Responding to COVID-19
Leveraging Analytics

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Agenda

- Data for Good
- COVID-19 Use cases
  - Medical resource optimization
  - Contact Tracing for Public Health
  - Scientific Literature Search and Text Analysis
  - Online Engagement Analysis
Data for Good
We are people that want to help other people. That's the satisfaction we get out of writing programs. Knowing we're going to make somebody else's life a lot easier ... and that we are constantly working on the future.

Jim Goodnight • CEO • SAS
One of Data for Good initiatives: WildTrack

Identification & Monitoring of endangered specifics using AI

WildTrack are monitoring endangered specifics without invasive monitoring techniques such as embedded sensors. SAS’ AI & deep learning techniques streamline monitoring processes by classifying footprint images sent by worldwide collaborators in cloud sourcing.

Protecting endangered species, one footprint at a time.
One of Data for Good initiatives: Project Data Sphere

Clinical Trial Data Sharing (CTDS) initiative supported by SAS

Project Data Sphere is an independent initiative of the CEO Roundtable on Cancer and provides researchers with access to patient-level cancer data.

Data Sharing Platform on cloud
(Supported by SAS)

https://data.projectdatasphere.org/projectdatasphere/html/home
Phases of Disruption

To strategically and responsively address the new challenges of COVID-19

**01 Respond**
- Achieving Situational Awareness
- Responding and Adjusting
- Mitigating Disruptions

**02 Recover**
- Rebuilding Organization to Operate in the New Environment

**03 Reimagine**
- Preparing the Organization for the Future
- Building Resilience
Medical resource optimization
The Unprecedented Challenge

For forecasting medical demand and optimizing response resources

Medical Response Optimization is a supply and demand problem made up of Situational Awareness (Demand), Equipment (Supply) and People (Supply)

Situational Awareness
- 14,687+ deaths (and growing) in the U.S.
- U.S., Italy, China & Spain have experienced the largest number of cases to date

Equipment
- Personal Protective Equipment (PPE) – gloves, masks, gowns, etc.
- Medical Equipment - bed, ventilators, personal protection, etc.
- Testing and treatment supplies

People
- Overtime and burn out rates
- Contact Tracing to identify people, that have come into contact with confirmed cases of COVID-19
- Staff and skill optimization
Mathematical model of infective disease

Overview of SIR model (1/2)

S
Susceptible
(uninfected patient)

I
infected/infectious

R
recovered/removed

(Source) Yokota Tomomi’s HP (Professor: Tokyo University of Science), etc.
Mathematical model of infective disease

Overview of SIR model (2/2)

\[ \frac{dS}{dt} = -\beta SI \]

[1]

\[ \frac{dI}{dt} = -\gamma I + \beta SI \]

[2]

\[ \frac{dR}{dt} = \gamma I \]

[3]

- **S**: Susceptible (uninfected patient)
- **I**: Infected/infectious
- **R**: Recovered/removed

\(\beta\%\) of the population is infected by one patient in a susceptible population.

\(\Gamma\%\) of infected patients are recovered/isolated/dead.

Recovered patients will be never infected again.
COVID-19 Epidemiological Scenario Analysis

A collaboration between the Cleveland Clinic and SAS

Using SIR & SEIR models, users can create and review multiple scenarios with combinations of different types of parameters including disease characteristic, regional and hospital parameters.


**Disease characteristic parameters**
- incubation, recovery, and doubling times

**Regional parameters**
- population, known admitted COVID-19 patients, and Social Distancing Interventions

**Hospital parameters**
- admission, ICU, ventilation, ECMO, dialysis, and mortality percentages and lengths of stay
The current challenge
The current Contact Tracing model is slow and ineffective

Public Health Worker
- Paper-based
- Manual data entry
- Slow

Patient
- Incomplete or missing information
- Cannot prioritize riskiest patients
The solution

SAS offers a modernized approach to Contact Tracing

1. Contact Database
   - Direct Links: Employer Rosters, Passenger Manifests, School Rosters
   - Inferred Links: Road Transponder, Card Transactions, Phone Location Data
   - Communication Methods: Location, Phone, Email

2. Enriched Data

3. Intelligent Alerting
   - Contacts

4. Insights
   - Public Health Officials

5. Public Health Worker
   - Patient
The new challenge
Data Privacy Laws Govern but do not Prohibit Contact Tracing

• Contact Tracing gathers protected data such as
  ✓ Name, address, phone, e-mail
  ✓ Health conditions

• Most data privacy laws allow for sharing of data during public health emergencies

• Ability to obtain a data source will vary widely by country

• Protect data through masking and de-identification
Contact Tracing: Image (1/3)

Patient linked to family members and employer (Nursing Home)
Contact Tracing: Image (2/3)
Expand to see all employees (2 others tested positive)
Contact Tracing: Image (3/3)

2 more employees linked to same flight as infected patient
Scientific Literature Search and Text Analysis
COVID-19 Scientific Literature Search and Text Analysis

Powered by SAS with publicly available research on CORD19 website

The COVID-19 Scientific Literature Search and Text Analytics dashboard aims to help researchers and practitioners accelerate discoveries by providing more efficient access to groups of documents, enabling scanning for relevance and extracting insights.

COVID-19 Scientific Literature Search and Text Analysis
System-identified Themes

A concerning trend is the alarming rate at which black and Hispanic/Latino Americans are being infected and dying from COVID-19 [23]. There were early data from cities and states across the country indicating higher mortality from COVID-19 in black and Hispanic/Latino populations. These included Milwaukee, WI, experiencing a 73% mortality rate in black patients who make up 25% of the population; Chicago, IL (46% of the mortality with 32% of the population); and the states of Louisiana (53% of the mortality with 42% of the population) and Michigan (51% of the mortality with 30% of the population). In the COVID-NET catchment population of the USA, a higher percentage of black patients were infected (25%) compared to a percentage of overall population being black (14%) [23]. This trend has been reported across the country and has brought into stark reality the devastating impact COVID-19 has had on communities of color [24]. While it is well known that black and Hispanic/Latino patients have a higher incidence of diabetes and hypertension, this alone does not explain the increased infected and mortality rates. Studies during prior epidemics have continued to demonstrate similar healthcare disparities on smaller scales likely related to multiple factors including access to care, racial and ethnic stigmas among medical professionals, crowded living conditions, income instability, and continued rates of exposure and contracting COVID-19.
COVID-19 Scientific Literature Search and Text Analysis

Co-Citation Network

Select an authority group for the top 30 most populated communities. Highlighted by the top three topics in that community, to see an associated network of co-citations. Zoom in on the top percentage of authoritative papers below. Each node in the network represents a paper or reference. The color of a node represents a paper’s authority score. A higher value here.
Online Engagement Analysis
A large life sciences company is running a series of live webinars for health care providers (HCPs) on COVID-19. Webinars are intended to connect HCPs with their peers to share their experiences in tackling various stages of COVID-19 infections. Ultimately the goal is to help save lives and inform HCPs about diagnosis and treatment practices.

In order to provide the best experience for their health care providers, the company deployed SAS CI 360 and SAS Visual Analytics on SAS Viya to glean insights on audience engagement during the webinars. This will inform future topics in the webinar series and also the technology used for creating and deploying the webinars (mobile, on-demand, audio, etc.)