Facebook Data for Good Annual Report 2020









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Foreword

By Sheryl Sandberg Chief Operating Officer, Facebook

When Facebook launched the Data for Good program in 2017, we never imagined it would play a role so soon in response to a truly global emergency. The COVID-19 pandemic is not just a public health crisis, but also a social and economic one. It has caused hardship in every part of the world, but its impact hasn't been felt equally. It has hit women and the most disadvantaged communities the hardest – something this work has helped shine a light on.

In response to the pandemic, Facebook has been part of an unprecedented collaboration between technology companies, the public sector, universities, nonprofits and others. Our partners operate in some of the most challenging environments in the world, where lengthy analysis and debate is often a luxury they don't have. The policies that govern delivery of vaccines, masks, and financial support can mean the difference between life and death. By sharing tools that provide real-time insights, Facebook can make decision-making on the ground just a little bit easier and more effective.

This report highlights some of the ways Facebook data – shared in a way that protects the privacy of individuals – assisted the response efforts to the pandemic and other major crises in 2020. I hope the examples included help illustrate what successful data sharing projects can look like, and how future projects can be improved. Above all, I hope we can continue to work together in 2021 and beyond to save lives and mitigate the damage caused by the pandemic and any crises that may follow.

About Data for Good

The mission of the **Data for Good program** at Facebook is to empower partners with privacy-preserving data products that strengthen communities and make progress on social issues.

Facebook's Data for Good initiative began in 2017 with the launch of Disaster Maps, a series of privacy-preserving data sets designed to help humanitarian organizations better respond to natural disasters. Since that time, the program's portfolio has grown to include dozens of tools built for addressing public health emergencies, spurring economic opportunity, and fighting climate change.

DATA FOR GOOD PRODUCTS

Data for Good offers organizations a range of tools, including high resolution population density maps built with satellite imagery and census information, surveys conducted in collaboration with academic institutions, and analysis of public post information to improve the effectiveness of online campaigns. These map, survey, and insights products are all built with the goal of achieving better research, outreach and service delivery in times of crisis.



PRIVACY PROTECTION

All of Data for Good's tools are formatted to prevent re-identification, while preserving useful crisisresponse insights. For example, maps that include location information are aggregated in a way that protects the privacy of individuals by using techniques like spatial smoothing to create weighted averages and obscuring areas where few people live. For certain public datasets, we use a differential privacy framework, which takes into account the sensitivity of the aggregated dataset, and adds a random number of additional observations to each area to ensure no one can re-identify users. To learn more about Data for Good's privacy by design approach, please read our **Privacy Matters** post.¹

GLOBAL PARTNERSHIPS AND REACH

The Data for Good program partners with over 450 organizations in nearly 70 countries and all of our tools are built collaboratively. Our publicly available tools, available on Humanitarian Data Exchange and through Amazon Web Services, were downloaded over one million times in 2020.

This report is the result of a research collaboration between Data for Good and its partners. In late 2020, researchers from Direct Relief, the Crisis Ready Network, NetHope, and Facebook interviewed a range of Data for Good partners about their applications of Facebook data for humanitarian responses. Because many tools produced by Facebook Data for Good are publicly available, the information included in this report does not capture all use of Facebook data products. However, by sharing lessons learned from select partners, we hope to provide an illustration of the potential impact that Facebook data can have in responding to crises.



Facebook Data for Good partners with over 450 organizations across nearly 70 countries in the world. Darker shade of blue indicates a higher number of partners

January - February

The Australia Bushfires and the onset of COVID-19

KEEPING COMMUNITIES AND RESPONDERS IN AUSTRALIA SAFE FROM UNPRECEDENTED WILDFIRES

On New Year's Day 2020, Australia was ablaze. Bushfires that began in September 2019 during record heat and drought conditions had, by January, grown to unprecedented levels, affecting nearly every region of the country. Eventually over 46 million acres burned, destroying nearly 6,000 homes and businesses, killing 34 and displacing nearly 65,000 people. An estimated three billion animals lost their lives to the fires. By January, the capital city of Canberra was experiencing the worst air quality in the world, and virtually the entire Australian emergency response capacity had been mobilized in the regions of New South Wales and Victoria.

The Facebook platform overall played a key role in public information and education efforts by facilitating the targeted alerting - and regular, localized updating - of public safety information. According to Shane Fitzsimmons, the Fire Commissioner for New South Wales, public information management became as important as fire-fighting itself.

Datasets produced by Facebook's Data for Good team helped the global medical relief agency Direct Relief to ship 430,000 N95 respirator masks into Australia to protect emergency responders from wildfire smoke, including national and state authorities, the Australian Red Cross, firefighters and ambulance crews, as well as health clinics and schools in key affected areas.



Nearly 100,000 N95 respirator masks are loaded onto a Qantas plane in Los Angeles on Jan. 6, 2020, bound for wildfire-impacted areas of Australia

Information on rates of population movement and displacement fed into improved understanding of the scale of shipments required, and the areas most in need throughout the rapidly changing landscape.

Surveys run by the Facebook Data for Good team and the Internal Displacement Monitoring Center² helped measure the extent of displacement and its differential impact on men and women. The analysis found that men were evacuating at slightly higher rates than women, but that women were evacuating earlier and were also more likely to do so in response to official evacuation orders. These insights offered invaluable feedback to emergency managers like Commissioner Fitzsimmons for their public information campaigns and planning for future events.



Population density mapping reveals evacuation patterns for communities affected by wildfires

THE EMERGENCE OF THE COVID19 PANDEMIC AND THE RESPONSE OF THE RESEARCH COMMUNITY

In early January 2020, as people were still fleeing the Australian coasts and the smoke drifting towards New Zealand covered an area greater than western Europe, the World Health Organization (WHO) began **posting to social media**³ about an unusual cluster of pneumonia cases reported by the Chinese government in the city of Wuhan, China. Soon thereafter, the first cases of the novel coronavirus, eventually named COVID-19, were reported in several other parts of China, as well as Japan, South Korea, Hong Kong, Taiwan, and Singapore.

By the 30th of January, China had already issued its first wave of travel restrictions and the **WHO** declared COVID-19 a public health emergency⁴. In February, a multi-disciplinary and multi-national research effort was launched to understand the disparate aspects of this new viral threat. Their efforts ranged from early gene sequencing studies, the demographics of risk factors, to the first studies of non-pharmaceutical interventions including physical distancing, mask wearing, and enhanced sanitation efforts.

March - April

A global pandemic emerges

On March 11th, the WHO Director General officially declared COVID-19 a global pandemic.⁵ Alongside this announcement, researchers at the Institute for Disease Modeling, the Fred Hutchinson Cancer Research Institute, and the Gates Foundation in Seattle, WA, published a landmark paper⁶ that sought to uncover what might happen to transmission rates if physical distancing were generally instituted. The researchers chose Seattle, not only because it was their home, but also because it was among the first US cities affected by COVID-19, and its recent history of extreme weather created a kind of natural experiment for linking infectious disease incidence to reduced population mobility.

The "snowpocalypse" event that shut down much of the Seattle metro area in early 2019 allowed for a rough comparison with changes in flu infection rates. This comparison, when combined with Facebook data on population mobility, indicated that broad-based physical distancing might reasonably achieve a 25% reduction in social contacts, resulting in nearly a four-fold expected decrease in potential cases within a month — a number with huge implications for Seattle's hospitals and health care system.



Scenarios for the possible cumulative burden of COVID-19 infection in King and Snohomish counties. Based on data from China and other countries, deaths occur in approximately 1 percent of the infected population (averaged across all ages) with an average three week delay relative to infection.

The Seattle mobility research was circulated widely through the public health and policy communities in Washington State and across the US, informing some of the early decision making about stay-athome orders.

A follow-up paper was published at the end of March by the same researchers, which also looked in detail at land use patterns within Seattle to understand spatial variations in mobility. This research was **cited**⁷ by Seattle and King County public health staff as key, early evidence of the effectiveness of physical distancing in curbing the spread of COVID-19. "We are seeing a positive effect from the social distancing and other measures we've put in place, although significant numbers of cases and deaths continue to occur."

> **Dr. Jeff Duchin** Health Officer for Public Health Seattle & King County

USING DATA ON POPULATION MOBILITY TO HELP PUBLIC HEALTH AGENCIES RESPOND TO COVID19

In the absence of a vaccine, the principal response to COVID-19 involved non-pharmaceutical interventions such as reducing travel to minimize viral contacts. Throughout the world, a variety of restrictions were put into place, including international travel restrictions such as border and airport closures, and eventually encompassing full-scale lockdowns.

Italy was the first country outside of China to move towards strict mobility restrictions at scale. Communities in a handful of small, northern Italian towns were told to stay at home on February 23rd. By the 9th of March, the entire country was on lockdown. The Italian government, through the Ministry of Innovation, formed its first coronavirus data task force in the first weeks of March, and urged the country's research community to come together around a national data-driven response plan. Some of the key, initial members of this task force included University of Pavia, Politecnico di Milano, University of Venice Ca Foscari, and Sapienza University of Rome, which utilized Facebook's data on population movement to **begin informing Italy's health leadership**⁸ about the social and epidemiological impact of movement restrictions. With Italy under lockdown and cases rising across Europe and the United States, demand for policy feedback on COVID-19 exploded. On Saturday, March 14th, an emergency gathering of the Facebook Data for Good community — attended by dozens of representatives from academia, non-profit institutions, and UN agencies was called to determine how institutions with existing Facebook data agreements might best collaborate to support their public sector counterparts.

The March 14th emergency meeting led directly to the formation of the COVID-19 Mobility Data Network (CMDN). Led by Drs. Caroline Buckee and Satchit Balsari of Harvard's Center for Communicable Disease Dynamics, Medical School, and School of Public Health, and Andrew Schroeder, the VP of Research and Analysis at Direct Relief, the CMDN played a key role throughout 2020 in coordinating public sector research support to cities and countries throughout the world, ranging from New York City, Syracuse, Boston, Chicago, New Orleans, Houston, Miami, Kansas City, San Jose, and Los Angeles to countries such as Canada, Chile, Peru, the United Kingdom, Spain, Italy, Botswana, India, Bangladesh, and Thailand

Shortly following, on March 17th, Facebook's CrowdTangle team launched a COVID-19 Live Display Hub, containing 100 public, real-time streams of COVID-19-related posts from public pages and accounts, including governments, global leaders, and media.

The state of California was among the first in the United States to put together a data team similar to those that proved instrumental in Italy's initial COVID-19 response. Through the CMDN, Direct Relief provided routine data support⁹ to California, leveraging an early version of Facebook Movement Range Maps, which revealed county-level metrics on the percent of people staying near home, as well as the overall county-level change in mobility.



Dashboards and analyses created by researchers at University of Pavia and other Italian research institutions helped inform Italian lockdowns

"We analyzed the social and economic impact of the mobility restrictions and designed models and scenarios for assessing the impact of exit strategies. Data provided from the Facebook Data For Good program were a key asset in the analysis."

Walter Quattrociocchi

Associate Professor in Computer Science and Head of the of the Data and Complexity for Society Lab at Sapienza Università di Roma Early findings from the California data indicated that places like San Francisco and Los Angeles, home to large numbers of workers who were able to shift towards remote work, performed quite well in terms of reducing mobility and controlling case totals.

However, areas with disproportionate numbers of jobs in agriculture, logistics, and services, such as Imperial County, San Bernardino, and the Central Valley, experienced significant challenges in lowering mobility rates and in controlling the spread of COVID-19. These social and geographic disparities, as well as the disproportionate impact COVID-19 had on communities of color, proved to be central factors in ongoing transmission as the pandemic progressed.

By late March, the New York City metro area had become the global epicenter of the pandemic. At the request of NYC's Chief Technology Officer, the city put together a working group on data for COVID-19. The data science volunteers in this group engaged with members of the CMDN to build a set of analytics workflows that used Facebook population mobility data to inform NYC's COVID-19 response.

According to representatives from the New York Department of Health and Hygiene, the key questions that Facebook's data helped to answer focused on neighborhood-level changes in mobility and transitions from borough to borough. Much like California, with its marked differences in employment based on where people live, New York City's leaders were concerned with disparities in the rates at which essential workers in the outer boroughs had to continue to make daily commutes at great personal risk of infection. These insights on interborough transitions played an important role in helping the Department of Health adjust physical distancing policies over time.



Dr. Mark Ghaly discusses mobility reports from the COVID-19 Mobility Data Network built with Facebook data during a California press conference on April 10, 2020

"Having access to the publicly available mobility data from Facebook helped inform our thinking around California's physical distancing efforts."

> **Dr. Mark Ghaly** Secretary of the California Department of Health and Human Services

Key insights from New York City were published in the journal Nature¹⁰ by Nishant Kishore and Dr. Caroline Buckee from Harvard, who found that higher rates of interborough travel led to higher rates of COVID-19 seroprevalence among pregnant women.

At the same time the United States was facing spikes in New York, lockdown orders were being issued in Mexico. To monitor country-wide adherence to these policies, the Undersecretary for Prevention and Health Promotion, Hugo López-Gatell, official Government spokesman for COVID-19, discussed monitoring mobility rates with Facebook data in an April press conference with President Andrés Manuel López Obrador.



SARS-CoV-2 prevalence was found lower in boroughs with greater declines in commuting movements

" Through Facebook we can also have confidential monitoring, which is very clear here. The identity of people is not at stake, of social network users, there is automatic monitoring in numerical terms, but nothing compromises the identity of people, nor your private information."

> **Dr. Hugo López-Gatell** Undersecretary for Prevention and Health Promotion in Mexico



Dr. Hugo López-Gatell discusses mobility rates by state based on Facebook data during an April press conference with President Andrés Manuel López Obrador

To support ongoing monitoring of COVID-19 in Mexico, the Consejo Nacional de Ciencia y Tecnología (CONACYT), created several data products using Facebook mobility data to advise the government on its strategy. CONACYT used Facebook mobility data to help predict how fast the virus might grow, as well as a mobility index to show how different states were performing in their relative reduction in people traveling. All of these reports factored into ongoing guidance to governors about risk of transmission in their states and informed a range of prevention strategies.

" Besides measuring the effect that social distancing measurements have on people's mobility, having access to this dataset has enabled us to detect regions that are interconnected which has given us a lot of context regarding the dynamics of the pandemic. This information has been key for us to inform the decision making process in such important times."

Paola Villarreal Rodríguez Coordinator of Research and Prospective Repositories of CONACYT

In Spain, one of the hardest-hit European countries, the Universitat Politècnica de Catalunya (UPC) provided a number of analyses on Facebook mobility data to the European Commission¹¹ to help inform containment measures throughout the region. In an analysis on Spanish re-openings, University of Catalunya found that mobility during the early April weekends post-lockdown was no higher than weekday mobility rates during the lockdown period, suggesting that a relaxation in stay at home orders did not lead to immediate spikes in people traveling outside the home.¹² These analyses were delivered weekly to European Union policymakers and helped inform thinking about stay at home orders across Europe.

" Facebook Data for Good tools are very robust and key in our reporting to the European Commission. They have shown that government measures have been having the desired impact and have been useful in comparing the situation of Northern European countries with Southern countries...These tools explain epidemiological dynamics within a country, while helping us to understand regional variability inside a country."

Enric Alvarez-Lacalle

Associate Professor Computational Biophysics, Department of Physics, BIOCOM-SC Research Group. UPC-BarcelonaTech

By the end of April, significant signs of progress in Europe sparked hope that the pandemic might be contained in time for medical researchers to make progress on vaccines and treatment. Mobility analyses using Facebook's data continued to serve as essential resources for health analysts across the world.

USING COLOCATION DATA TO FORECAST DISEASE TRANSMISSION

While COVID-19 surged in Europe and the United States, one country stood out as having undertaken uniquely rigorous and successful containment efforts. Taiwan, which saw one of the earliest outbreaks, implemented an extremely effective COVID-19 response strategy. Over the entire year, only seven people — out of a population of 24 million — died from COVID-19.

Taiwan's response plan included a combination of rapid contact tracing of positive test results, quarantines for infected cases, tight controls on incoming travel, expanded sanitation, and universal mask mandates. Leadership of the response was located within a Central Epidemic Command Center and the Taiwanese Centers for Disease Control (CDC), both of which acted quickly to monitor case alerts in real-time and implement response plans. An **October 2020 study in the Lancet**¹³ highlighted each of these areas as being crucial to Taiwan's success.

Data analysis and modeling were also at the center of Taiwan's effort to contain COVID-19. In addition to general population statistics and integrated data through the national health system, Taiwanese researchers were among the first to implement a new dataset that was produced by Facebook Data for Good on the colocation probability of people from different regions to understand the rates at which people may be coming into contact. " Given the colocation probability, we can estimate the risk of infection for different locations, even without any cases. If we know the contact probability difference, then we know that R(t) (the number of individuals that will be infected by a single infected individual) will be different in different places."

Hsiao-Han Chang College of Life Science, National Tsing Hua University

By knowing changes in colocation rates, researchers could improve their models of infection transmission risk and get ahead of future outbreaks. This foundational research, along with Facebook campaigns conducted in partnership with local health agencies, contributed to Taiwan's effective containment of the virus and ultimately led to Facebook's award of an official Medal of Appreciation from President Tsai Ing-wen.

" Facebook has not only assisted the Central Epidemic Command Center (CECC) in providing accurate information to users, but also provided big data on population mobility to help Taiwan analyze its epidemic prevention strategies."

President Tsai Ing-wen



Researchers at National Tsing-Hua University in Taiwan used Facebook co-location maps to understand how population contacts contributed to infection rates in Taiwan

May - June

Basic service delivery amidst a pandemic and COVID-19 in Latin America

HELPING INDIA RESPOND TO CYCLONE AMPHAN WITH FLOOD FORECASTING

While Taiwan undertook its nationwide plan to contain COVID-19, a low pressure zone developed into a concerning storm over the southern portion of the Bay of Bengal. Days later, that storm intensified and by the time it made landfall on May 20th, Cyclone Amphan was the largest to strike India in 20 years. Amphan affected nearly 45 million people, including 4.2 million that evacuated and nearly 1.2 million that were exposed to a coastal storm surge of nearly seven feet. Given strong early warnings, the vast majority of people evacuated to safety, but the storm was nevertheless considered to be the most financially costly natural disaster of the region in decades.



Researchers at the University of Bristol analyze high resolution population density and terrain maps to understand the impact of Cyclone Amphan

To understand the number of people impacted by the cyclone's flooding, the University of Bristol used Facebook's High Resolution Population Density data to build flood forecasting and population exposure tools that were shared with India's emergency management agency via the UK Foreign, Commonwealth & Development Office. Using a methodology developed during Cyclones Idai and Kenneth, these studies made important gains in specific projections of the number of people exposed to flooding events, which in turn improved the capacity of response agencies. According to Dr. Laurence Hawker of the University of Bristol, the scale of detailed information afforded by Facebook population data was essential to ensure that impact estimates could account for precise settlement locations and transport networks at local levels. "We can look by locality now at which district would be particularly affected; then we look deeper into that area and find out why particular towns are more affected than others - Will this particular road be cut off given certain levels of inundation? That is the extra level of analysis that my colleagues and I are doing; and that's why that level of spatial resolution is really important."

Dr. Lawrence Hawker School of Geographical Sciences, University of Bristol

Dr. Hawker's and his colleagues' **research**¹⁴ is now also contributing to analysis of flooding exposure compared to future climate change scenarios in high risk areas to inform both settlement and disaster response planning.

Alongside this work, Facebook launched Climate Conversation Maps, a tool designed for climate change researchers to understand trends in how people are discussing climate issues on social media.

RESPONDING TO SOCIAL AND ECONOMIC NEEDS DURING THE COVID19 SURGE IN LATIN AMERICA

Latin America saw increased cases of COVID-19 in several countries during the spring, but the pandemic did not peak across the region until the summer. Just as lockdowns and the expansion of COVID-19 controls brought the initial case spikes in Chile and Peru largely under control by early June, infection rates began to take off in waves across virtually every other country in the region from late June through much of the rest of 2020. One of the key issues in Chile, as in many parts of the world, was the unevenness of ability to adhere to physical distancing measures that varied based on income and socioeconomic status. Poorer Chileans had greater challenges with meeting basic needs during lockdown conditions, and had correspondingly higher incentives to travel, despite the risk of infection.

A team of researchers led by Pablo Marquet at Catholic University of Chile and Pamela Martinez from Harvard T.H. Chan School of Public Health, in collaboration with the COVID-19 Mobility Data Network, linked mobility data to an analysis of economic inequality for the Chilean Minister of Science. Their work in turn influenced policy discussions with the Minister of Interior and the President about how best to respond to the economic needs of the Chilean population. Policies around provision of food boxes to poorer citizens and increasing support for direct cash transfers were driven in part by mobility studies related to neighborhood and economic factors. Likewise, economic issues took center stage along with public health in Lima, Peru, which implemented some of the sharpest lockdowns in mid-April yet nevertheless saw enormous COVID-19 spikes in July and August. A high level of transmission appeared to be happening at markets that were attracting visitors into concentrated locations. This led to proposals in late May from the Lima city government to move temporary markets closer to poorer communities, in order to minimize the need to travel for basic needs and reduce congestion at existing markets.

Researchers in the Engineering School at the Universidad del Pacifico used Facebook's High Resolution Population Density data to undertake an **optimization analysis of potential temporary market locations**¹⁵ that would achieve the city's economic and public health policy goals.

The Universidad del Pacifico teams worked in tandem with municipal councils in Lima to improve understanding of where market transactions could happen safely during the pandemic, as well as to share broader insights on how to leverage novel data in analysis and policy making.

Elsewhere in the region, the non-profit research organization Social Progress Imperative was working with the Costa Rican government through their National Emergencies Committee to contain the spread of COVID-19 during celebrations amidst summer holidays. Social Progress Imperative used Facebook's publicly available Movement Range datasets to inform real-time risk mapping, which proved to be particularly important around holidays. By investigating changes in health risks based upon mobility during the national independence day celebrations, the Costa Rican government was able to estimate elevated risks for coastal communities and prepare for the impact on the health system.



High resolution population density data combined with economic analysis enabled better understanding of where to locate temporary markets in Lima during the COVID-19 lockdowns



"We developed a risk model by cantons in Costa Rica using socioeconomic data and the Facebook data - where socioeconomic factors play a major role in how people are able to distance, and those areas were then examined in terms of their mobility at a specific time like Independence Day. We could then inform the Ministry of Health that people were moving in this case towards Tallamanca, Aguirre and Osa, which are some of the best beaches in Costa Rica. And they could then begin focusing COVID19 protocols in those specific places."

> Jaime Garcia Social Progress Imperative

USING FACEBOOK POPULATION DENSITY MAPS TO PROVIDE ACCESS TO SHELTER AND CLEAN WATER

Sustaining essential ongoing programs in the face of enormous infectious disease risk was among the greatest challenges of 2020 for international development organizations. While COVID-19 cases continued to spread, development organizations endeavored to maintain programs that offered other basic services such as shelter and clean water.

One such organization was Cadasta Foundation, a nonprofit that focuses on securing land rights of marginalized communities, including people that live and work in urban slums but do not have official land titles. In early 2020, Pamoja Trust and Amnesty International, partners of Cadasta working in Kenya, became aware of demolition plans in Nairobi. Cadasta partnered with Pamoja Trust to determine whether communities in those areas were at risk of eviction.

Cadasta used Facebook High Resolution Population Density Maps and geospatial analysis to create visualizations of each of the locations and identified at-risk areas falling within 100, 200, and 500 meters radius from the planned demolition locations, classified as Extreme Risk (100 m), High Risk (200 m), and Medium Risk (500 m) of eviction.

" Facebook Population Density Maps were very useful in creating a solid foundation that successfully convinced local officials to halt the forced evictions."

Justus Wambayi Program Specialist at Cadasta Pamoja Trust leveraged this analysis to petition government officials to halt construction and avoid displacement of an estimated 71,000 people. Based on the success of this work, Cadasta is planning to work with Amnesty International to map all green spaces in Nairobi, as well as with Transparency International to support efforts to secure Kenyan public schools at risk of being dispossessed. Amnesty International, through the housing coalition, also plans to expand the use of these mapping tools for advocacy related to housing rights.



Image of areas surrounding Kariobangi Sewage Treatment Plant, home to approximately 35,000 people, presented by Cadasta and Pamoja Trust in proceedings to halt evictions

Another development organization working to sustain basic service delivery during the pandemic was Saha Global, a nonprofit whose mission is to provide clean drinking water to the 800,000 people in Northern Ghana at risk of drinking contaminated water. Saha Global identifies small villages of less than 100 people and trains women in those villages to build water treatment businesses. To identify villages where their program can reach the greatest number of people lacking access to clean water, Saha Global used Facebook High Resolution Population Density Maps to scan for small population clusters that have no water treatment facilities. To date, Saha Global has established 246 water treatment small businesses, which they estimate provide clean drinking water to over 106,000 people. Their analysis using Facebook Population Density Maps has helped them identify 16 distinct locations for water treatment sites that serve roughly 7000 people.





July - August

The effects of COVID-19 on small businesses and disease control in the Global South

SMALL BUSINESSES AND THE ECONOMIC EFFECTS OF THE PANDEMIC ON WOMEN

As the public health effects of the pandemic expanded, economists and other officials began to draw attention to the economic effects of COVID-19. In May, the Centre for Risk Studies at **the University of Cambridge released a report** stating that the global economy could suffer over \$80 trillion in losses due to the pandemic.¹⁶ Alongside that report, Facebook began collecting data from small businesses in over 50 countries to determine whether COVID-19 had caused them to close, whether they had laid off employees, and how the pandemic had affected their revenue and sales. After surveying over 30,000 small businesses around the world. Facebook partnered with the World Bank and Organisation for Economic Cooperation and Development (OECD) to launch the Global State of Small Business **Report.**¹⁷ This report found that among small businesses surveyed, over one in four had closed in the first half of the year, with closure rates in some countries reaching over one in two. The survey also found that the economic effects of the pandemic were disproportionately felt by women, with women-owned small businesses more likely to have closed, as well as had their operations impacted by domestic responsibilities. Using information from this survey, the World Bank authored a policy brief18 and an article in the Global Observatory¹⁹ examining the impact of COVID-19 through a gender lens and advocated for carefully designed cash transfer programs to women, as well as loans with flexible terms to female-owned firms to support their transition to recovery.

Insights from the Global State of Small Business Report underscored the need to better understand COVID-19's impact on gender equality. As a result, in collaboration with the World Bank, UN Women, Equal Measures 2030, and Ladysmith, Facebook launched the inaugural Survey on Gender Equality at Home, which surveyed over 450,000 people in over 200 countries and territories to understand differences in women and men's access to resources, their time spent on unpaid care work, and their attitudes about equality. **Reports about the global and regional aggregate responses** were published at the 2020 UN General Assembly, and de-identified responses are being analyzed by research collaborators including the World Bank who will publish more detailed findings in early 2021.



Small business closure rates across the world in the July 2020 Global State of Small Business Report

USING SURVEY AND POST DATA TO SUPPORT HEALTH POLICIES AND MESSAGING IN THE GLOBAL SOUTH

Over the summer, while many countries in Europe undertook temporary re-openings, public health systems were working to contain the spread of COVID-19 in the Global South. **In an August report**, the World Health Organization warned that there were over a million cases in the African Region and the number was rising.²⁰

Earlier in the year, Facebook in partnership with Carnegie Mellon University and the University of Maryland launched a global survey of COVID-19 symptoms. In addition to questions about symptoms, the survey asked about protective behaviors like mask wearing, risk behaviors like contacts with people outside the household, as well as testing.

To date, the Symptom Survey has had over 50 million responses and is one of the best sources

in the world for information on mask-wearing. In August 2020, using data from Facebook, the Institute of Health Metrics and Evaluation (IHME) found that near universal adherence to mask-wearing and other prevention measures in Sub-Saharan Africa could reduce the death toll by over 60,000 in 2020, with the greatest opportunity to save lives in South Africa, Ethiopia, Kenya, and Senegal.

"[These analyses] would simply not be possible without all the data that Facebook has been sharing with us."

Chris Murray Director of the Institute for Health Metrics and Evaluation

Similar to the African Region, Brazil was also experiencing record-high numbers of COVID-19 infections, reporting over 69,000 cases in a single day on July 29th. In response, Resolve to Save Lives, a nonprofit founded by former US Centers for Disease Control Director Tom Frieden, offered to support Brazil's response with information from the Symptom Survey. Resolve to Save Lives worked with Facebook to analyze data for Brazil and found that COVIDlike illness reported by respondents provided 6-10 days lead time for predicting outbreaks when compared to traditional methods. Resolve to Save Lives is now working with state governments in Brazil to use this data to activate policies that will mitigate COVID-19 outbreaks sooner.

" We're learning more every day about the epidemiology of COVID-19, and this type of rapid, open-source data and analyses can help decision makers better adapt their response to protect and save lives."

Dr. Tom Frieden

Former CDC Director and CEO of Resolve to Save Lives, an initiative of Vital Strategies

With COVID-19 cases on the rise since early summer, India began working to develop their prevention plans for the spread of other infectious diseases in advance of the rainy season. To support this effort, Facebook partnered with Malaria No More on a nationwide messaging campaign and analyzed public posts in India to determine which messages would resonate with at-risk communities the most. Facebook found that people in the 45-66 age bracket were least likely to post about ways to protect themselves from mosquitoborne disease. As a result, Malaria No More developed the "Don't Take the Bite Lightly" campaign, which included images of a middle-aged family and women wearing masks with a caption on malaria prevention below. The campaign reached nearly 50 million people and resulted in a 2.6 percentage lift in people indicating that they would seek testing if they believed they might have malaria, translating to 1.28 million users that reported a desire to seek testing as a result of seeing the campaign.



The Malaria No More Campaign reached nearly 50 million people and increased likelihood of people stating they would seek testing for malaria as a result of seeing the campaign

September - October

Hurricane season, mask-wearing data, and increasing adoption of routine immunizations

UNDERSTANDING THE DRIVERS OF PREVENTIVE BEHAVIOR ADOPTION

With several months of physical distancing measures in place in the US, researchers began to use Facebook data to evaluate the effectiveness of these measures, as well as measure how people's behaviors were being influenced by factors other than local policy.

Using information from the Social Connectedness Index and Facebook mobility data, Massachusetts Institute of Technology's (MIT) Initiative on the Digital Economy found that the mobility patterns of people in one state are substantially affected by the policies and behavior of people in other, sometimes distant states, revealing why coordination in COVID-19 response across large geographic areas is critical. This **work**²¹ was featured in several op-eds as well as on television, as part of MIT's advocacy for coordination across US states in

COVID-19 containment measures.

Facebook also worked with MIT, Johns Hopkins University, and the World Health Organization to launch a new survey focused on understanding knowledge, attitudes, and practices related to COVID-19 prevention. This survey was designed to support researchers and policymakers with information on how to improve health communications related to the pandemic, such as vaccine acceptance.

In September, Johns Hopkins released a set of public dashboards based on this data that showed trends in attitudes and behaviors over time, as well as comparisons across countries. These dashboards have been used by various global health organizations and governments, including the Ministry of Health in Indonesia and Caribbean Public Health Agency, to understand vaccine hesitancy and inform messaging strategies. The Johns Hopkins Center for Communication Programs' Breakthrough ACTION project has also incorporated the survey data into their risk communications and engagement initiatives in a dozen countries.



Self-Reported Prevention Behaviors

Compare COVID-19 prevention behaviors across several demographic characteristics November 2020

• represents a weighted percent for one demographic group | represents the median for all demographic groups

Survey data provides essential insight into changes in health seeking behaviors that help to mitigate COVID-19

% of individuals reporting prevention behavior

"We know people are tired of the disruptions and restrictions caused by the COVID-19 pandemic. I know I am. The value of these new findings is that they show us where people have let down their guard and where public health officials may need to redouble their efforts to make sure that people are doing everything they can to stem the spread of the disease."

Susan Krenn Executive Director of the Johns Hopkins Center for Communication Programs

INCREASING THE LIKELIHOOD OF VACCINATION THROUGH CONTENT EXPERIMENTATION

While researchers worked tirelessly on the development of a COVID-19 vaccine, public health systems were also seeing sharp declines in the uptake of routine immunizations for polio and measles. To combat these declines, Facebook partnered with UNICEF's Pakistan Office in October to increase awareness of the importance of children receiving routine vaccinations during the pandemic.

To test which content would be most effective, UNICEF ran three different segments, including illustrative images that showcased graphics encouraging continued immunization, field images of real people and children getting vaccinated, and short videos depicting guidelines designed to build trust and sustain uptake of vaccines during the pandemic. The campaign reached nearly 7.2 million people and a postcampaign survey found that people who saw the ads were more inclined to vaccinate their child in a health center or felt that it was safe to vaccinate during COVID-19.

Of the three content types, illustrative images were the most effective in convincing parents to routinely vaccinate their children, a finding that will help inform future campaigns in Pakistan. UNICEF and Facebook are currently running similar projects in 10 countries using both post analysis and information from CrowdTangle to understand vaccine conversations on our platforms, as well as understand their audience and track campaign performance.

" This digital media campaign with Facebook was a first step to re-engage the public in completing the vaccination schedule of children after health services came to a halt during the COVID emergency. Facebook provided key insights around the public's information requirements during the pandemic that helped UNICEF in tailoring messages and content to reach our target audience in Pakistan through official digital platforms of the Expanded Program on Immunization. The partnership ensured access to real time data and use of digital technology to engage with the public when face to face interactions were limited due to the risk of infection."

Ayesha Durrani

Communications for Development Specialist, UNICEF Pakistan



UNDERSTANDING GENDER DIFFERENCES IN HURRICANE AND FLOODING EVACUATIONS ACROSS THE US GULF COAST

The 2020 hurricane season was unusually active, with 30 named storms, including six that reached hurricane strength. The Gulf Coast suffered four hurricanes, two of which struck in nearly the same location in Louisiana. Hurricane Laura landed in Louisiana and Texas at the end of August, damaging thousands of homes and displacing tens of thousands. As Hurricanes Sally, Delta and Zeta arrived weeks later, people once again evacuated at-risk locations and sought safety from the storms — in the midst of the pandemic. Some evacuees from earlier storms were still staying in temporary shelters, hotels, and other types of short-term housing even as new flood waters rose. The succession of events and their geographic overlap raised serious concerns about safe evacuation and long term displacement.

Direct Relief responded to each of the storms by delivering essential medical aid to primary care clinical partners throughout the region and used Facebook's displacement data to understand how men and women might be differentially impacted. According to data from Facebook, population displacement from Calcasieu Parish, the hardest hit area from the hurricanes, was substantially influenced by gender. Whereas 55% of all displaced persons in the Facebook data were women, as of September 10th, 2020 that number rose to 63%. And while one in three people displaced from Calcasieu had returned home within the next ten days, differences by gender persisted — 37% of all women displaced had returned compared with only 28% of men. These differences suggest that women were more likely to be displaced in the first place, but were also more likely to return home at the earliest moment possible.

Reasons for the gender disparities in displacement were likely in part due to underlying social vulnerabilities in the area. For example, the rate of households headed by a single parent in Calcasieu Parish is more than three times greater for women as compared to men, with 10.5% of family households being headed by a single female parent as opposed to 2.8% for men. These findings had important implications for disaster preparedness and response programming geared towards women throughout the region.



Displacement data from Lake Charles, LA showed where communities saw the greatest influx of people in need following the devastating series of storms from August to October

ENLISTING ARTIFICIAL INTELLIGENCE TO FORECAST CHANGES IN COVID19 THROUGHOUT THE US

With the return of cooler temperatures in the fall, more people began to move indoors and risks for COVID-19 began to rise globally. Starting at the end of September, a new wave of infections began to sweep through the United States and hospitalizations and deaths began to climb. This uptick across the US raised fears of what might happen if the pandemic went unchecked into the winter holidays, when gatherings and travel are traditionally at their highest.

In order to provide public health systems with an accurate picture on how cases might increase in their areas, the Facebook Artificial Intelligence Research (FAIR) team released COVID-19 forecasts that leverage AI and publicly available data to predict cases at the county level. The **Facebook model**²² was validated against 15 other forecasts and was the most accurate in predicting actual caseload, predicting on an

average within 21.6 cases of the correct daily count. These publicly available forecasts were leveraged by the State of New Jersey, the State of New York and Austria, as well as Direct Relief, to make critical decisions on distribution and procurement of supplies like ventilators, masks and personal protective equipment.

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Using Data from Facebook AI Research Direct Relief mapped changes in projected case totals three weeks in the future to understand resource allocation needs for primary care clinics

November-December

COVID-19 winter surges and economic insights to drive the recovery

SUPPORTING HEALTH RESILIENCE THROUGH THE WINTER COVID-19 WAVE

With cases surging globally, models from the Institute of Health Metrics and Evaluation using mask data from the Symptom Survey continued to be used by the World Health Organization, the European Union, the World Bank, and state and federal governments around the world.



In late September, IHME briefed the Polish government on low mask rates reported in the Facebook survey, and shared scenarios showing that increasing mask use would save lives. In response, the Polish government implemented a mask mandate on October 10th, which led to a significant increase in mask use. Alongside other preventive measures, this contributed to a greater than 2x decline in COVID-19 case load.

Similarly in November 2020, the Government of Georgia implemented a mask mandate that had been informed by IHME projections. Dr. Amiran Gamkrelidze, the Director-General of the Georgian National Center for Disease Control and Public Health reported that their multi-sectoral coordinating board, which is in charge of all governmental decisions, had been "following all updates from IHME and suggested scenarios' development" and that they were "relying on IHME's COVID-19 policy briefings for current restrictive measures." In December, IHME also released a series of sobering estimates from their models for the United States, stating that the U.S. was forecast to see a cumulative 539,000 deaths by April, and that the expected vaccine rollout would only reduce the death toll by 9,000. IHME said that achieving 95% mask-wearing in the U.S. could save 66,000 lives over the same time period.

Mobility data continued to be leveraged heavily, as travel around the world increased during the winter holidays. In Indonesia, the University of Indonesia and the Center for



Mask wearing data from the Symptom Survey helped inform a mask mandate in Poland, which contributed to a significant drop in COVID-19 cases

Strategic and International Studies had been analyzing Facebook data to understand community adherence to travel restrictions and the United Nations Global Pulse Lab in Jakarta used high resolution population data to develop a localized COVID-19 risk map for West Java. In December, the Minister of Health used analysis of Facebook movement data in a nationwide press briefing, explaining the spike in movement due to holiday travel and what this would mean for hospital capacity across the country if people continued to travel at high rates.

"Based on the results of the analysis of mobility data in collaboration between the University of Indonesia and Facebook Data for Good, there is always an increase in mobility during holidays which is followed by a surge in coronavirus cases. So, it is our collective responsibility to protect ourselves and our surroundings, even if we are bored, to maintain safety together by avoiding crowds and complying with the best possible health protocols."

Dr. Damar Susilaradeya, MRes, Ph.D

Deputy Chair of the UI Mahadata Synergy Team and FKUI Medical Technology Cluster Researcher

TOOLS FOR THE ECONOMIC RECOVERY FROM COVID-19

With an additional stimulus package being negotiated in the United States, small business owners continued to lobby for more support to address the economic effects of the pandemic. To provide better visibility into the economic consequences of COVID-19, **Facebook launched new insights**²³ on the activity of small businesses, showing significant drops in foot traffic, as well as an international version of Commuting Zones, which revealed real-time areas of economic activity and how they differ from official boundaries. New economic insights from the global symptom survey also showed high levels of food insecurity around the world, as well as a correlation between a rise in cases and people being worried about their financial future.

Indonesia Food Security, November 2020

Survey Question: How worried are you about having enough to eat in the next week?



Data from the global symptom survey showed a high number of people in Indonesia experiencing food insecurity alongside the COVID-19 pandemic

" Determining whether small and medium businesses are open is very important to assess the recovery after events like mandatory stay-at-home orders. The traditional way of collecting this information, such as surveys and interviews, are usually costly, time consuming, and do not scale. By using real time information from Facebook, we hope to make it easier for public institutions to better respond to these events."

Dr. Flavia De Luca

Senior Lecturer in Structural and Earthquake Engineering at the University of Bristol

AUSTRALIA ON THE ROAD TO RECOVERY

At the close of a year like no other, the forests and wildlife of Australia, under existential threat at the beginning of 2020, were recovering. Green had returned to many of the places most severely burned. Populations of koalas, birds, and other animals were multiplying and reoccupying spaces they had been forced to flee months earlier. The damage of the wildfires remained apparent, but signs of renewal were equally significant.

At the end of December, Australia's COVID-19 incidence rate had also fallen to less than one case per million people. Much like the massive collaboration required to respond to the wildfires, success against the pandemic required broad social mobilization, clear guidance from health authorities, strong reliance on accurate information, and constant attention to data.

Underpinning Australia's successful response, **a team of researchers led by Dr. Nic Geard**²⁴ from the University of Melbourne had worked with members of the Australian government on data projects for nearly a decade prior to the onset of the pandemic. When COVID-19 hit, they already had in place the ability to engage quickly with the Department of Health at the national level and with the states of New South Wales and Victoria to understand how mobility changes were affecting viral transmission.

The speed of that collaboration was essential to its impact. One of their key findings was that while mobility plays an ongoing role in disease spread, it was most important to understand and act upon people traveling within a specific window of time, when cases were just high enough that some effect could be detected, but when COVID-19 was not yet at community transmission.

Insight needed to be not just accurate and sophisticated, but also rapidly developed, shared, and interpreted in order to be useful within the relevant window of time. Another one of the key lessons from Australia's successful response is that the partnerships need to be formed in advance and activated quickly in times of need.



Hope for 2021 and Beyond

If the experiences of 2020 are any indication, governments, nonprofits, and researchers have more work to do to combat COVID-19 this year. With the enormous task of vaccinating the majority of the world's population ahead, the role of real-time information to guide the delivery and acceptance of health services has never been more important. Fortunately, our partners have already begun to leverage Facebook data to inform these efforts. Forecasts from the Symptom Survey have been used by the private sector to accelerate recruitment into trials for vaccines and **survey** results on vaccine acceptance²⁵ have begun to inform outreach. The Data for Good program is also continuing to offer new tools and programs, including new insights from the Symptom Survey on how many vaccines have already been distributed by age and demographic group, as well

as trainings that assist public health officials to use our high resolution population density maps for vaccine distribution.

Despite its extraordinary challenges, 2020 also was a year in which a ground-breaking vaccine was created in record time; in which healthcare workers rose to the occasion in every country; and in which partnerships across government, academia, non-profits, and the private sector were built at unprecedented levels. As for Facebook Data for Good, it was a year in which we learned about what data makes a difference to decision-makers and what insights are needed to save lives, on the ground. We hope to carry these lessons forward with renewed focus on our mission this year, working alongside our partners to make progress on the many tasks ahead.

Percentage of people who would definitely or probably choose to recieve a COVID vaccine if it were offered to them today, based on surveys of Facebook users



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