Cyber Security and Privacy in the Digital Health Age

How Big Data Has Changed the Canadian Public Health Landscape

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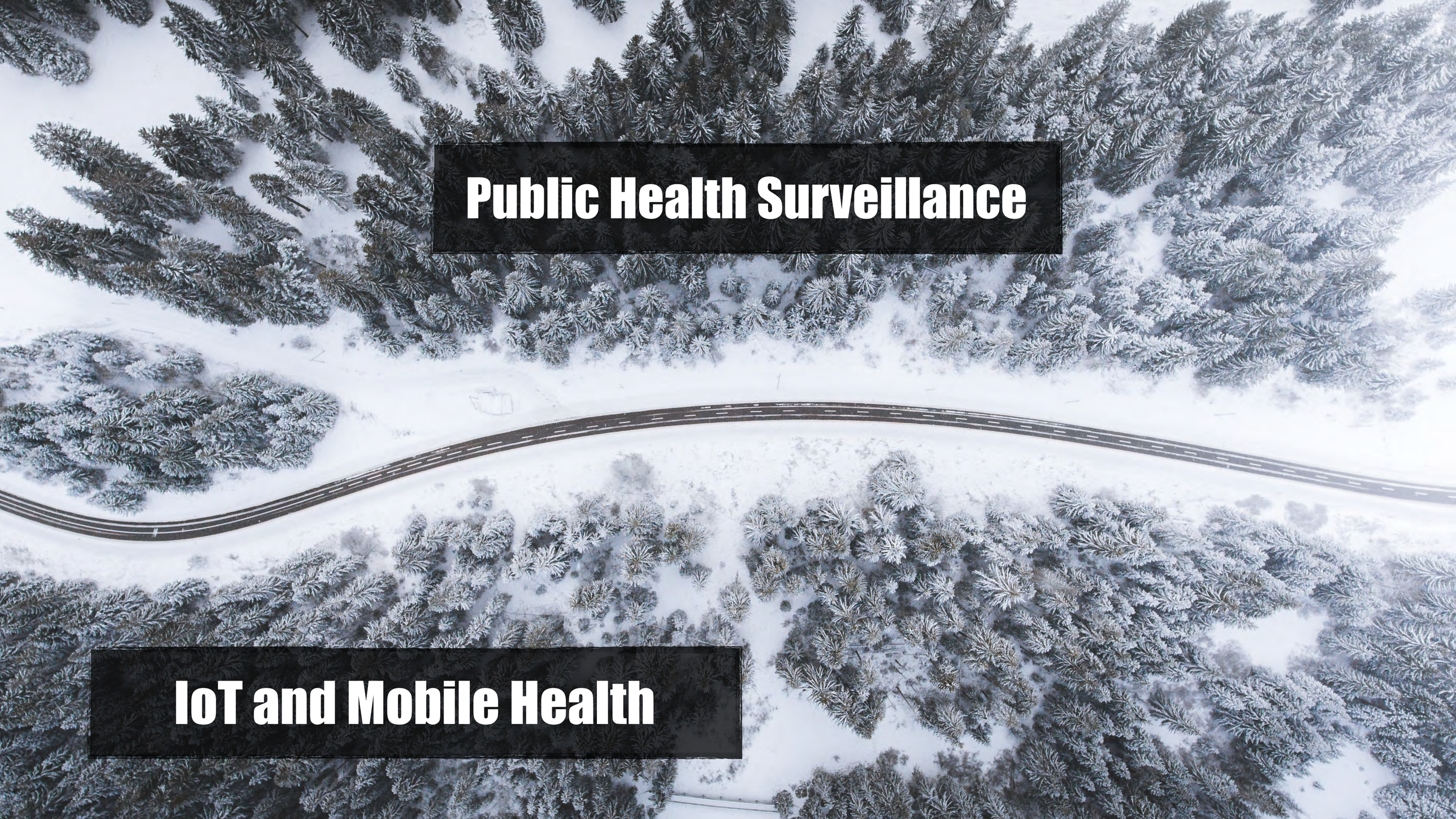
The Ubiquitous Health Technology Lab (UbiLab)


Public Health Surveillance
IoT and Mobile Health

EXTREME HEAT

EXTREME AIR POLLUTION

PANDEMICS


PUBLIC HEALTH SURVEILLANCE

Wearables

Internet of Things

WHAT THE COVID-19 PANDEMIC SHOWED US?

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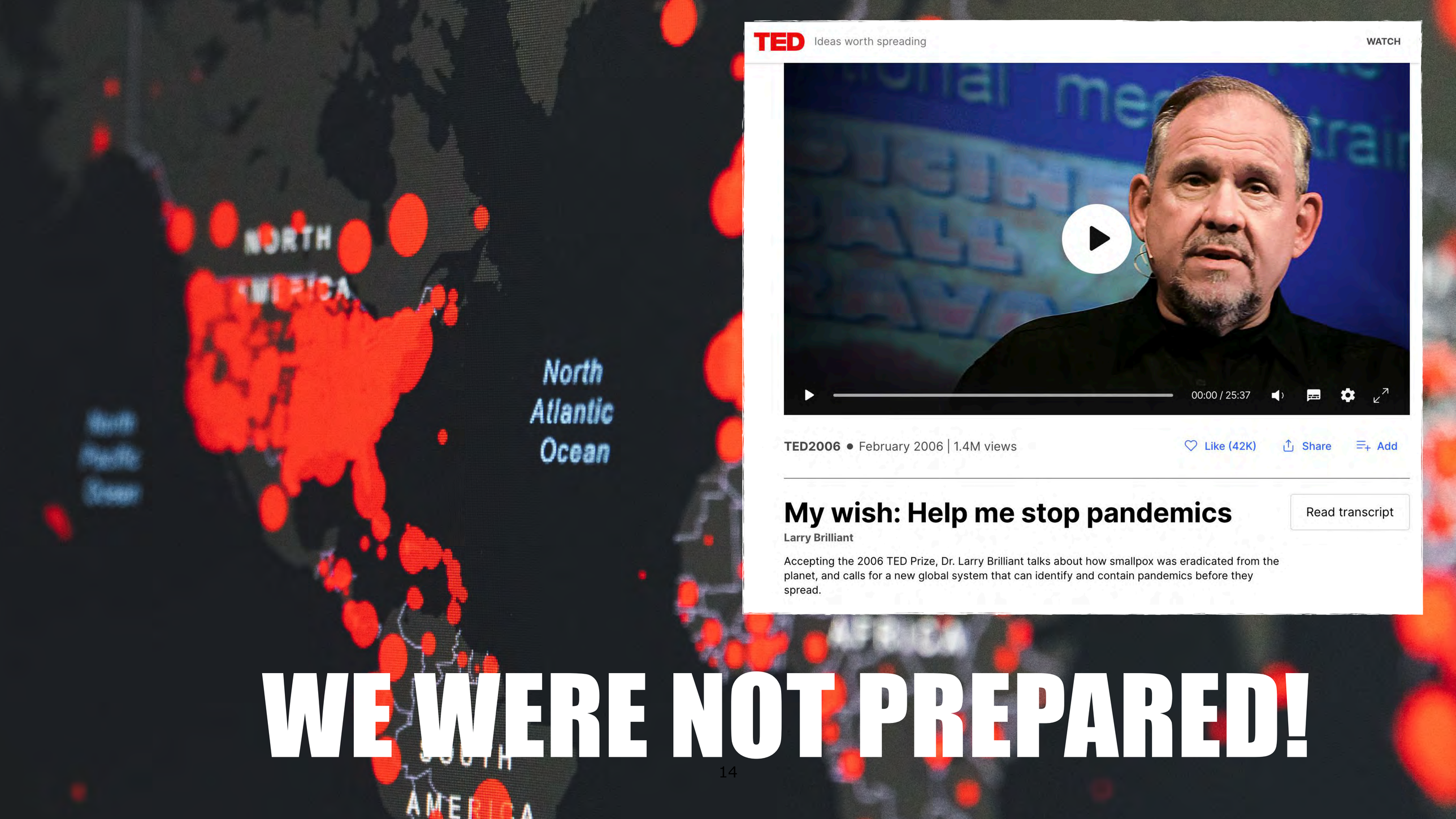
WE WERE NOT PREPARED!



TED Ideas worth spreading WATCH

00:00 / 25:37

TED2006 • February 2006 | 1.4M views Like (42K) Share Add

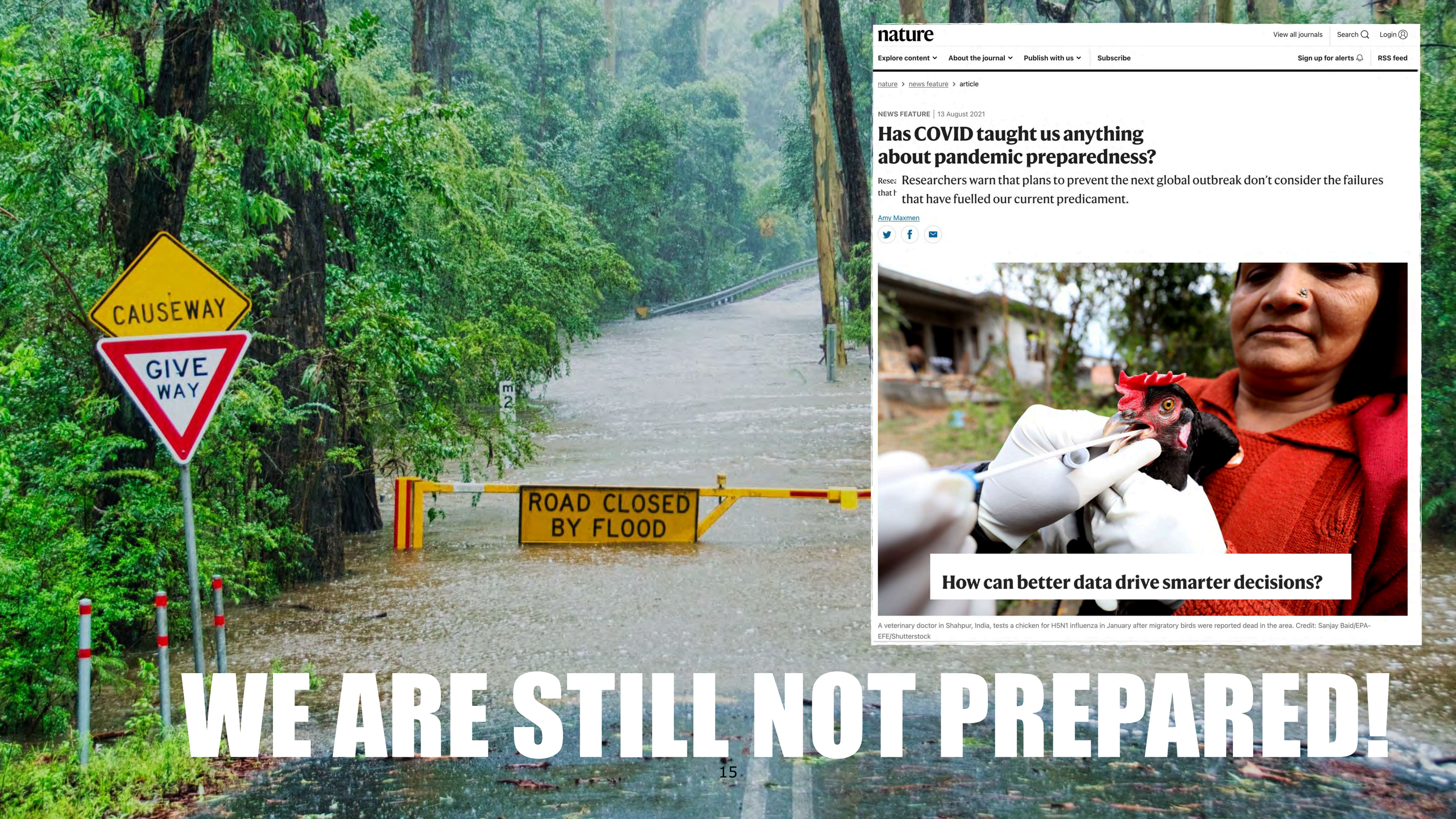
My wish: Help me stop pandemics

Read transcript

Larry Brilliant

Accepting the 2006 TED Prize, Dr. Larry Brilliant talks about how smallpox was eradicated from the planet, and calls for a new global system that can identify and contain pandemics before they spread.

WE WERE NOT PREPARED!



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NEWS FEATURE | 13 August 2021

Has COVID taught us anything about pandemic preparedness?

Researchers warn that plans to prevent the next global outbreak don't consider the failures that have fuelled our current predicament.

Amy Maxmen

How can better data drive smarter decisions?

A veterinary doctor in Shahpur, India, tests a chicken for H5N1 influenza in January after migratory birds were reported dead in the area. Credit: Sanjay Baid/EPA-EFE/Shutterstock

WE ARE STILL NOT PREPARED!

The rise of digital health technologies during the pandemic

Briefing – 14-04-2021

Coronavirus has accelerated the rise of digital health, a broad concept that includes solutions for telemedicine and teleconsultation, remote monitoring, connected devices, digital health platforms and health apps. The concept also covers the related health data analysis and application in systems based on big data, for instance for epidemiological research and AI-enabled diagnosis support. Digital technologies are becoming critical in the fight against the ongoing pandemic. They have been used, among other things, for online medical consultations from home and for increasing efficiency in diagnosis and treatment of patients through telemedicine, which, like teleworking and online education, has been a novel experience for many. Likewise health workers have been using digital technology to diagnose the virus. For instance, China has developed new e-health apps allowing patients to assess their Covid-19 symptoms remotely. Patients with existing critical illnesses, reluctant to go to hospital because of the risk of contracting the virus, have been able to get online consultations from home and have in some cases been monitored remotely. Moreover, thanks to the availability of digital health records and e prescriptions in many EU countries, it has been possible to issue repeat prescriptions remotely, limiting unnecessary contact between doctors and patients and reducing the chances of exposure to the virus. Nevertheless, there are many challenges to overcome as advances in digitalisation of healthcare come with drawbacks. They highlight a widening 'digital divide' that risks leaving behind the elderly and socially disadvantaged, who are less able to master or afford the technology. In addition, liability, reimbursement and cybersecurity issues are among the other key challenges that need to be

HOW ARE WE TACKLING THESE ISSUES?

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NextGen Public Health Surveillance Technologies

frontiers in Public Health

PERSPECTIVE
published: 03 December 2021
doi: 10.3389/fpubh.2021.756675

Check for updates

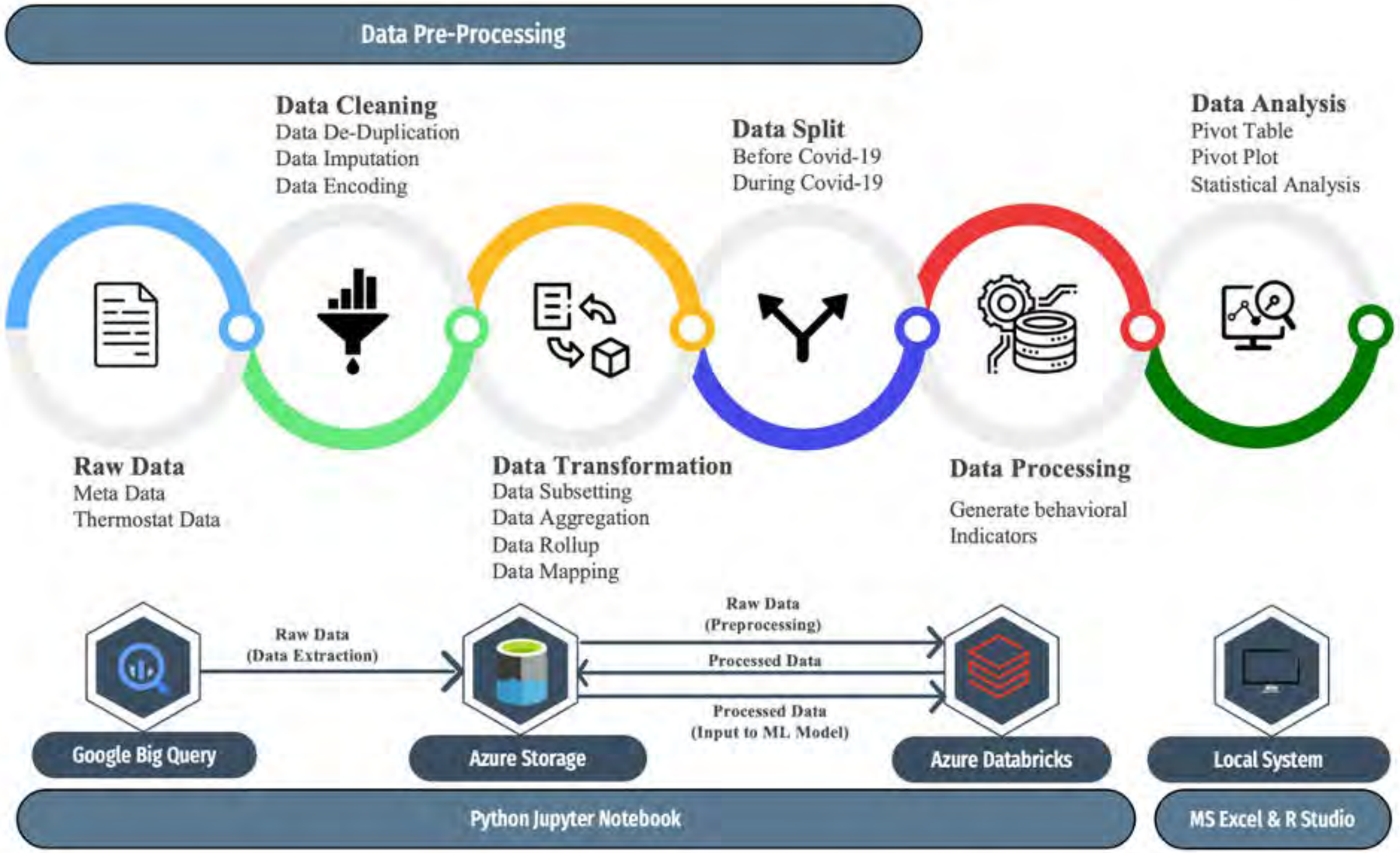
NextGen Public Health Surveillance and the Internet of Things (IoT)

Kirti Sundar Sahu[1], *Shannon E. Majowicz*[1], *Joel A. Dubin*[1,2] *and Plinio Pelegrini Morita*[1,3,4,5,6*]

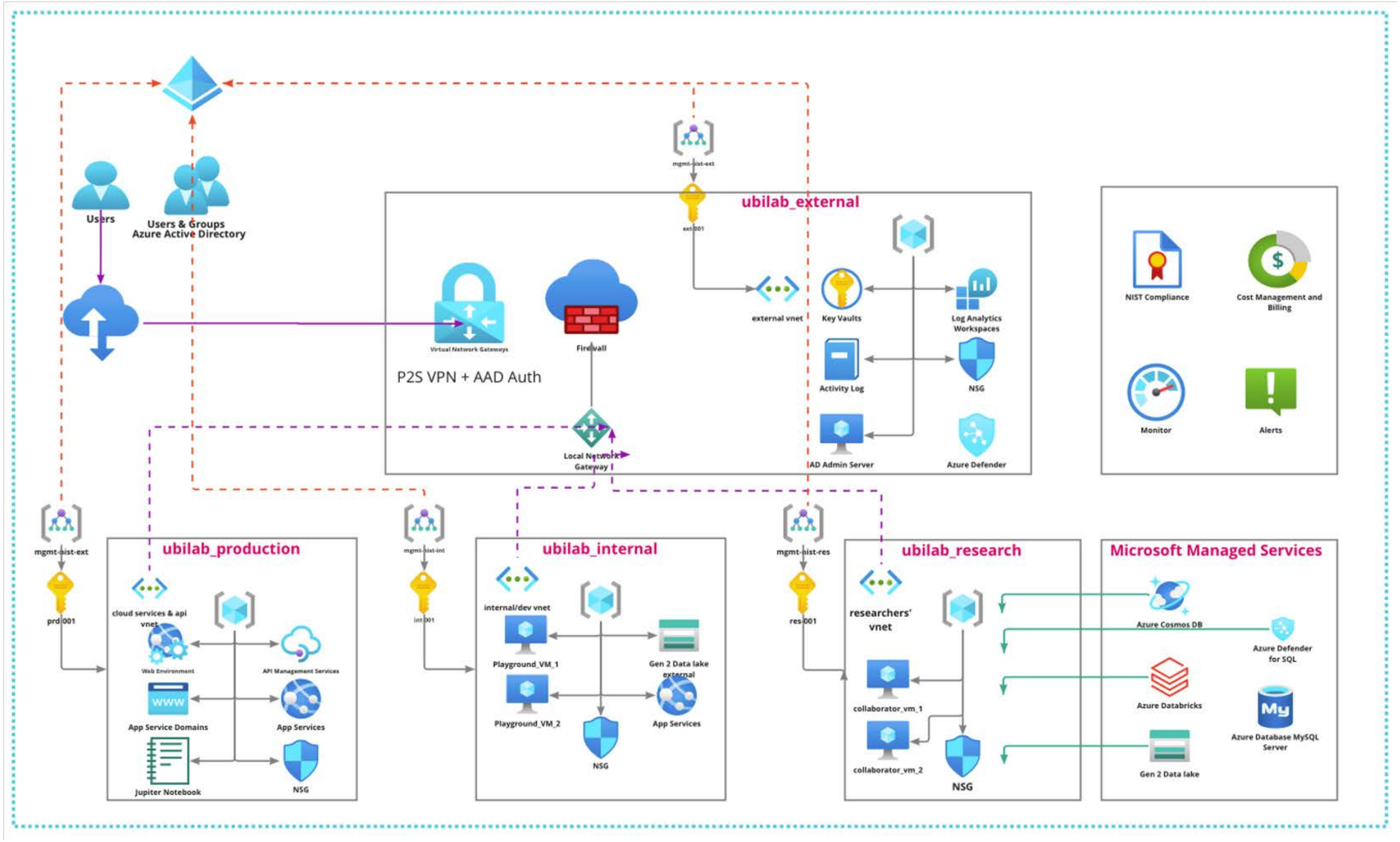
[1] *School of Public Health Sciences, University of Waterloo, Waterloo, ON, Canada,* [2] *Department of Statistics and Actuarial Science, University of Waterloo, Waterloo, ON, Canada,* [3] *Institute of Health Policy, Management, and Evaluation, University of Toronto, Toronto, ON, Canada,* [4] *Department of Systems Design Engineering, University of Waterloo, Waterloo, ON, Canada,* [5] *Ehealth Innovation, Techna Institute, University Health Network, Toronto, ON, Canada,* [6] *Research Institute for Aging, University of Waterloo, Waterloo, ON, Canada*

Recent advances in technology have led to the rise of new-age data sources (e.g.,

Data Ecosystems for NextGen Surveillance



Data Ecosystems for NextGen Surveillance



CORPORATE INITIATIVES

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FITBIT NEWS

APRIL 2, 2020

The Impact Of COVID-19 On Global Sleep Patterns

BY FITBIT STAFF

Last week, we shared an important story about the impact COVID-19 has had on our global Fitbit community's physical activity levels and provided a few tips on how we can help. This week, we've taken a look at how sleep patterns have changed during this time. Based on our review of aggregated and anonymized data, we saw that in locations with shelter-in-place mandates, bedtime and bedtime consistency shifted.

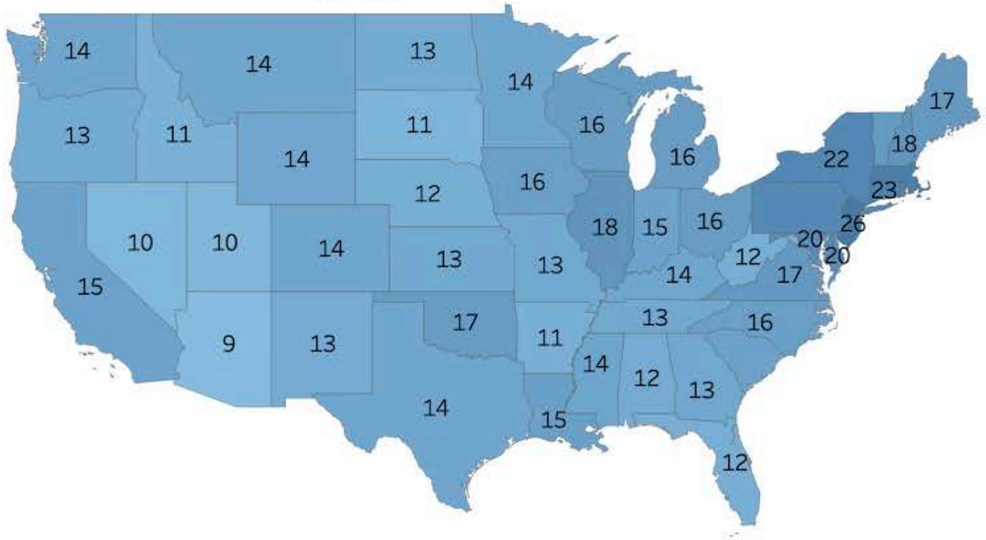
For the most part, people are going to bed later but getting more sleep, as well as more quality rest. For those whose quality of sleep has improved, they have been spending more time in deep and REM sleep.

Take a look at the maps below to see how quality of sleep changed for different age groups in the US during the week that ended March 22, 2020.* The blue color represents an increase in minutes of average sleep, while the orange color represents a decrease. The numbers shown in

Impact of COVID-19 on Sleep

Change in Sleep Minutes
Week Ending 3/22

18-29



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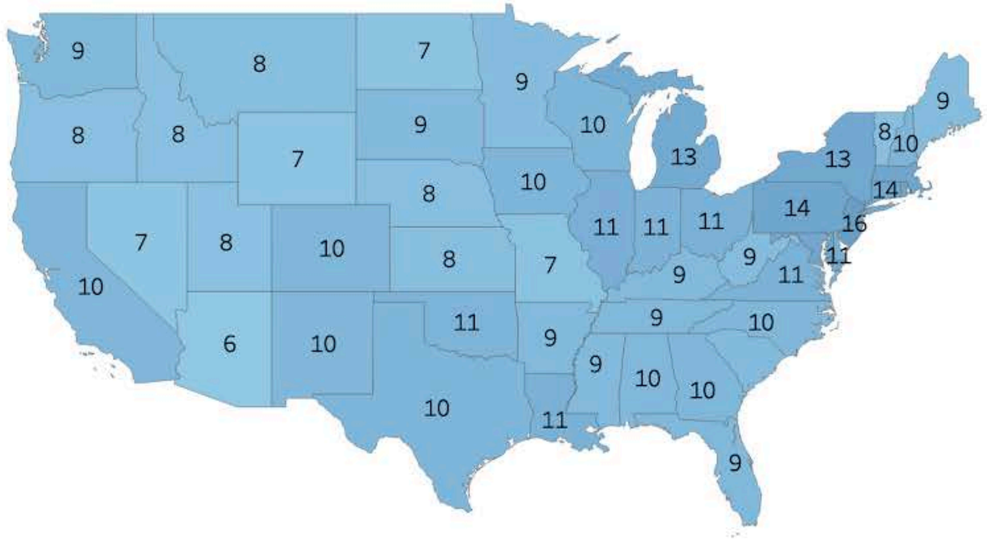
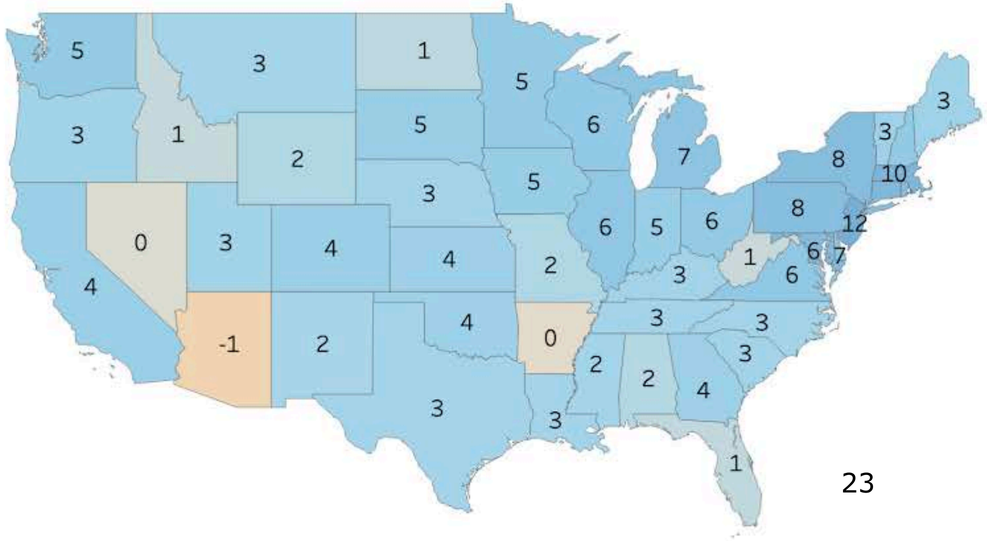
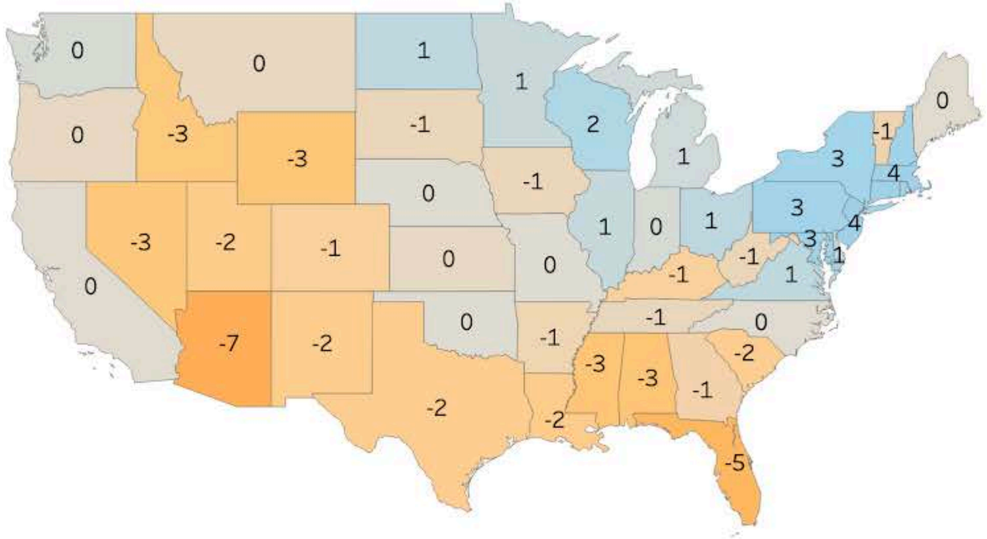


50-64

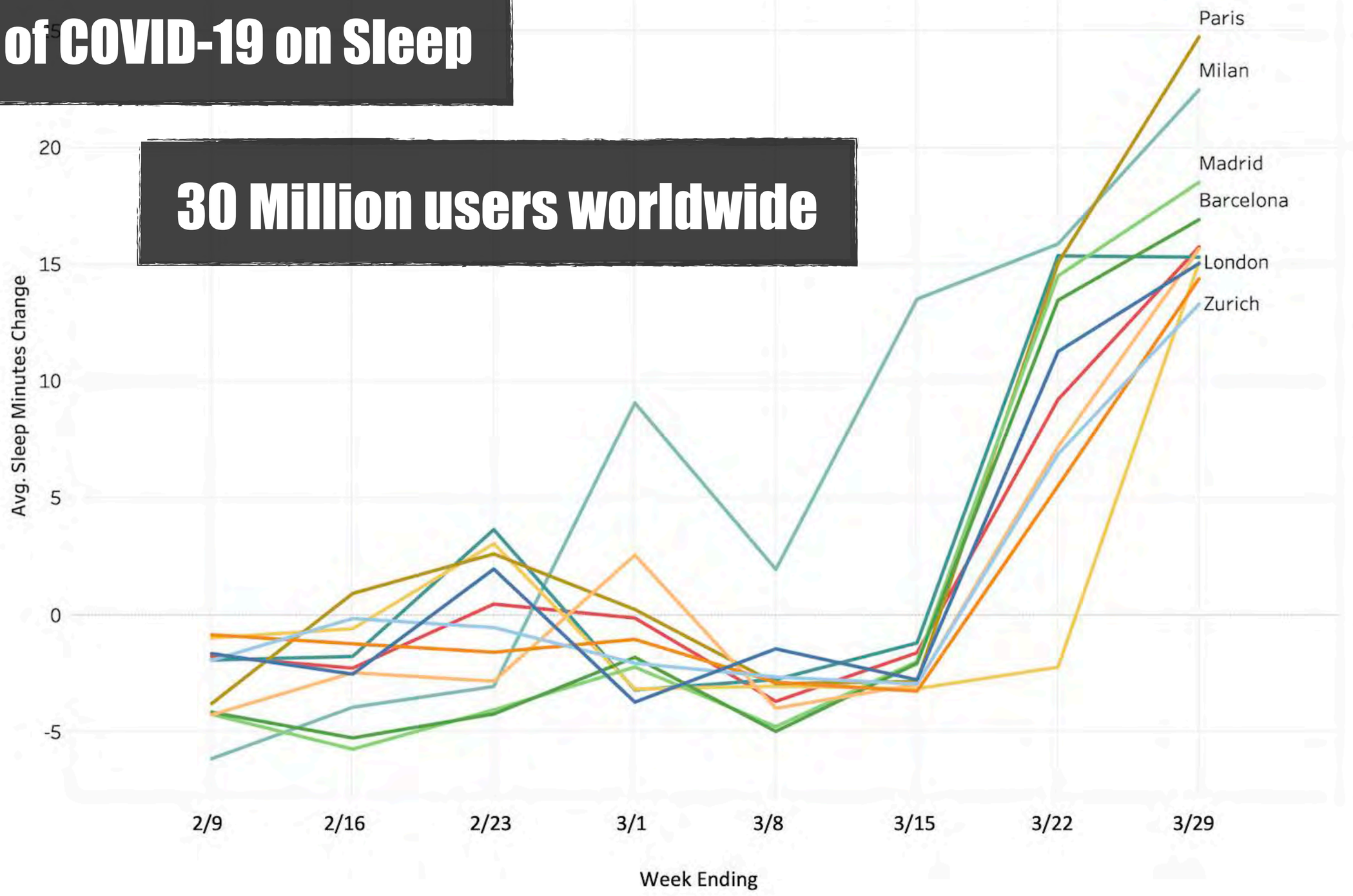


65+



Impact of COVID-19 on Sleep

30 Million users worldwide



IOT AND SMART HOMES

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Monitoring Sleep using Smart thermostat Data

Leveraged data from 200K ecobee thermostats to understand changes in sleep patterns during the pandemic.

Data

- Data from motion and temperature sensors from ecobee smart thermostats.
- Pre-consented, available to registered researchers, de-identified, household-level data.
- Developed algorithms for monitoring indoor activity levels and sleep indicators.
- Currently using the data for exploring the effects of heatwaves on indoor temperatures.

Public Concerns

- Data hosting, data access, anonymity, privacy loss.

Original Paper

Usability of Smart Home Thermostat to Evaluate the Impact of Weekdays and Seasons on Sleep Patterns and Indoor Stay: Observational Study

Niloofar Jalali[1], MSc, PhD; Kirti Sundar Sahu[1], MPH, MPT; Arlene Oetomo[1], BSc; Plinio Pelegrini Morita[1,2,3,4], MSc, PEng, PhD

[1]School of Public Health and Health Systems, University of Waterloo, Waterloo, ON, Canada
[2]Institute of Health Policy, Management, and Evaluation, University of Toronto, Toronto, ON, Canada
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[4]eHealth Innovation, Techna Institute, University Health Network, Toronto, ON, Canada

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Abstract

Background: Sleep behavior and time spent at home are important determinants of human health. Research on sleep patterns has traditionally relied on self-reported data. Not only does this methodology suffer from bias but the population-level data collection is also time-consuming. Advances in smart home technology and the Internet of Things have the potential to overcome these challenges in behavioral monitoring.

Objective: The objective of this study is to demonstrate the use of smart home thermostat data to evaluate household sleep patterns and the time spent at home and how these behaviors are influenced by different weekdays and seasonal variations.

Methods: From the 2018 ecobee *Donate your Data* data set, 481 North American households were selected based on having at least 300 days of data available, equipped with ≥6 sensors, and having a maximum of 4 occupants. Daily sleep cycles were identified based on sensor activation and used to quantify sleep time, wake-up time, sleep duration, and time spent at home. Each household's record was divided into different subsets based on seasonal, weekday, and seasonal weekday scales.

Results: Our results demonstrate that sleep parameters (sleep time, wake-up time, and sleep duration) were significantly influenced by the weekdays. The sleep time on Fridays and Saturdays is greater than that on Mondays, Wednesdays, and Thursdays (n=450; *P*<.001; odds ratio [OR] 1.8, 95% CI 1.5-3). There is significant sleep duration difference between Fridays and Saturdays and the rest of the week (n=450; *P*<.001; OR 1.8, 95% CI 1.4-2). Consequently, the wake-up time is significantly changing between weekends and weekdays (n=450; *P*<.001; OR 5.6, 95% CI 4.3-6.3). The results also indicate that households spent more time at home on Sundays than on the other weekdays (n=445; *P*<.001; OR 2.06, 95% CI 1.64-2.5). Although no significant association is found between sleep parameters and seasonal variation, the time spent at home in the winter is significantly greater

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Data

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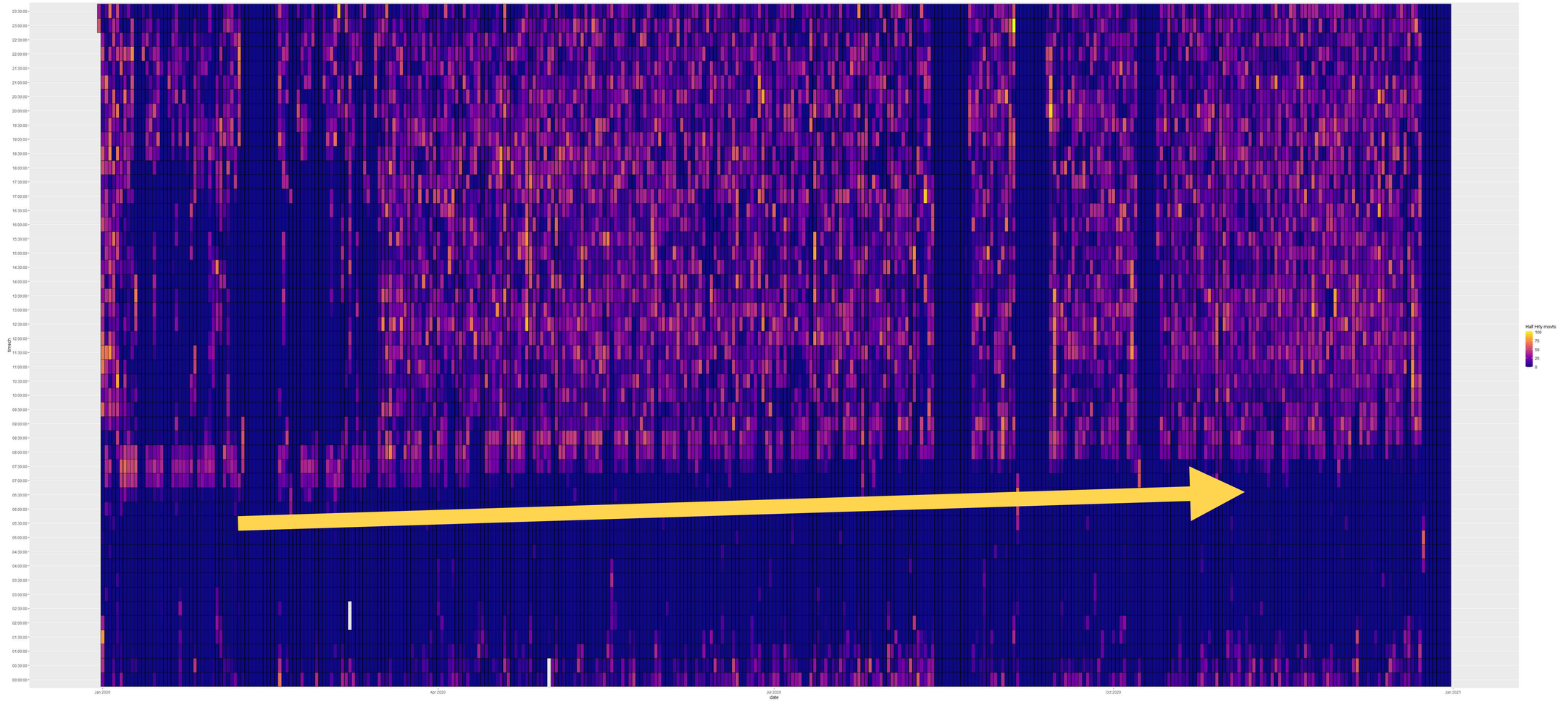
- Data hosting, data access, anonymity, privacy loss.

Impact of COVID-19 on Wake Up Times



Wake up time - 2020

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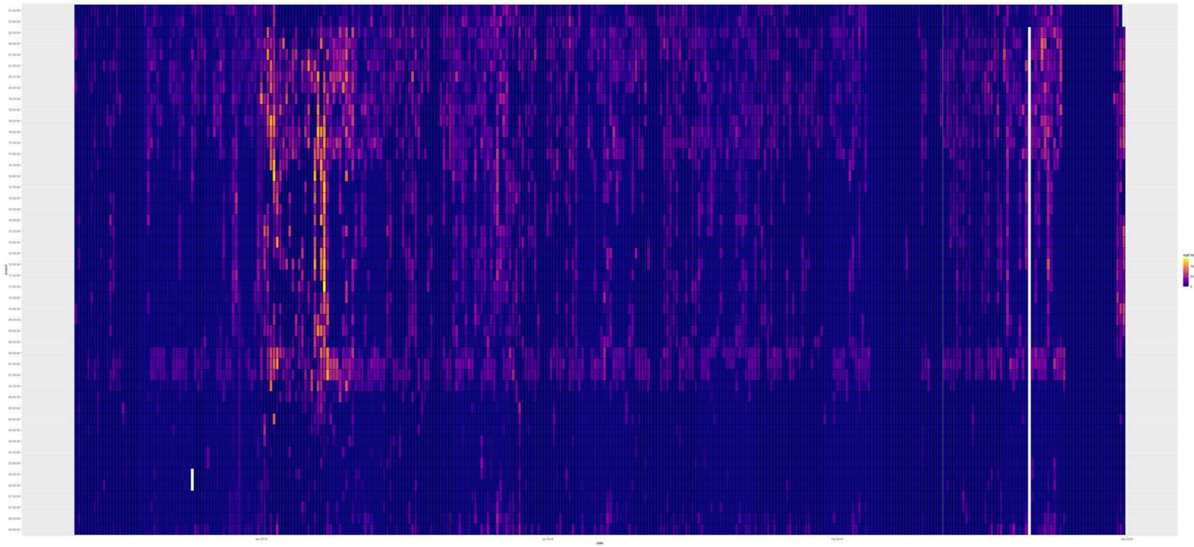
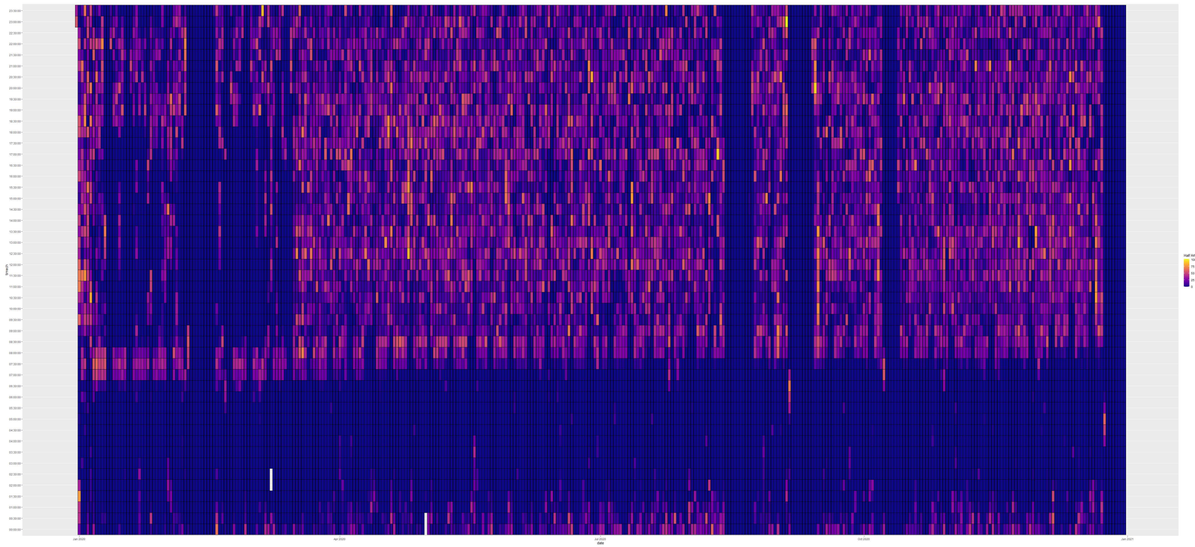
Impact of Lockdowns

2019



2020



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SOCIAL MEDIA

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Social Media as a Public Health Surveillance Tool

Twitter data has been used to evaluate the public perceptions of heatwaves, misinformation in dentistry, the spread of propaganda in the Russian war, and the public's perception on vaccine hesitancy.

Data

- Data mined from Twitter's APIs, through a data ecosystem developed at the University of Waterloo.
- Non consented, individualized, identifiable, non-private/ public data.
- Twitter posts are public and hosted on databases managed by Twitter and made available to researchers through a special program.

Public Concerns

- Use of their social media content to inform public health practices, concerns about the use of their "private" information.

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Ethical principles for infodemiology and infoveillance studies concerning infodemic management on social media

Matheus Lotto[1,2], Thokozani Hanjahanja-Phiri[2], Halyna Padalko[2], Arlene Oetomo[2], Zahid Ahmad Butt[2], Jennifer Boger[3], Jason Millar[4], Thiago Cruvinel[1] and Plinio P. Morita[2,3,5,6,7]*

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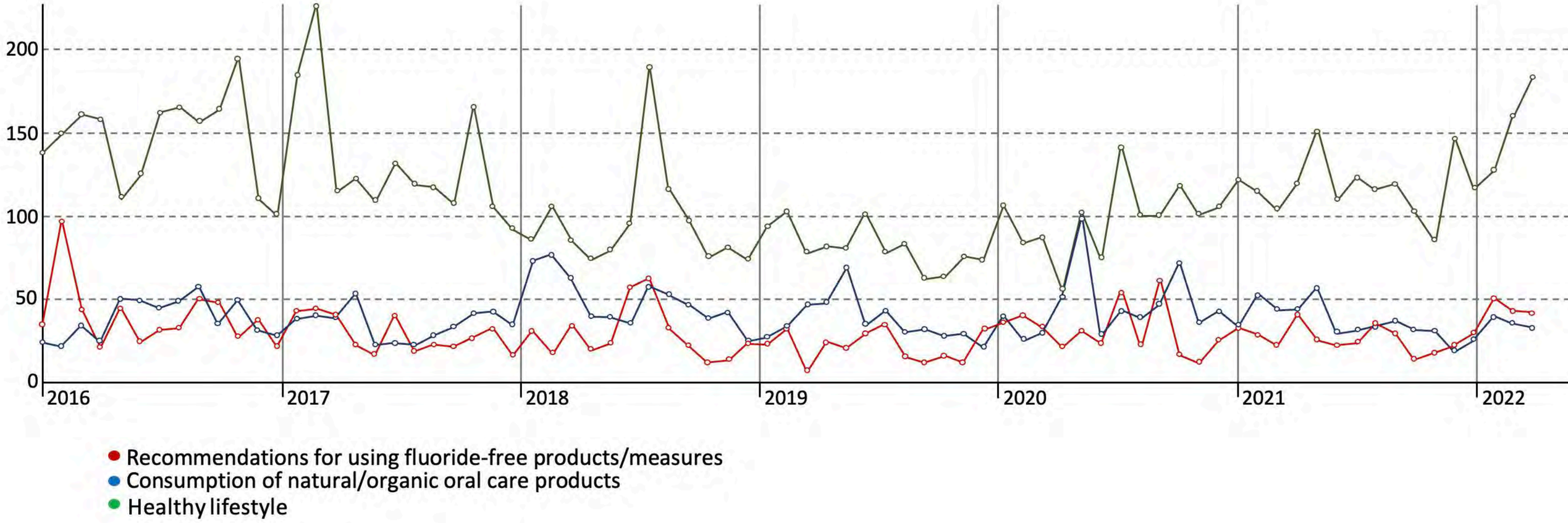
Big data originating from user interactions on social media play an essential role in infodemiology and infoveillance outcomes, supporting the planning and implementation of public health actions. Notably, the extrapolation of these data requires an awareness of different ethical elements. Previous studies have investigated and discussed the adoption of conventional ethical approaches in the contemporary public health digital surveillance space. However, there is a lack of specific ethical guidelines to orient infodemiology and infoveillance studies concerning infodemic on social media, making it challenging to design digital strategies to combat this phenomenon. Hence, it is necessary to explore if traditional ethical pillars can support digital purposes or whether new ones must be proposed since we are confronted with a complex online misinformation scenario. Therefore, this perspective provides an overview of the current scenario of ethics-related issues of infodemiology and infoveillance on social media for infodemic studies.

KEYWORDS

health information, infodemic, infoveillance, misinformation, social media

Introduction

Social Media as a Public Health Surveillance Tool



GOOGLE MAPS AND GOOGLE MOBILITY

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Google Mobility and COVID-19

Used publicly available mobility data from Google to estimate the effects of mobility change on COVID-19 cases.

Data

- Data from Google Maps searches, use of public transit, and location of Google Maps Users.
- Pre-consented, publicly available, aggregate.
- Generated based on mobility data collected by Google (yes, Google owns your data!), but presented in aggregate format.

Public Concerns

- Location information, loss of privacy, concerns about their individual behaviour leaking to the public.

https://www.utpjournals.press/doi/pdf/10.5138/cpp.2021-022 - Wednesday, May 03, 2023 5:33:46 AM - IP Address:24.114.39.185

Estimating the Effects of Non-Pharmaceutical Interventions and Population Mobility on Daily COVID-19 Cases: Evidence from Ontario

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QIHUANG ZHANG
Department of Biostatistics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania

Cette étude cherche à évaluer les effets des interventions non pharmaceutiques (INPs; restrictions sur les activités commerciales et rassemblements sociaux) et de la mobilité de la population sur le nombre de cas d'infection par jour, en utilisant les nombres de cas d'infection par la maladie à coronavirus 2019 (COVID-19) et les données de mobilité de Google pour 12 des plus grands Bureaux de Santé publique de l'Ontario entre le printemps 2020 et la fin janvier 2021. La méthode des variables instrumentales (VI) permet de rendre compte d'un biais potentiel de simultanéité puisque les taux quotidiens de COVID-19 et les INPs dépendent, tous les deux, du nombre de cas décalés. Les estimations par les VI basées sur les différences de durée des décalages d'ajustement pour inférer des estimations causales impliquent que de plus strictes INPs et le port obligatoire du masque dans les endroits fermés sont associés à une réduction de cas d'infection. Par ailleurs, Les estimations basées sur les données de mobilité de Google montrent que la présence accrue sur le lieu du travail est corrélée avec un plus grand nombre de cas d'infection. Finalement, d'octobre 2020 à Janvier 2021, les prévisions faites à partir de modèles de Box-Jenkins en série chronologique s'avèrent plus précises que les prévisions officielles et que celles utilisant le modèle épidémiologique susceptible – infecté – retiré.

Mots clés : COVID-19, données de Google, mobilité de la population, modélisation en série chronologique, Ontario, prévisions, SIR

This study uses coronavirus disease 2019 (COVID-19) case counts and Google mobility data for 12 of Ontario's largest Public Health Units from Spring 2020 until the end of January 2021 to evaluate the effects

Google Mobility and COVID-19

Used publicly available mobility data from Google to estimate the effects of mobility change on COVID-19 cases.

Data

- Data from Google Maps searches, use of public transit, and location of Google Maps Users
- Pre-consented, publicly available, aggregated.
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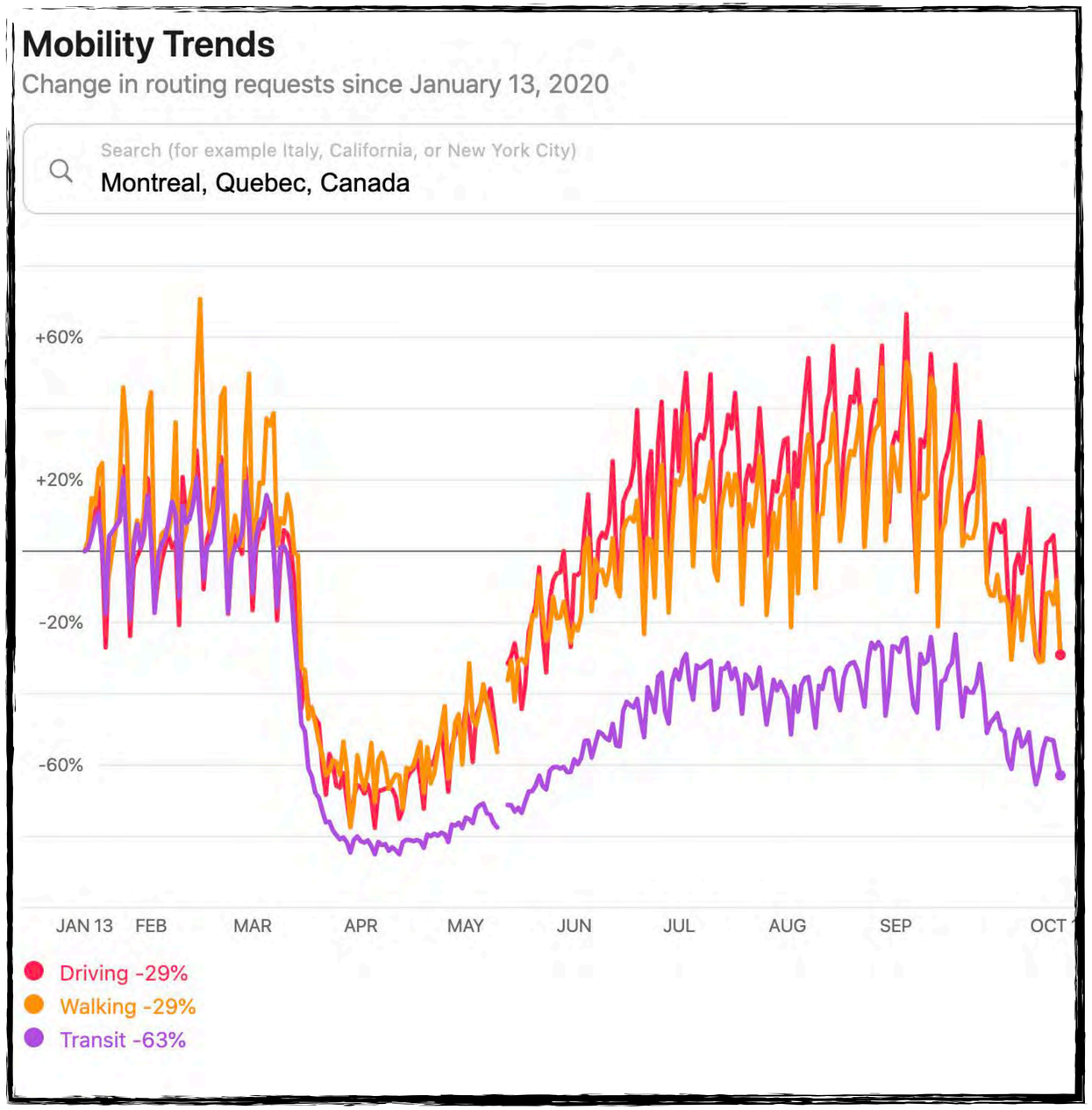

GREATEST DATA CHALLENGES IN PUBLIC HEALTH RESEARCH AND PRACTICE

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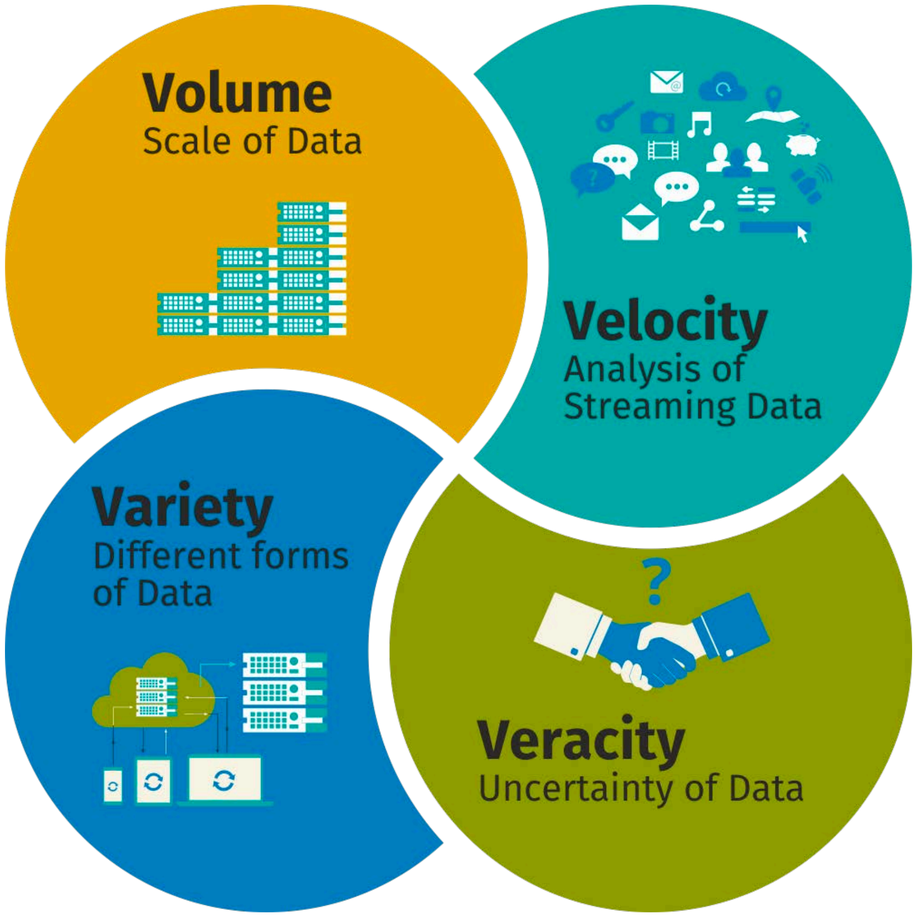
Big Data

Big data is often defined by four V's (or seven V's depending on the community).



Challenges

- Public health officials are not currently equipped to work with real-time data (volume and velocity)
- Large volumes of useful data are being collected, but public health practitioners are not trained to use this data.

Consequences and Next Steps

- Powerful data often goes unused.
- Time and effort needs to be placed on creating tools and repositories that public health officials can use.
- Public health education needs to reflect this new technological landscape.

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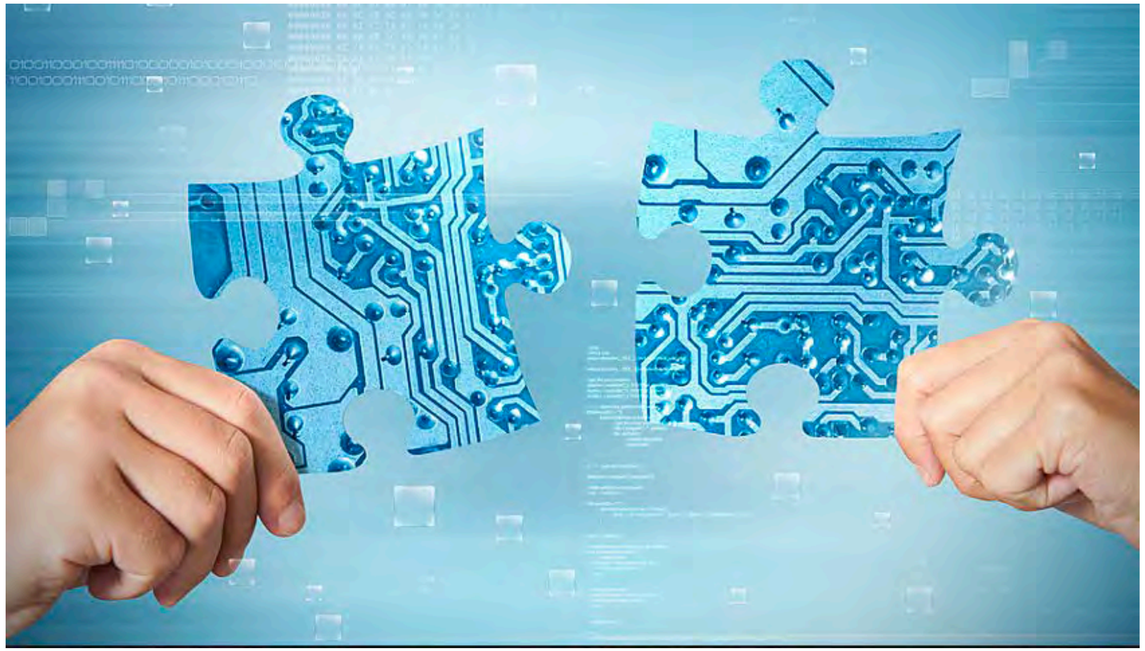
Lack Consistent Data Structure an Data Repositories

While data is widely collected through different systems and sensory technologies, accessing and integrating all these datasets can be really challenging.

Challenges

- Data collected is often stored using company-specific data models.
- Data is often siloed and hidden behind corporate and institutional walls.
- Companies and institutions do not have the necessary expertise to create secure and privacy-presenting data sharing programs.



Consequences

- Relevant data that could have a positive effect on public health practices is often unused.

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WHAT DO WE NEED TO ADVANCE THE USE OF BIG DATA IN PUBLIC HEALTH

Better literacy and knowledge dissemination.

As a country, we need a centralized big data strategy.

Train our public health professionals to use big data.

Corporate-Public Health Partnerships to facilitate access to big data hosted by corporations.

Thank you!

Plinio Pelegrini Morita, PhD

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