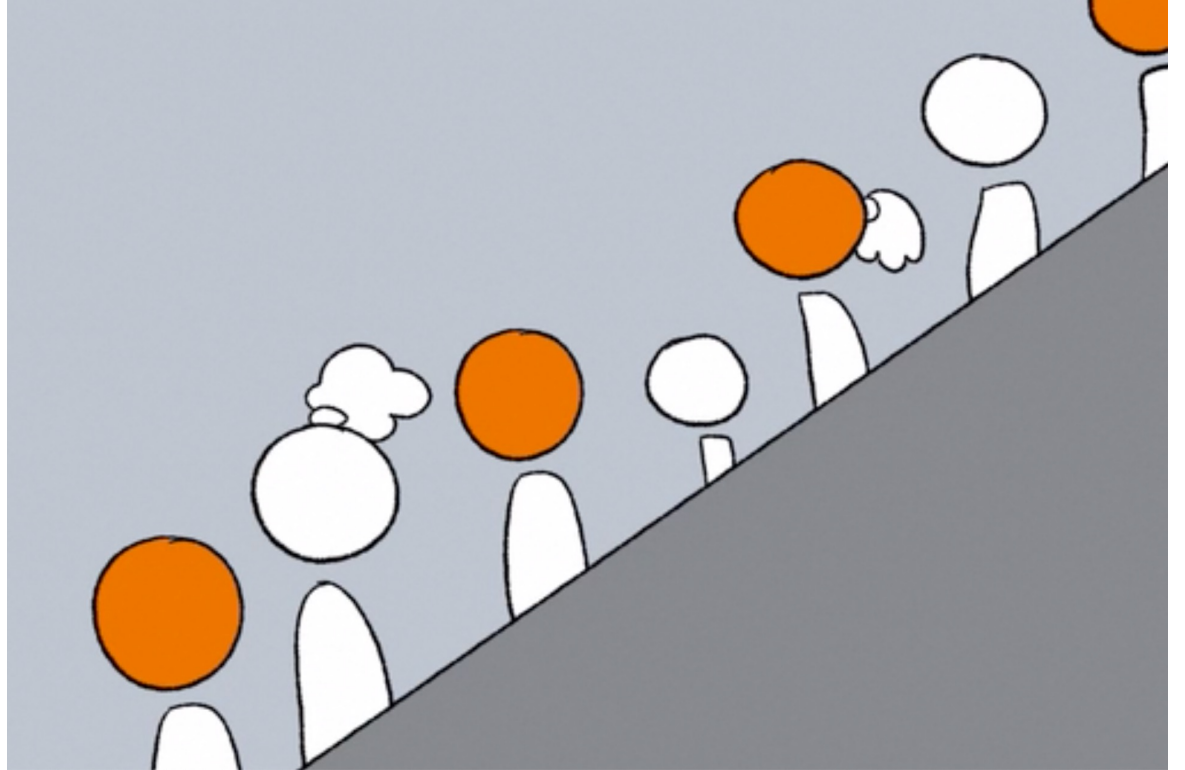


What is the effectiveness of a COVID-19 E-E video?

COVIDEO RANDOMIZED CONTROLLED TRIAL

$N = 14,477$ adults in USA, Germany, UK, France, Spain and Mexico

- **Randomized to 3 arms**
 1. CoVideo
 2. Attention placebo control
 3. Pure control
- **Primary endpoints**
 1. COVID-19 knowledge
 2. COVID-19 behavioral intentions

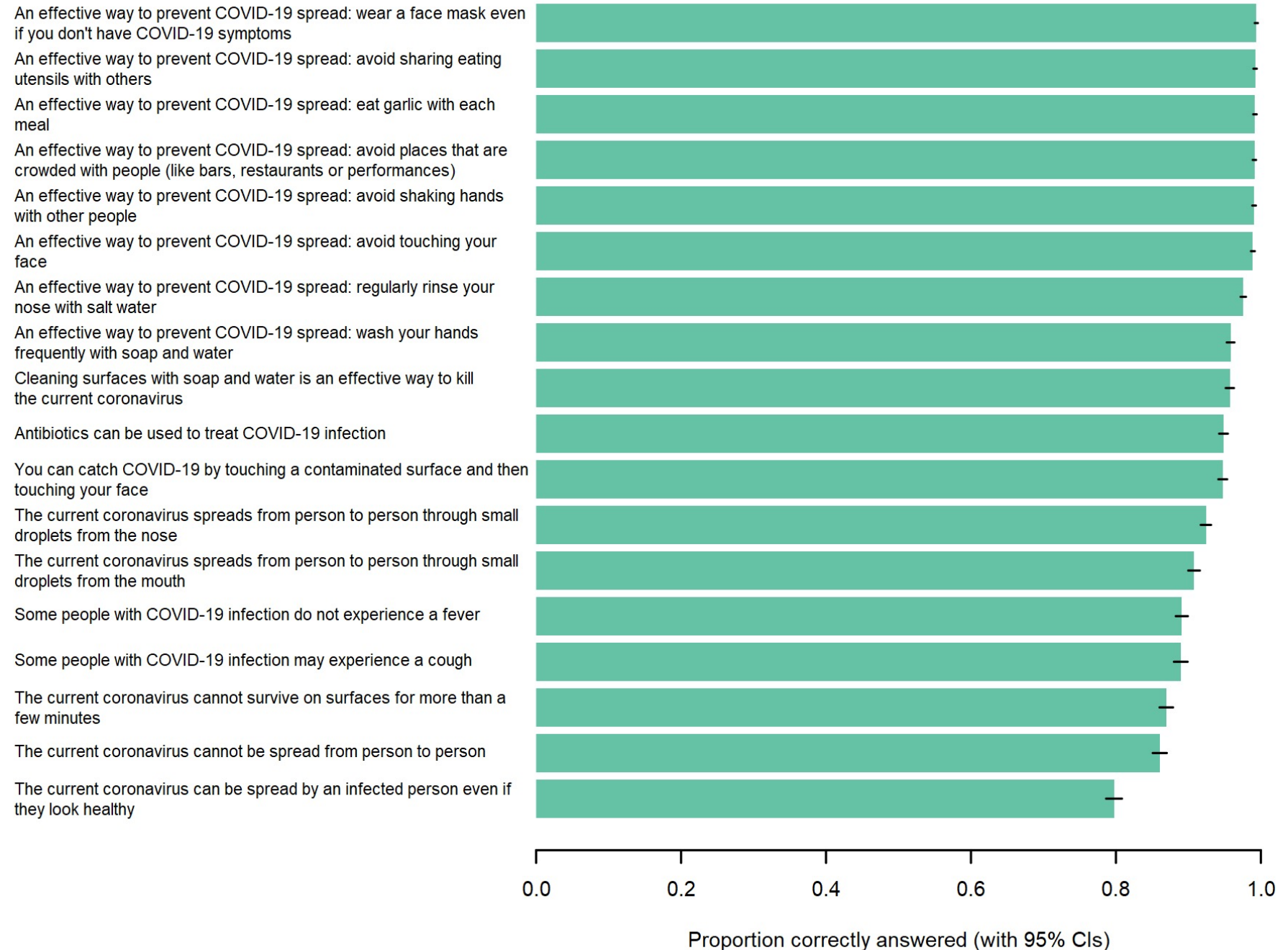


Vandormael, Adam, Greuel,
Bärnighausen *Trials* 2020

COVID-19 baseline knowledge is very high

CONTROL ARM RESULTS

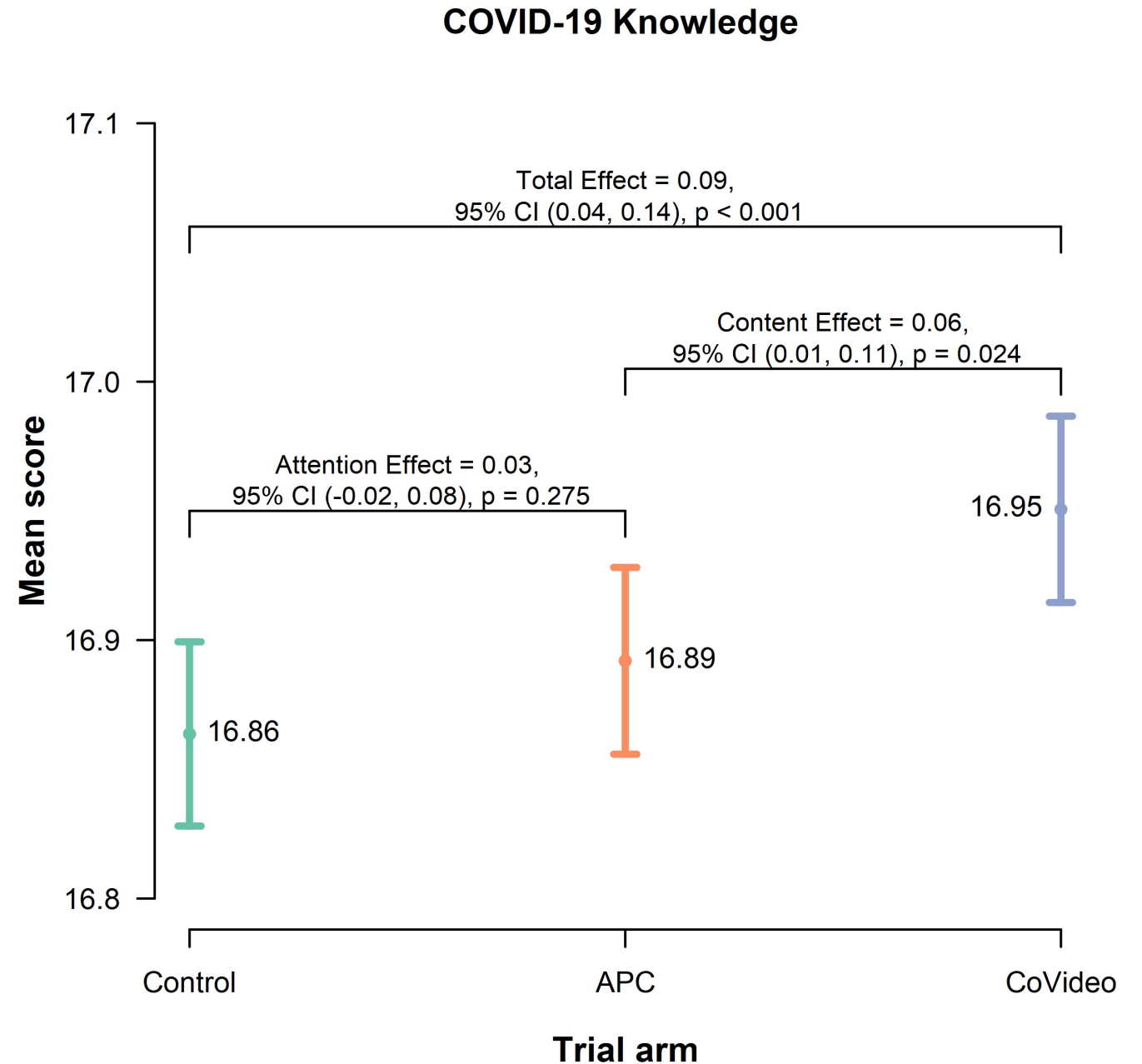
Vandormael, Greuel,
Gates, Adam,
Bärnighausen *JMIR* 2021



... but the COVIDEO further boosted knowledge

COVIDEO TRIAL RESULTS

Vandormael, Greuel, Gates, Adam,
Bärnighausen *JMIR* 2021

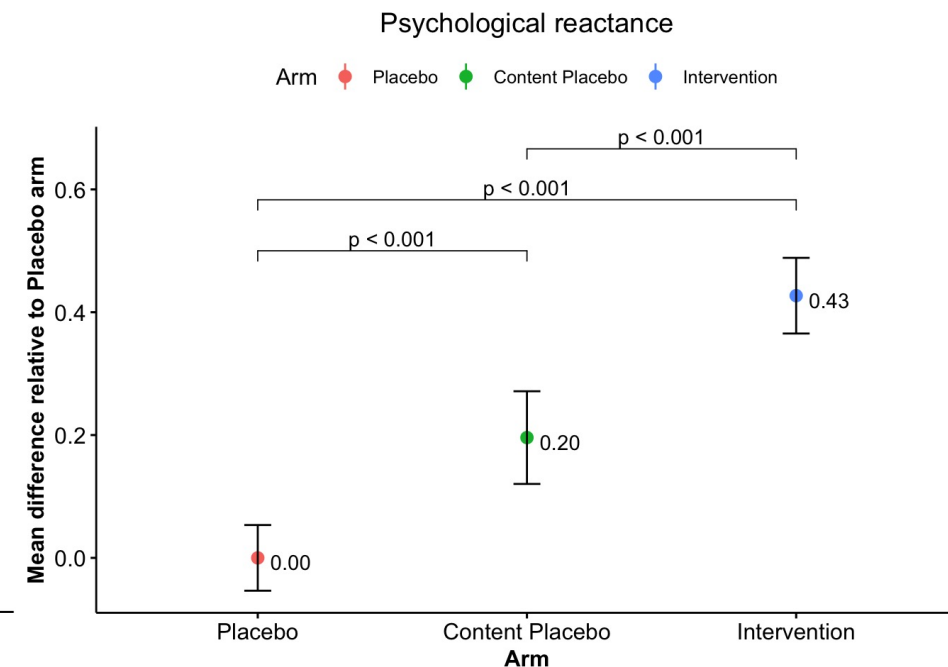
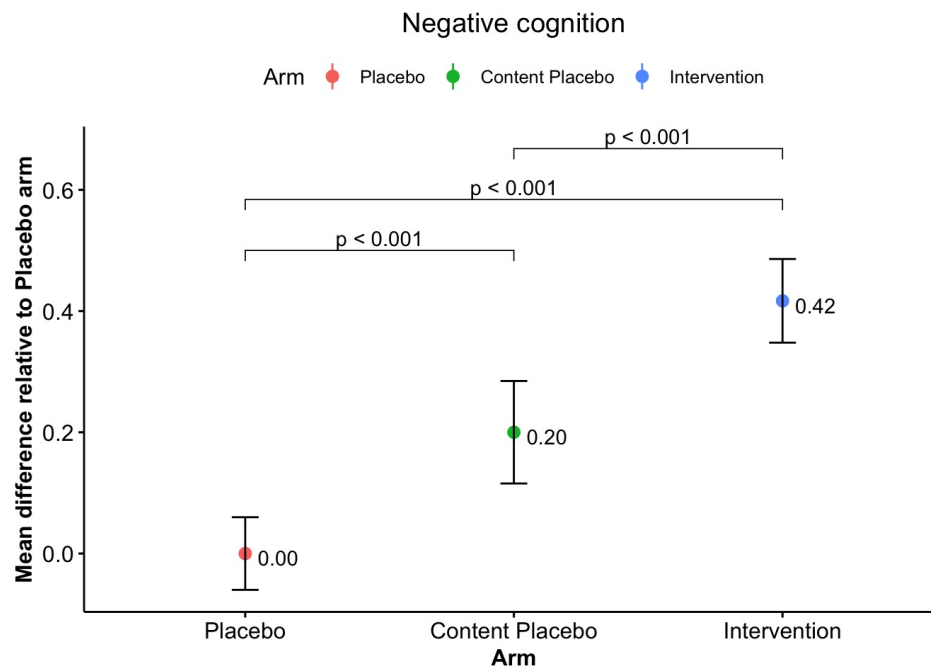
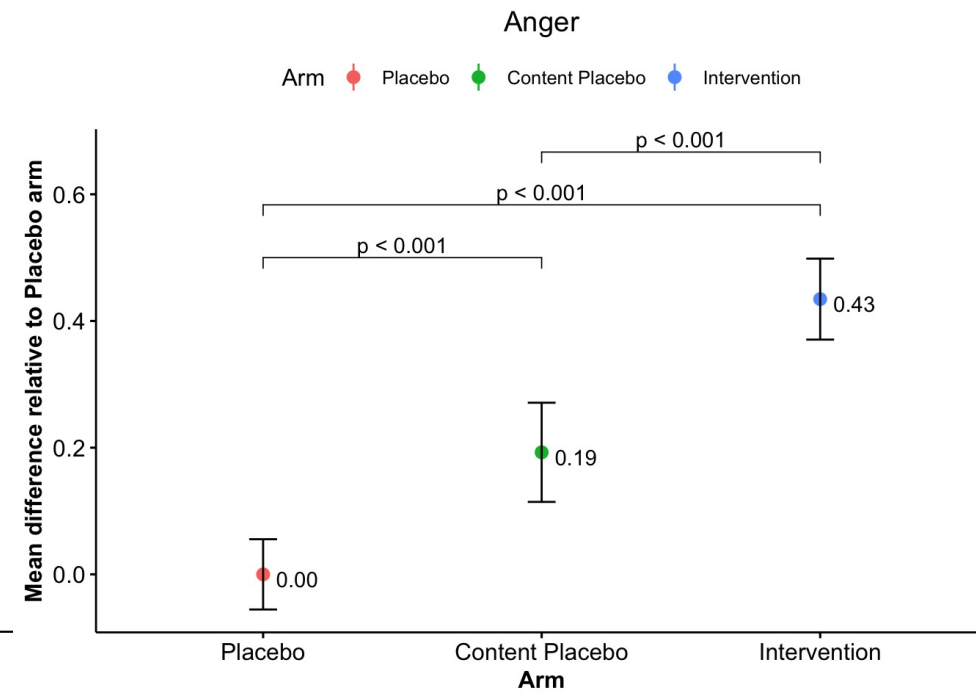
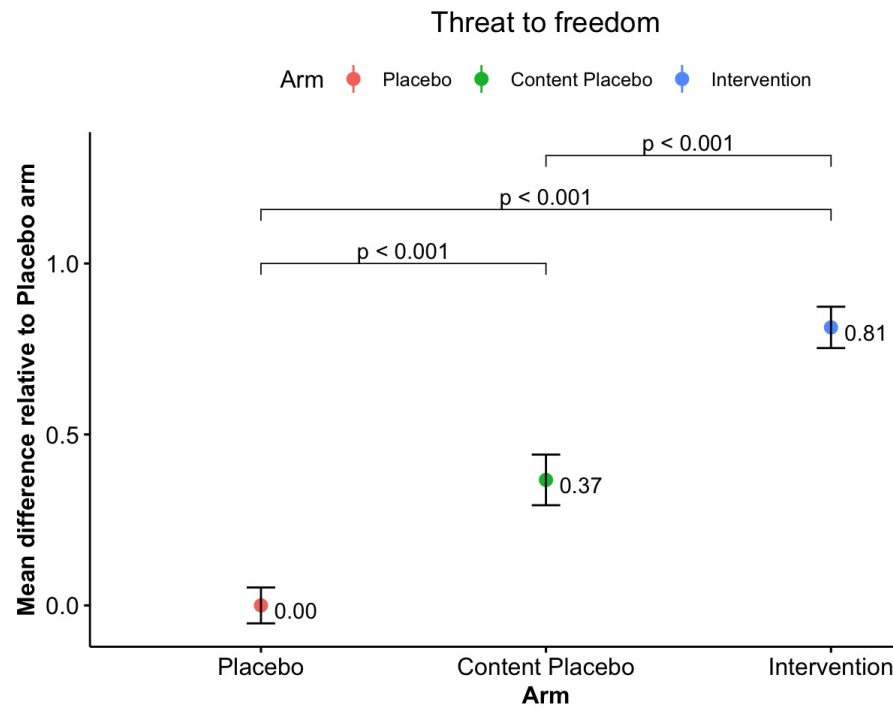


Reactance to sugar reduction advice

4 REACTANCE PHENOMENA

4000 individuals 1:1:1 randomly assigned

- Sugar-reduction E-E video
- Content placebo
- Placebo



We can boost the representation, transportability and speed of our science

DISCUSSION

- **Pooling nationally representative data** for regional and global representation – regional and global relationships between climate variables on health
- **Quasi-experiments** leveraging nationally representative data for transportability and speed – regression discontinuity analyses of climate change mitigation and adaptation policies
- **Online trials** for transportability and speed – online trial of an app labelling foods for planetary and personal health impacts