Responding to COVID-19 with Data, Analytics and Digital Solutions

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COVID-19 reproductive rate is 2.5 – 3.0: higher than influenza at 1.1-1.5.

During first 5 days, COVID-19 patients shed up to 1,000 times more virus than SARS. SARS patients are usually only infectious during deep-lung, late stage illness. But, with COVID-19, **asymptomatic and pre-symptomatic cases infect disproportionately** – most infectious before we know we are ill

**Case fatality rate** is highly dependent on the age structure of those infected and underlying health conditions

**Three unknowns that will influence intensity and future waves**: proportion infected and recovered (with acquired immunity for the 2nd wave), seasonality and duration of immunity
World Bank Group’s COVID-19 Response

• **WBG COVID Financing Facility** with up to $150bn in funds
• **Purpose:** Assist IBRD and IDA-eligible countries in their efforts to prevent, detect and respond to the threat posed by COVID-19 and strengthen national systems for public health preparedness.
World Bank’s COVID Emergency Response: Theory of Change

**Impact:**
Strengthened human capital and national systems for public health preparedness

**Medium-Term Results:**
- Reduced risk of COVID-19 infection among program beneficiaries
- Reduced morbidity & mortality due to COVID-19-related illness among program beneficiaries

**Short-Term Results:**
- Prevent/limit COVID-19 transmission through containment strategies
- Strengthened multi-sector, national institutions for coordination of prevention & preparedness using One Health approach
- Efficient national and sub-national prevention and preparedness
- Community engagement and risk communication

**Inputs & Outputs:**
- Improving supply and quality of prevention & preparedness services:
  - Expand service delivery to prevent, detect, and respond
  - Provide essential equipment, commodities, and human resources
  - Develop human resource capacity and skills at all levels
- Increasing utilization and demand creation:
  - Expand strategic communications and tailored behavior change efforts at all levels
  - Increase community ownership and active engagement in prevention and preparedness
- Enabling environment:
  - Efficient data collection and results monitoring
  - Develop capacity, multi-sectoral, partner coordination, and management
  - Improve efficiency and stewardship of the national and sub-national response

**Emergency financing instrument, building on national systems and adapted to specific country-contexts**
Typical Activities for WB COVID-19 Response Projects

**Component 1: Emergency COVID-19 Response** (prevention and containment strategies)
- Case Detection, Confirmation, Contact Tracing, Recording, Reporting
- Social Distancing Measures
- Health System Strengthening
- Communication Preparedness
- Social and Financial Support to Households

**Component 2: Strengthening Multi-sector, National Institutions and Platforms for One Health**

**Component 3: Supporting National and Sub-national, Prevention & Preparedness**

**Component 4: Community Engagement & Participation**

**Component 5: Implementation Management and Monitoring and Evaluation**
How data, analytics and digital interventions have already been used in COVID

• Unprecedented use to date

• Famously, BlueDot’s AI system picked up an anomaly before public was notified:
  • WHO notified on 9 Jan 2020, CDC on 6 Jan 2020, and BlueDot on 31 Dec 2019

• Several predictive models to predict epidemic spread and health system capacity

• Governments around the world quote modellers widely in predictions and potential impacts; translated to general health promotion messages -- #FlattenTheCurve

• Plethora of digital interventions either being developed or customized

• US Government created a COVID-19 Open Research Dataset (CORD-19) – urging AI developers to develop tools to mine and analyze the data. Available here: https://pages.semanticscholar.org/coronavirus-research
  • Since then, 29 other open datasets relating to COVID made available open
  • World Bank Group’s Data Collaboratives effort – additional requests from data collaborators
Coronavirus Innovation Map

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Development Data Partnership

The Development Data Partnership organizes opportunities for World Bank staff to work with technology companies on solving development challenges.

#DATA4COVID19

Data Collaboratives in Response to COVID-19


https://datacollaboratives.worldbank.org

https://docs.google.com/document/d/1JWeD1AalGKMPry_EN8GjlqwX4J4KLQIAqP09exZ-ENI/edit

Big Data Analytics to Support Countries with COVID-19 Response

1. Analytics to **predict future spread and impact** of response options

2. Analytics for **geographic and subpopulation hotspots** and prioritization

3. Analytics to **monitor, track, change and evaluate implementation**

4. Analytics that estimate the **wider economic impacts** and interventions to mitigate them
Models to **predict future spread and impact of response options**

**ONLINE MODELLING TOOLS AVAILABLE**

- **Univ of Basel tool:** Neher Lab (University of Basel) (https://neherlab.org/covid19),
- **Penn Medicine tool:** CHIME (COVID-19 Hospital Impact Model for Epidemics) https://penn-chime.phl.io/
- **Johns Hopkins SURGE Tool:** https://www.pacerapps.org/
- Tool used by some **WHO offices:** COVID ICU and Death Calculator
- **Modeling COVID-19 Spread vs Healthcare Capacity**
  https://alhill.shinyapps.io/COV19seir/
- **COVID-19 FORECASTING** http://epidemicforecasting.org/ from the Future of Humanity Institute, University of Oxford, which is based on server inputs: experts’ forecasting, an advanced epidemic modelling software, an airline booking dataset, a commuting database, multiple levels of global mitigation measures, and multiple models of SARS-CoV-2.
Models to predict future spread and impact of response options

MODELS DEVELOPED BY MODELLING GROUPS WITH TECHNICAL ASSISTANCE AVAILABLE

- Harvard modelling: https://dash.harvard.edu/handle/1/42638988
- Imperial college modelling work: https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/news--wuhan-coronavirus/ (Graphic User Interface for administering the tool online oneself will be available in the near future)
- Johns Hopkins University is providing modelling support: If task teams or their managers need such modeling analysis for specific countries, they may consider contacting Justin Lessler at “jlessle1@jhu.edu” (bio at https://www.jhsp.edu/faculty/directory/profile/2566/justin-lessler).

GLOBAL MODEL DEVELOPMENT AND ALIGNMENT IN THE WORKS WITH NUMEROUS PARTNERS AROUND THE WORLD

- World Bank is co-covening – with the International Decision Support Initiative -- this effort
- Intended to link to economic impact modelling
Predicted Global Spread and Impact of Response Options in 202 countries

Source: Imperial College, 26 March 2020
Big Data Analytics to Support Countries with COVID-19 Response

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Predicting Hotspots and Areas of First Testing

Source: Coopersmith: https://medium.com/@CooperSmithOrg/can-we-predict-covid-19-hotspots-15fe3393013d
Data Elements to Better Identify High-Risk Zones

- Disease Burden Data
- Genomic Data
- Demographics (Age)
- Airline Traffic Data
- Known Congregation Areas
- Key Service Suppliers
- Population Density (MNO)
- Infection Location
- Network Analysis (MNO)
- Weather Data

Weighted Risk Score Calculation

Risk Score – High Geographical Resolution

Source: Coopersmith: https://medium.com/@CooperSmithOrg/can-we-predict-covid-19-hotspots-15fe3393013d
Data to Enhance High-Risk Zones – Population Density

Daily Population Density based on movement & season

Source: Coopersmith: https://medium.com/@CooperSmithOrg/can-we-predict-covid-19-hotspots-15fe3393013d
Data to Enhance High-Risk Zones – Age

% of Population > 50 yrs. Of age

Source: Coopersmith: https://medium.com/@CooperSmithOrg/can-we-predict-covid-19-hotspots-15fe3393013d
Resources for Replication

Success depends on four essential technical building-blocks:

- Participation and support of mobile network operators
- Technical partner to anonymize and aggregate individual user data
- Access to relevant public data (e.g., census data) and private data (e.g., clinic data), if available
- External Dashboards that pull in real-time data for public use

Source: Coopersmith: https://medium.com/@CooperSmithOrg/can-we-predict-covid-19-hotspots-15fe3393013d
Other Approaches to Use Big Data to Sense COVID Infection ‘Signals’ at the WBG

- Classification of social media posts mentioning COVID-related symptoms (source: Twitter API, Global)
- Survey of social media users posting COVID-related symptoms to infer their health status to overcome the lag in testing
- Retrospective validation at the local level using actual reported cases
- Monitoring of COVID-related hashtags and news sharing on social media to infer awareness of COVID at the local level
- Natural language processing of news to track governments actions to increase social distancing (source: Factiva API, Global)

For more info, contact WBG Data Collaboratives team (Holly Krombeck), COVID Mobile Data Task Force (Ariana Legovini), Aivin Solatorio (DEC), Dunstan Matekhanya (DEC), or Sam Fraiberger (DEC)
Big Data Analytics to Support Countries with COVID-19 Response

1. Analytics to **predict future spread** and **impact** of response options

2. Analytics for **geographic and subpopulation hotspots** and prioritization

3. Analytics and data to **monitor, track, change and evaluate implementation**

4. Analytics that estimate the **wider economic impacts** and interventions to mitigate them
Using Facebook mobility and other data to look at changes in social (physical) distancing strategies

- Realtime and global
- Does not rely on country level reporting
- For WBG task teams – new way of monitoring implementation
- Also other social distancing metrics
  - Changes in the frequency of movement
  - Changes in the distance of movement relative to house
  - Changes in frequency of contacts between close friends
  - Changes in daily commuting patterns
  - Quantify the effect of social distancing by measuring variations in the frequency of visits to clinics/hospitals
  - Changes in the number of locations visited
  - Changes in the kinds of places visited – i.e. definition and measurement of traffic to “Points of interest”, e.g., schools, parks, restaurants, stores, etc.

- Other approaches and data sources too:
  - Using smartphone location data to infer social distancing (source: Cuebiq, US/EU+TBD)
  - Traffic data (source: Waze)
  - Pollution data at high resolution (source: Plume labs)
Digital Solutions for COVID-19 Responses

Inventory of COVID-19 Digital Health Solutions
https://docs.google.com/spreadsheets/d/15hkhdtGNzx7oHkO8Y2MOiY83JsHjqxL4MhMGvIA_J6I/edit#gid=579623365

Newsletters and Online Conference

NEEDS DRIVEN HEALTH TECH SOLUTIONS
For Managing the COVID-19 Crisis

Global Digital Health Network

Version 1.0 Published 18/3/2020 12:00
This catalogue is continuously updated. Check for updates on www.healthtechhub.org/covid-catalogue
Add-ons to Existing Mobile Services

- **Module 1 - Community Engagement** through 3-2-1 & large scale push voice and SMS campaigns
- **Module 2 - Frontline Worker Training** (via mobile phone) for via mobile phone (more info here)
- **Module 3 - Mobile Surveys** - for hygiene and social distance knowledge measurement, outbreak monitoring AND healthcare access monitoring (more info here)

For more information, contact Stephen Meyer <stephen.meyer@viamo.io>

- Based on national guidelines and multi-language
  - South Africa: USSD COVID-19 Symptom Checker
  - South Africa: USSD Frontline Health Worker Clinical Decision Support Tool

For more information, contact

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The service can be accessed through a link that opens a conversation on WhatsApp. Users can simply type “hi” to activate the conversation, prompting a menu of options that can help answer their questions about COVID-19.

Send a WhatsApp to +41 79 781 87 91, and say ‘Hi’ for this conversation to start.
SafePaths: Private Kit

Global scale COVID-19 private tracker without government tracking
For individuals and health authorities
Mathematically enforced privacy of personal data
Open Source App by MIT faculty
No Servers,
Plug-ins by Partners

Download the app: https://play.google.com/store/apps/details?id=edu.mit.privatekit

IOS version coming soon
Safe Path- Prioritizing Privacy and Utility

- The Private Kit: Safe Paths platform has been built to optimize both data use and data privacy, creating maximum utility while protecting users.

- World Health Organization (WHO) has identified this is a priority partner and solution for decentralized, participatory COVID-19 surveillance and tracking, with the WHO committing to release this real time epidemiology tool for citizens.

For more information, please contact

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**SafePaths** (technology and background)
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Ramesh Raskar--rameshboston@gmail.com
How it Works

1) Patient is diagnosed with COVID-19
2) Clinician photographs QR code from PrivateKit and adds to patient's record
3) Response center receives code and converts to location details
4) Data can be analyzed and visualized for immediate public health use
5) Public will be able to see overlap with diagnosed patients

Beta

Version 1.0

Version 2.0
Oura ring: Realtime vital signs tracking of health workers

- Lets healthcare workers easily track changes in their body temperature, respiratory rate, and heart rate
- Improves early warning signs of infection within the group and to take necessary actions to better coordinate this unprecedented push to fight COVID-19.
- Then, everyone who currently owns an Oura
Rapid Acceleration of Telemedicine Services

Two purposes
• Prevent COVID-19 positive cases from infecting others
• Keep COVID-19 negative persons with underlying conditions away from facilities for routine and regular care

Virtual Field Hospital approach
• Telemedicine ‘in a box’
• Triage all NCD patients away from facilities or to non-COVID primary care
• Technical deployment within 4 days
• Business model is subscription basis (per health worker)

For more information, please contact
Shaun Rangappa, srangappa@deloitte.com
Laura Baker, labaker@deloitte.com
Chinese Hospitals Deploy AI to Help Diagnose Covid-19

Software that reads CT lung scans had been used primarily to detect cancer. Now it’s retooled to look for signs of pneumonia caused by coronavirus.

https://www.itnonline.com/content/researchers-use-ai-detect-covid-19
Resources as discussed and requested from the BBL

Strategic Impact Evaluation Fund (SIEF) – Call for Proposals for Education-related Impact Evaluations, including for COVID-19 responses


Video from South Korea on how they flattened the curve with digital technology: https://www.youtube.com/watch?v=aJKGPzAsABw&feature=youtu.be


TraceTogether is an initiative from Government of Singapore: [https://www.tracetogether.gov.sg/](https://www.tracetogether.gov.sg/)

Government of India has published Telemedicine Practice Guidelines

Australian Society of Telehealth has made guides available for remote consultations. Their information for GPs on video consultations is very helpful


UK’s WhatsApp bot: [https://www.bbc.co.uk/news/technology-52049520](https://www.bbc.co.uk/news/technology-52049520)
Resources as discussed and requested from the BBL

Database with cumulative cases per day and per country: https://coronavirus.jhu.edu/map.html

Telemedicine Society of India is taking leadership in training 500 000 doctors in telehealth: https://www.mohfw.gov.in/pdf/Telemedicine.pdf

Australian College of Rural and Remote Medicine and the Australasian Telehealth Society:


Comprehensive guide on managing appointments and conducting remote consultations


https://www.paho.org/ish/images/docs/covid-19-teleconsultations-en.pdf?ua=1
Resources as discussed and requested from the BBL


https://www.youtube.com/watch?v=INDW-slJPu0

COVID-19 GOVERNMENT RESPONSE TRACKER BY UNIVERSITY OF OXFORD
