

Technology and the Covid Pandemic

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11 Technologies

- Additive manufacturing
- Big data
- Machine learning
- Crowdsourcing
- Internet of things
- Virtual reality
- Robotics
- Crowdfunding
- Digital Currencies
- Blockchain
- E-Commerce

1. Additive Manufacturing (3D Printing)

1a. Respirators

- In Spain, the first 3D printed respirator has just been developed and approved by medical experts.
- The device is an emergency device that can help patients breathe for a short period of time.
- “This is an emergency respirator, for an emergency situation. Assembly is very fast, so we can produce about 100 of them per day,” says Manel Balcells, Health Commissioner at the Leitat Technology Centre.



1b. Hands-Free Door Opener

- In Belgium, software and 3D printing service provider Materialise has opted to make printed hands-free door opener.
- The door opener eliminates the need for direct contact with door handles.
- “By making the design available digitally, it can be produced on 3D printers everywhere and become available around the world in a matter of hours,” says Fried Vancraen CEO of Materialise.



1c. Face Shields

- Stratasys, using its direct manufacturing facilities in Minnesota, Austin, Texas and California, plans to make both 3D-printed frame and a clear plastic shield that covers the entire face.
- Medical technology company Medtronic and the Minneapolis-based Dunwoody College of Technology are providing support for the materials.
- In addition, Stratasys is joining the CoVent-19 challenge, an initiative to asks engineers and designers to help develop new, rapidly deployable ventilators.



1d. Nasal Swabs

- Formlabs will dedicate 250 3D printers to build up to 1000,000 Nasal Swabs for COVID19 tests everyday.
- They will begin shipping to hospital struggling with necessary tools to diagnose patients with the coronavirus outbreak.

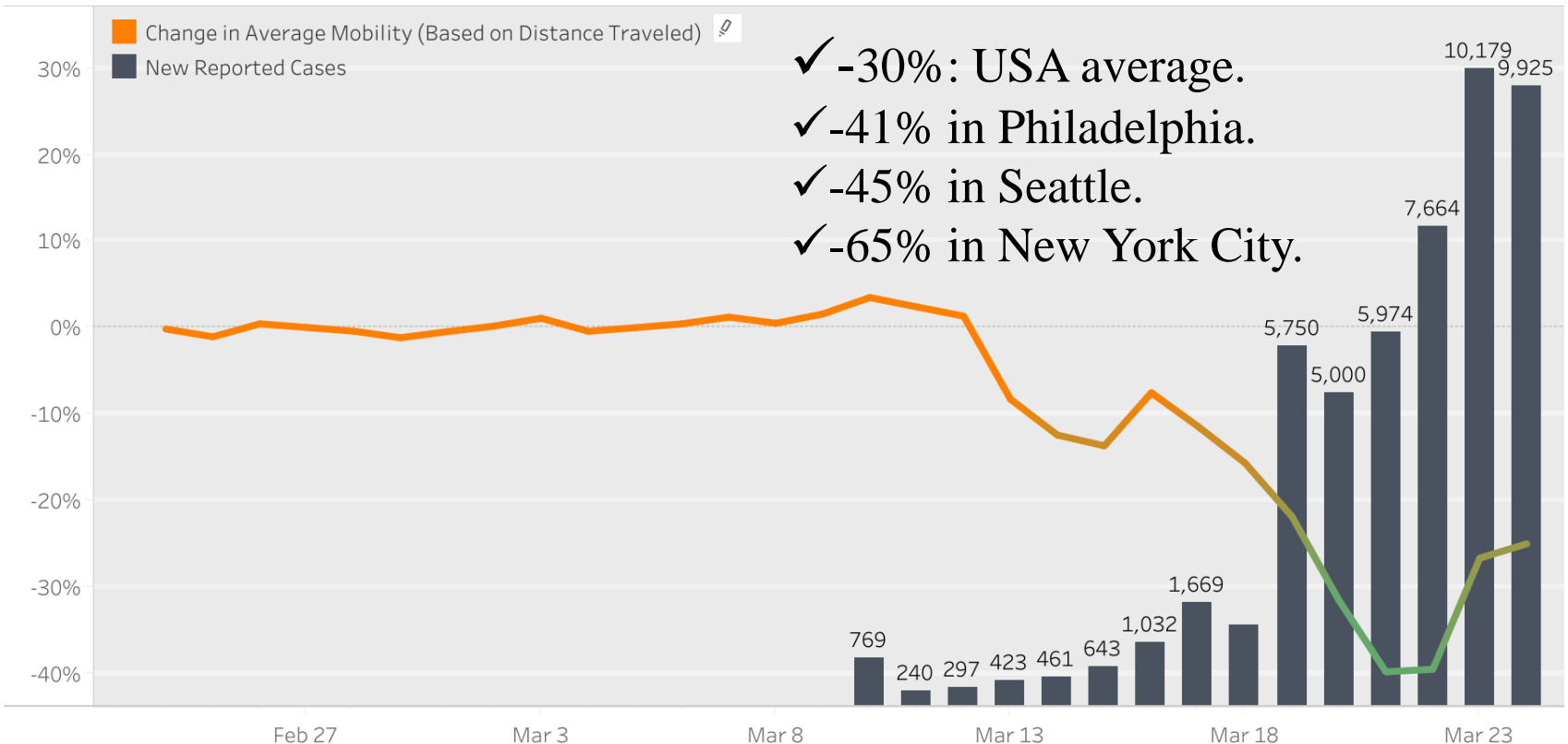


2. Big Data

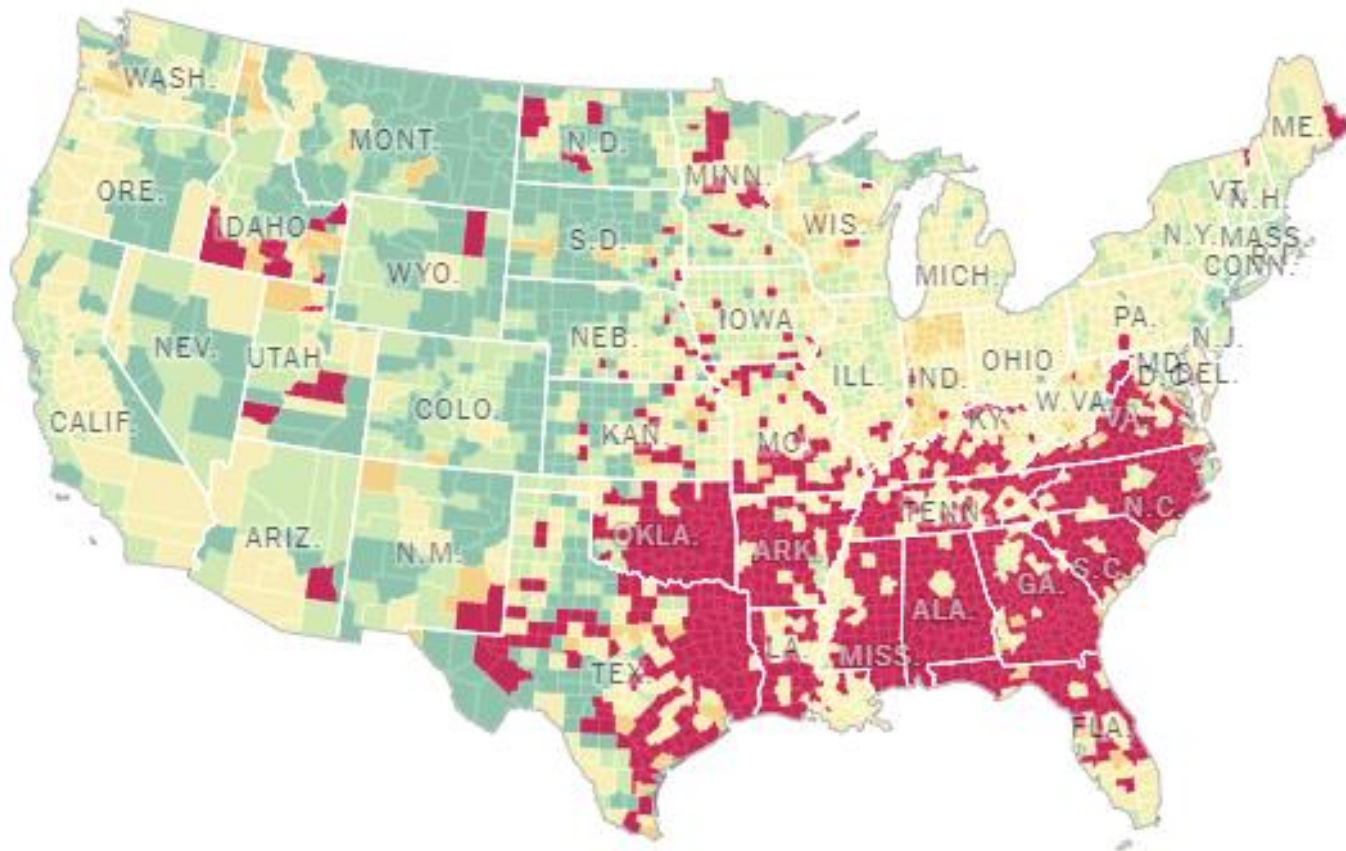
2a. Measuring Social Distancing

- Use of mobile phone data to measure social distancing and sheltering in place.
- Decline in distance travelled.

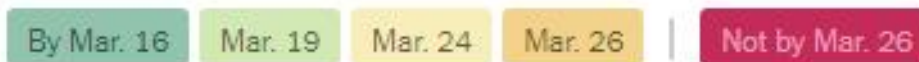
Change in Average Mobility (Based on Distance Traveled) - US



Compliance with Distancing



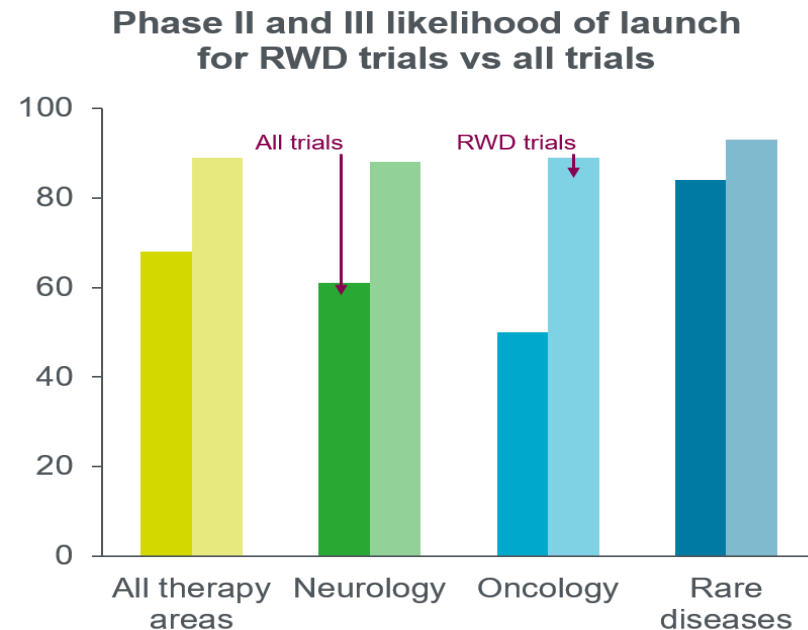
When average distance traveled first fell below 2 miles



Data is through March 26. Only weekdays were counted, because almost everyone traveled less on weekends.

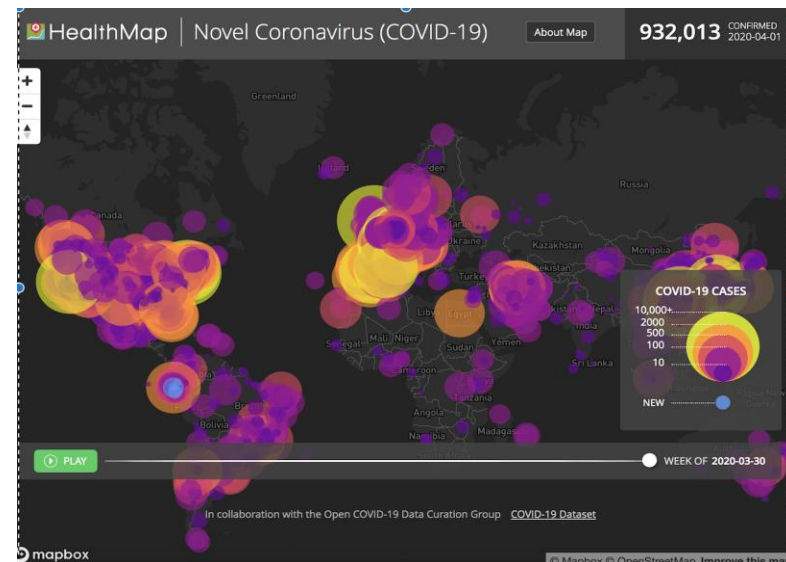
2b. RWE

- Large scale COVID-19 Real World Evidence (RWE) studies obtain data from patients currently under treatment.
- It includes a more patient-centric and patient-friendly focus on identifying and developing potential cures.



2c. Social Media & Online Searches

- Social digital data as a way to track, predict and prevent global disease.
- The global disease monitoring system 'HealthMap' captured digital clues about the COVID-19 outbreak from an online press report a week before it was reported by WHO.
- HealthMap uses artificial intelligence to filter out any repetition or irrelevancies news. The WHO routinely uses Health Map, ProMED and similar systems to monitor infectious disease outbreaks.

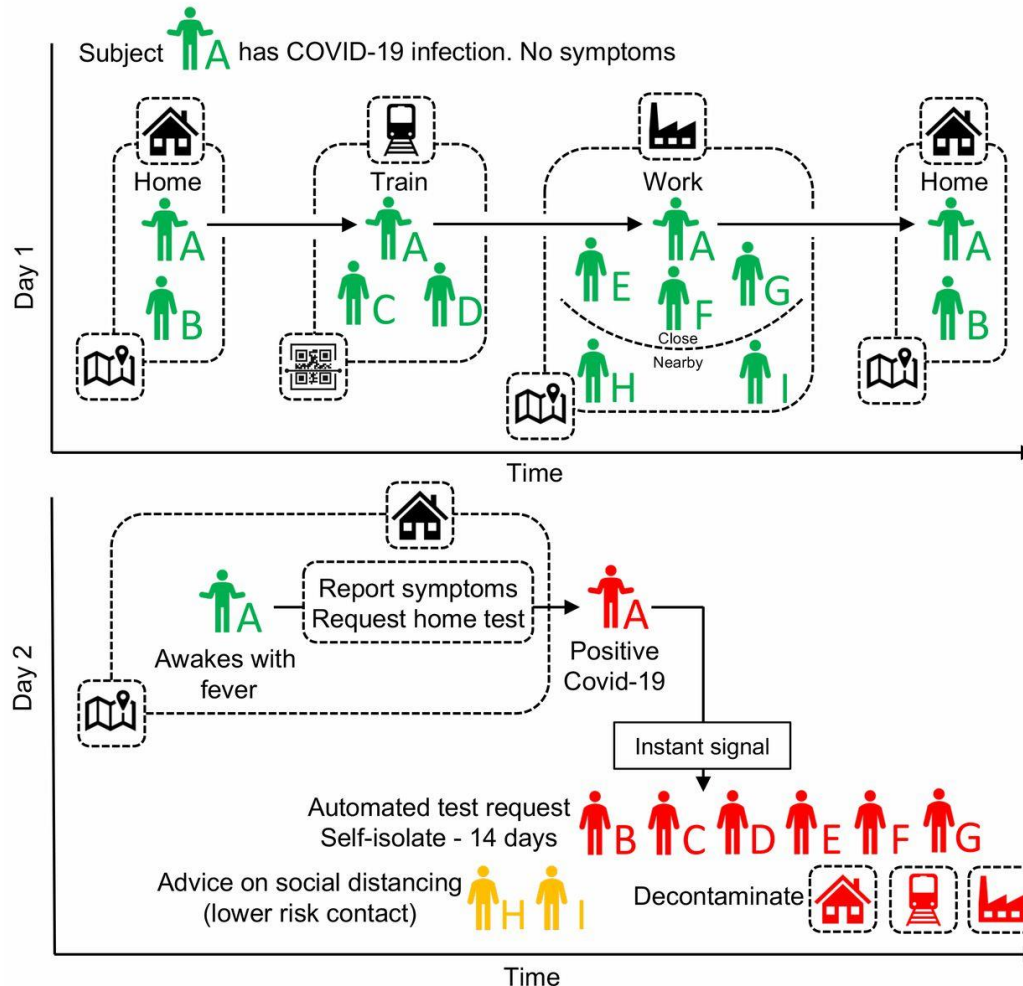


2d. Smartphone Trajectory Data

- For tracing the contacts of people carrying the virus.
- An infectious disease transmission model can be used to assess the risk of transmission and the need to notify the exposed.
- Once the contacts are identified, public safety technology such as Reverse 911 can be used to deliver any medical advice to people potentially exposed.

Tracing Contacts

Fig. 4 A schematic of app-based COVID-19 contact tracing.



Luca Ferretti et al. *Science* 2020;science.abb6936

3. Machine Learning

3a. Finding Patterns

- NYU's Grossman School of Medicine and the Courant Institute of Mathematical Sciences in partnership with Wenzhou Central Hospital and Cangnan People's Hospital led an artificial intelligence project that studied and predicted which people with the virus would go on to develop severe respiratory disease.
- The AI project concluded that levels of a liver enzyme, alanine aminotransferase (ALT), reported myalgia, and hemoglobin levels were the most accurate patterns to predict severe lung disease.



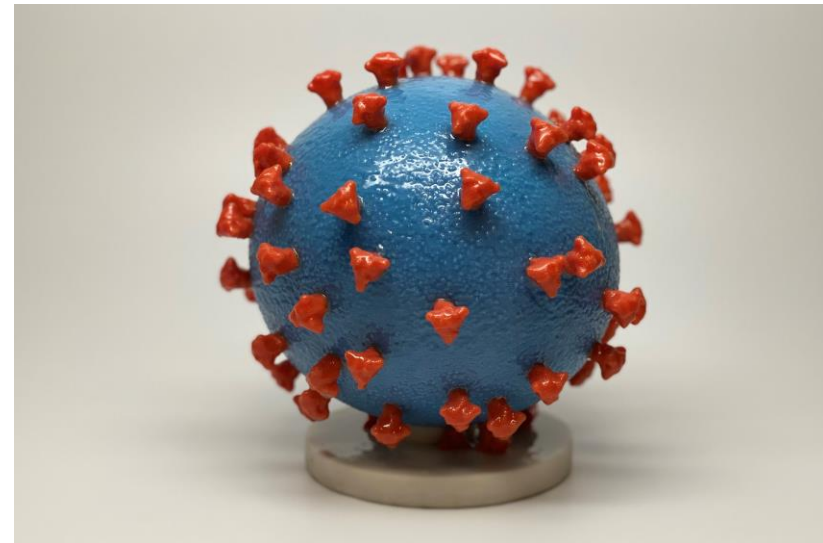
3b. Telemedicine

- Medicare telehealth services to fight COVID-19.
- The services include nurse practitioners, clinical psychologists, and social workers.



3c. Tracking the Coronavirus

- BlueDot, a Canadian AI platform tracked a cluster of “unusual pneumonia” around a market in Wuhan. Nine days later, the WHO released a statement, declaring the discovery of a “novel coronavirus.”
- BlueDot uses machine learning algorithms to peruse information from hundreds of sources for early signs of infectious epidemics.
- Algorithms to study travel patterns were able to predict where the people who had contracted the virus were likely to travel.



4. Crowdsourcing

4a. Finding a Vaccine

- One of the largest crowdsourced supercomputing projects in the world to find a vaccine is led by Greg Bowman, a computational biophysicist associate professor at Washington University School of Medicine.
- The project is called Folding@home.
- Bowman and his team are trying to understand the structure of COVID-19's spike protein, used by the virus to infect cells.



<https://youtu.be/RGGzMQ2oFrA>

<https://medicine.wustl.edu/news/crowdsourced-supercomputing-project-sets-sights-on-coronavirus/>

4c. NASA @ WORK

- NASA is using its crowdsourcing platform NASA@WORK, to collect creative ideas about new ways to address the COVID-19.
- They are already offering supercomputing resources for treatment research.



5. Internet of Things

5a. Smart Thermometers kinsa™

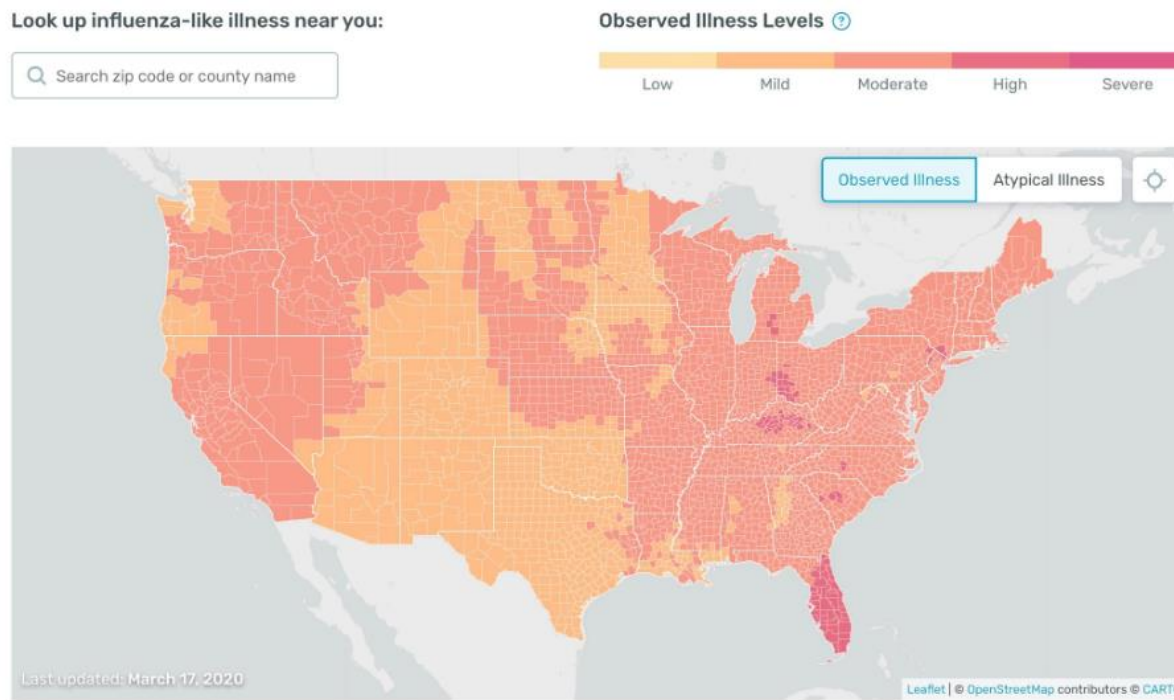
The New York Times

Can Smart Thermometers Track the Spread of the Coronavirus?

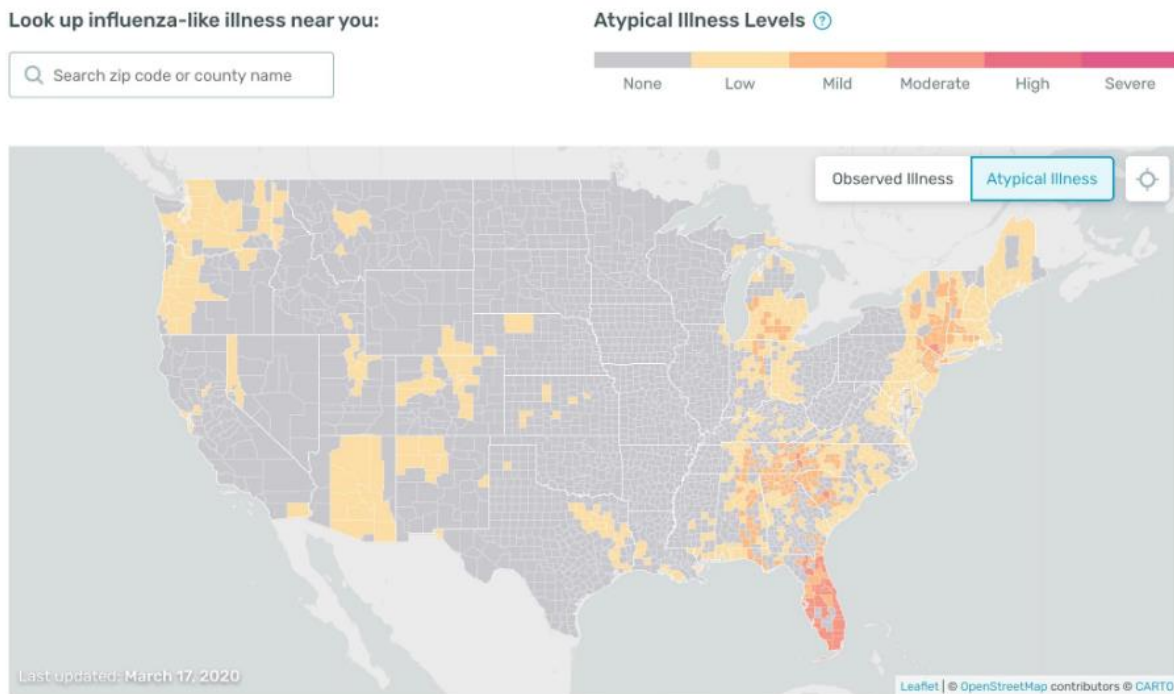
- Kinsa Health has sold more than a million internet-connected thermometers.
- Over the last two years they have drawn accurate maps of the spread of the flu two weeks ahead of the CDC.
- They can compare observed to expected “flu-like” levels to identify atypical illness levels, likely attributable to Covid.



Observed

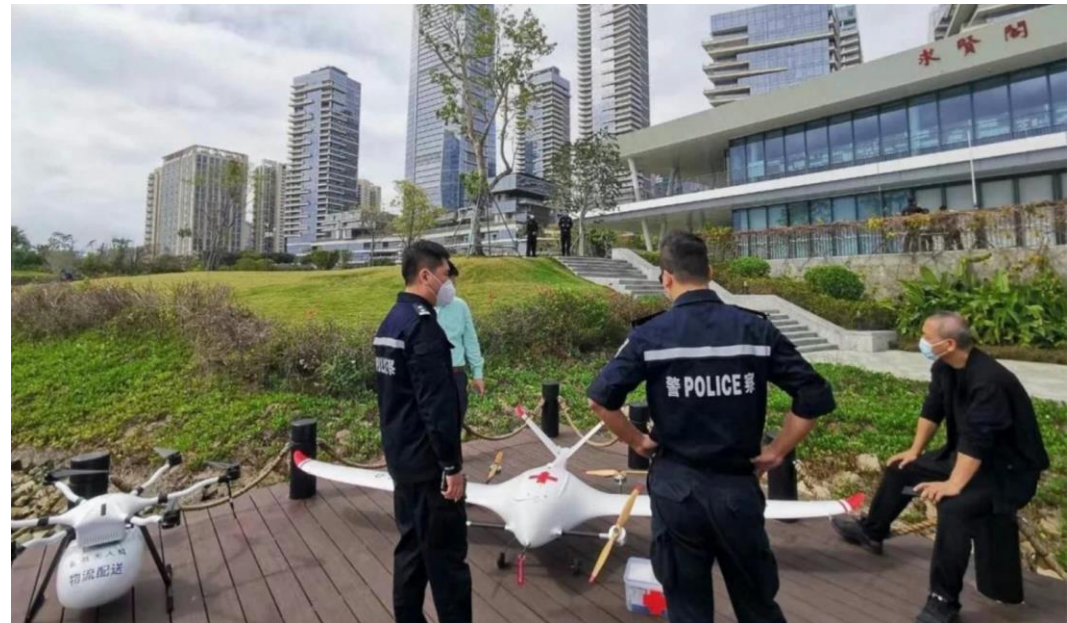


Atypical



5b. Drones

- The Chinese government uses drones to monitor compliance with public health measures.
- Drones software has been rewritten to adapter applications for crowd management and disease detection.
- The srones are outfitted with thermal sensors and spray jets for disinfecting large areas.



5c. Coronavirus Health Chats

- Conversa Health launched Coronavirus Health Chats to manage COVID-19 patients.
- It allows a better virtual care to help people assess risk, stay safe, and check symptoms.
- The platform enables healthcare organizations to monitor, engage, and manage the patients.



6. Virtual Reality

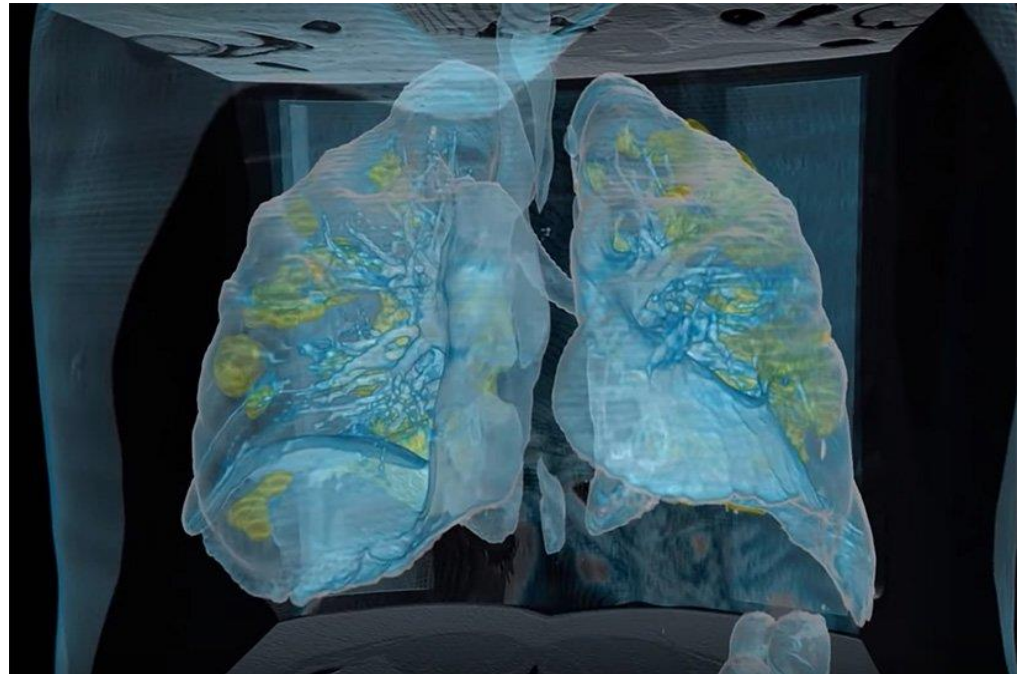
6a. Augmented Reality

- Augmented Reality technology is allowing a mix of 3D models of viral structures, that give coronaviruses their characteristic crown appearance, layered onto live video.
- The tool is called ChimeraX, a molecular visualization program developed by Tom Goddard, a programmer and analyst at the University of California San Francisco.
- Using a depth-sensing camera and a VR headset, Tom is able to manipulate the 3D models of the SARS virus.



6b. Surgery

- Virtual Reality technology assesses the first COVID-19 patient at George Washington Hospital.
- Surgical Theatre, a well-know developer of VR imaging software, allows to see the inside of a coronavirus-damaged lung.



6c. Virtual Space

- MeetinVR claims that there is a 25% increase in attention span when meeting in virtual reality space compared to video conferencing.
- Yaser Sheikh, Director of Facebook Reality Labs told *Wired*, “The real promise of VR is that instead of flying to meet me in person, you could put on a headset and have this exact conversation that we’re having now.”
- VR has the advantages over video conferencing because the participants are in the same virtual space.



7. Robotics

7a. Performing Tests

- Engineers in China have developed a robot to treat and test COVID-19 patients while allowing healthcare workers to remain at a safe distance.
- The remote-controlled robot, can take mouth swabs, ultrasound scans and listen to organs with a robot stethoscope.



7b. Taking Care of People Carrying the Virus

- At a smart hospital in Wuhan, robots outnumber human caregivers.
- Robots take vital signs, deliver medicines, disinfect the facility, and even entertain quarantined patients.
- At the entrance of the Hospital, 5G- powered temperature measurement devices flag patients displaying fever symptoms.



7c. Autonomous Vehicles

- Even if autonomous vehicles still require disinfection, self-driving cars might minimize the spreading of the virus.
- Robotaxis, delivery robots, and specialized vehicles contribute to social distancing.



8. Crowdfunding

8a. CDC Foundation

- The CDC Foundation launched a crowdfunding campaign aimed at raising \$100 million to bolster public health response efforts.
- “The campaign provides an incredible opportunity for individuals, philanthropies and corporations to take part against COVID-19,” says Judy Mondroe, president and CEO of the CDC Foundation.
- Funds raised will be used to: help communities prevent, detect and response COVID-19; fund and deliver critical home essentials, such as food and medical needs; and build capacity and infrastructure for global response efforts.



8b. Healthcare Provider Protection

- UCLA Health has created two COVID-19 funds to support healthcare provider protection.
- One fund will provide protective equipment to meet the needs of medical professionals, support for ventilators, and seed innovation that leads to advances in testing, treatment and devices.
- A second fund will provide for exploration of the pathogenesis and transmission of the coronavirus, the development and scaling up of novel diagnostics tests and infectious disease education for health care providers and the public.



8c. Foundation Initiatives

- The Chan Zuckerberg Initiative announced it is contributing \$25 million to an accelerator run by Bill & Melinda Gates Foundation for finding treatments for COVID-19.
- The project's goal is to discover affordable treatments to COVID-19 patients that can be distributed at scale.
- MasterCard and the Wellcome Trust are also partnering

9. Digital Currency

9a. Getting Money to People Faster

- Funds from the economic stimulus package can be disbursed more quickly with the “use of a digital dollar or digital dollar wallet.”



9b. Crypto Communities

- Cryptocurrency exchange **Coinbase** has formally codified a multistage disease response plan into company policy, basing its system on how employees and company offices as a whole will act when certain possibilities occur, such as a rise in coronavirus cases.
- In this pandemic situation, the decentralized nature of the cryptocurrency and blockchain space has been a particular advantage as many tech workers are used to work on sophisticated projects from home.



9c. Mobile Payments

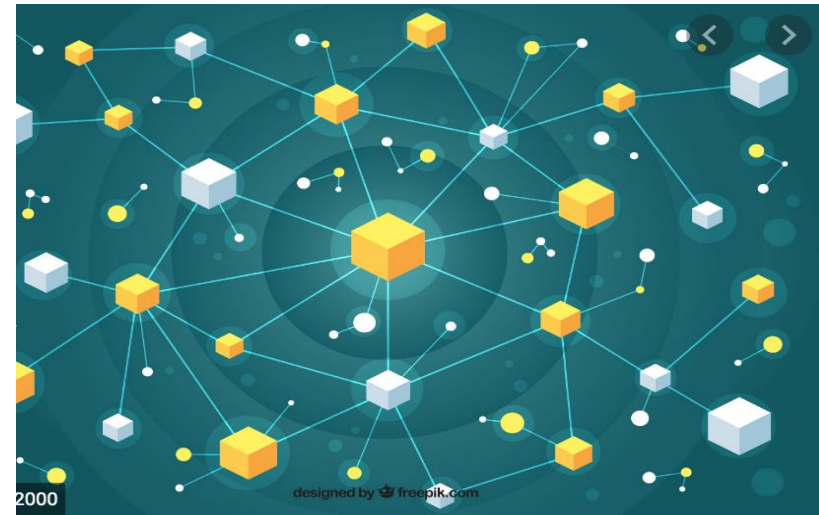
- Africa is using digital finance as a means to stem the spread of COVID-19.
- In Kenya, the largest telecom, **Safaricom**, is waiving fees on East Africa's leading mobile-money platform, **M-Pesa**, to reduce the physical exchange of currency in response to COVID-19.



10. Blockchain

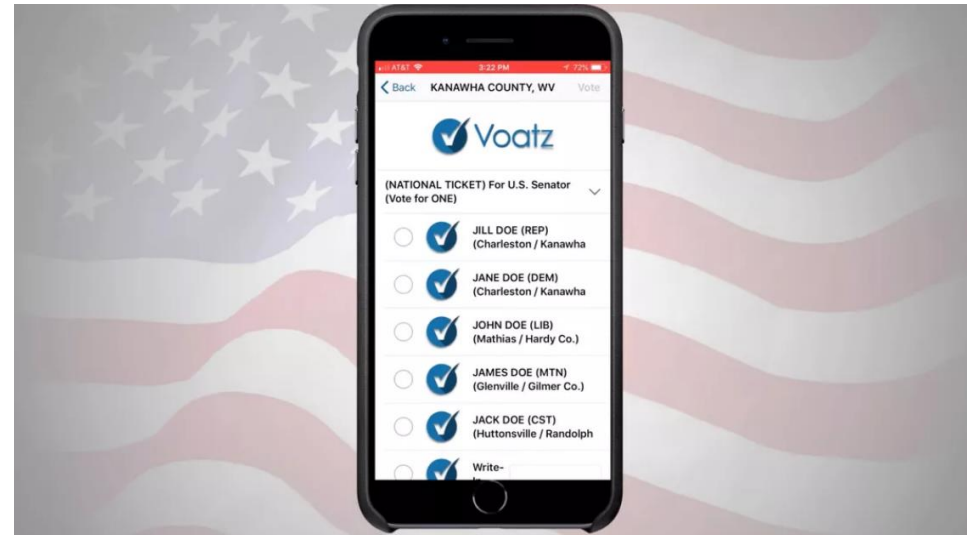
10a. COVID-19 Data Information

- The WHO is working with blockchain on a program to help convey data about the ongoing COVID-19 pandemic.
- **MiPasa**, a distributed ledger technology (DLT), will hopefully help with early detection of the virus and identifying carriers and hotspots.
- **MiPasa** is built on top of Hyperledger Fabric in partnership with IBM, computer firm Oracle, enterprise blockchain platform HACERA and IT corporation Microsoft.



10b. Enabling Voting During Quarantines

- Startup **Voatz** uses blockchain technology to record the votes of overseas citizens and military personnel.
- The company says it secures votes from cyber attacks using blockchain technology to encrypt the data.
- However, **Voatz** hired a Trail of Bits to conduct a security review last December and found 79 issues with the software, including issues with personal information that can be leaked to attackers and insufficient monitoring for potential attacks.



10c.Managing Supply Chains

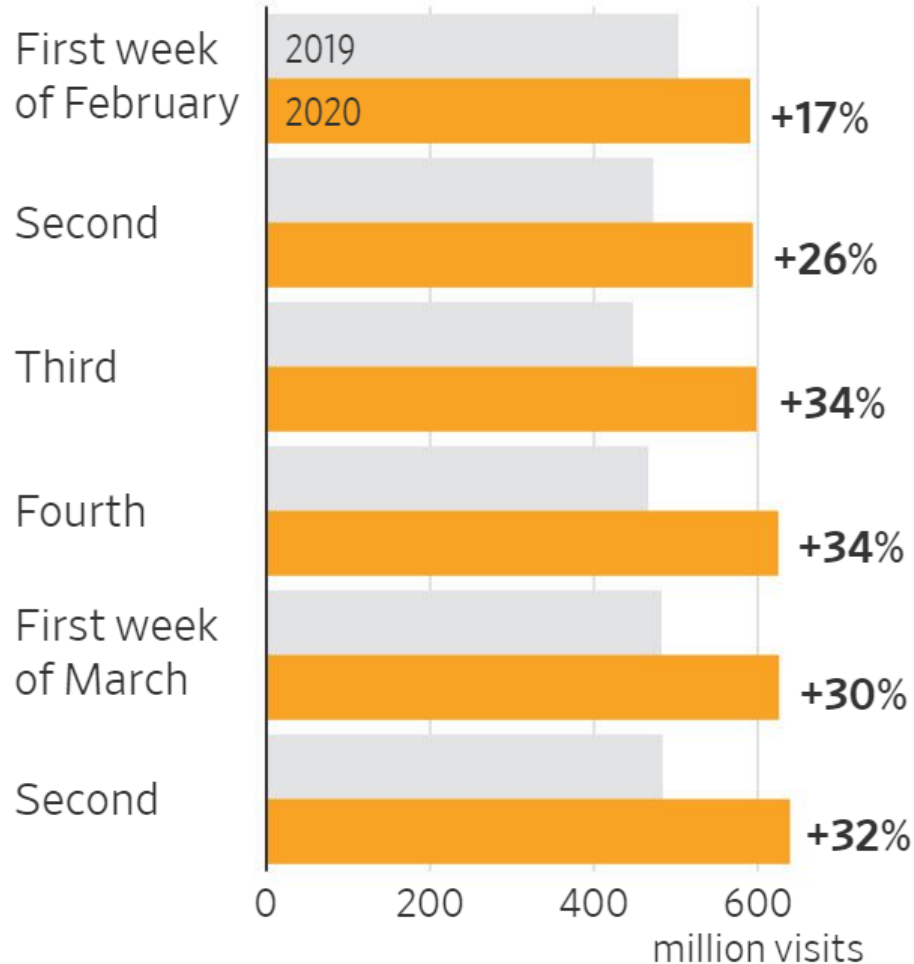
- Blockchain technology is already being used to manage the movement of goods from producers and suppliers, to stores and to consumers.
- Luis Macias, founder and CEO of **GrainChain Inc**, uses a blockchain system to empower small farmers, partnering with coffee farmers in Honduras and connecting them directly to shippers, distributors and retailers.
- **IBM** is also using blockchain to bring more transparency to food supply chain through its product IBM Food Trust.



11. E-Commerce

11a. Online Retail

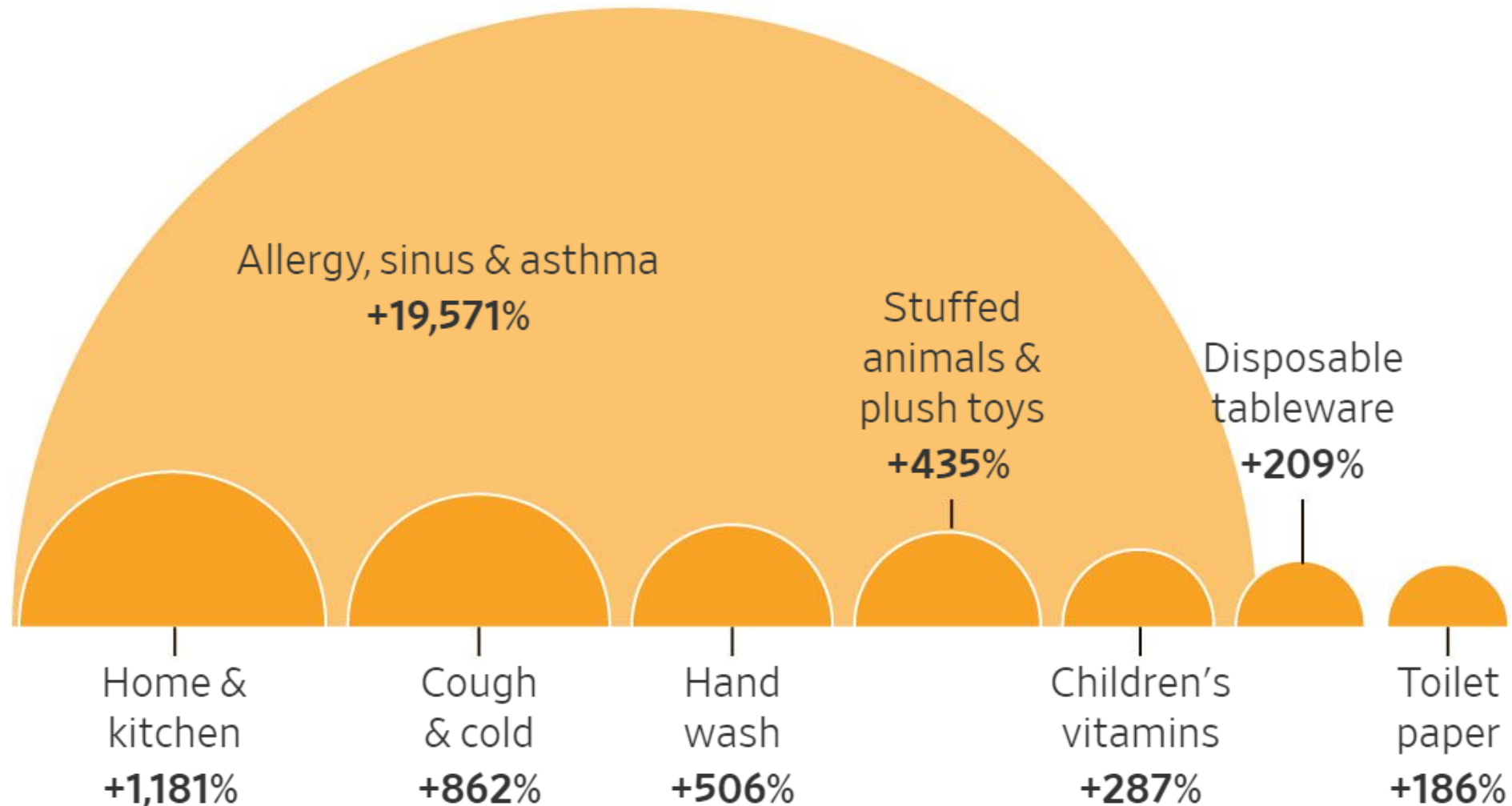
Weekly U.S. Amazon visits



Source: Comscore

E-Commerce Categories

Amazon sales by category, Feb. 20-March 23, change from a year earlier

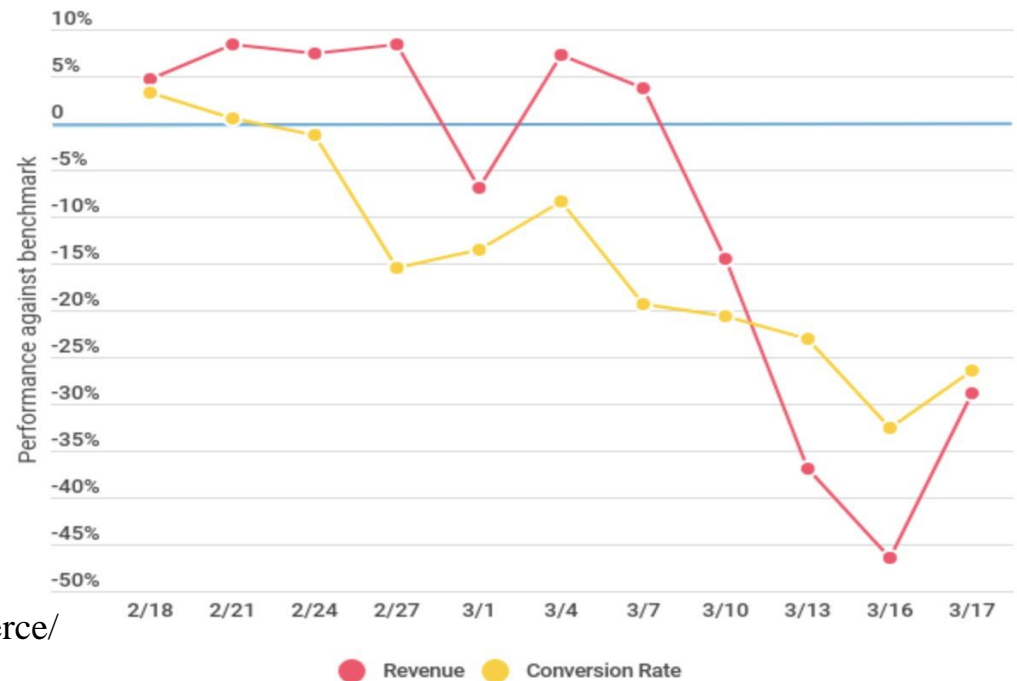


Source: CommerceIQ analysis of 5,000 products across 50 categories on Amazon

<https://www.wsj.com/articles/amazon-struggles-to-find-its-coronavirus-footing-its-a-time-of-great-stress-11585664987>

11b. Subscription Services.

- Subscription and convenience services have seen significant upward trends in both revenue and conversion.
- **Disney** is providing a free movie to streaming subscribers starting April 3.
- Social-distancing imperative brings more attention and potential subscribers to the streaming services.



<https://www.bigcommerce.com/blog/covid-19-ecommerce/>

<https://www.fool.com/investing/2020/04/02/disney-is-onward-and-upward-despite-covid-19.aspx>

10c. New Marketing Initiatives

- New Balance, an athletic footwear and fitness apparel, is dedicating its U.S. factories to develop, manufacture and deliver face masks to hospitals.
- Brands say that email marketing is also working best for them.

**Made shoes yesterday.
Making masks today.**



All hands on deck. Our U.S. factories are working to develop, manufacture and deliver facial masks to the hospital community.

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Mauro Guillén's Online Courses

- Analyzing Global Trends for Business and Society.

<https://www.coursera.org/learn/wharton-global-trends-business>

- Managing the Global Firm.

<https://online.wharton.upenn.edu/leadership-and-management-certificate/>

- Managing in the Global Digital Economy.

To be launched in April 2020.

- Globalization: Social, Economic, and Political Aspects

To be launched in the Spring of 2021.

Sources of Information

- Johns Hopkins Coronavirus Resource Center: <https://coronavirus.jhu.edu/>
- World Health Organization: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
- Pew Research Center: <https://www.pewresearch.org/topics/coronavirus-disease-2019-covid-19/>
- International Monetary Fund: <https://www.imf.org/en/Topics/imf-and-covid19>
- World Bank: <https://www.worldbank.org/en/who-we-are/news/coronavirus-covid19>
- Bureau of Economic Analysis: <https://www.bea.gov/>
- United Nations: <https://www.un.org/en/coronavirus>
- Air travel: <https://www.iata.org/en/programs/safety/health/diseases/>
- BBC: <https://www.bbc.com/news/explainers>
- Brookings: <https://www.brookings.edu/topic/coronavirus-covid19/>
- Peterson Institute for International Economics: <https://www.piie.com/>
- American Enterprise Institute: <https://www.aei.org/2019-coronavirus-coverage/>
- The Conference Board: <https://info.conference-board.org/kW06r0x10PK00BWZbS0Og0Z>
- JP Morgan: <https://privatebank.jpmorgan.com/gl/en/insights/investing/eotm/coronavirus-research>

Session Narrative Summary

How can technology help cope with the COVID-19 pandemic? Using examples from around the world, this session explores applications of additive manufacturing, big data, machine learning, crowdsourcing, the internet of things, virtual reality, robotics, crowdfunding, cryptocurrencies, the blockchain, and e-commerce to help curb the spread of the virus and cope with the economic and financial implications.

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