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

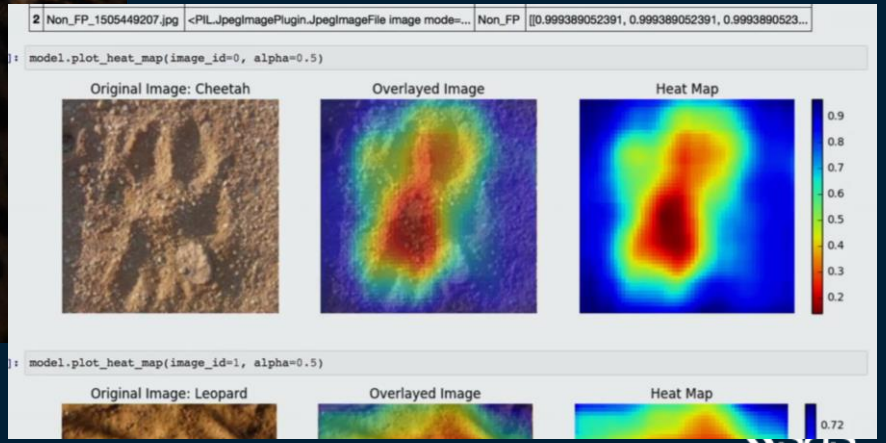
Data for Good

https://www.sas.com/en_us/data-for-good.html#m-913410818489323959186864 0

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.

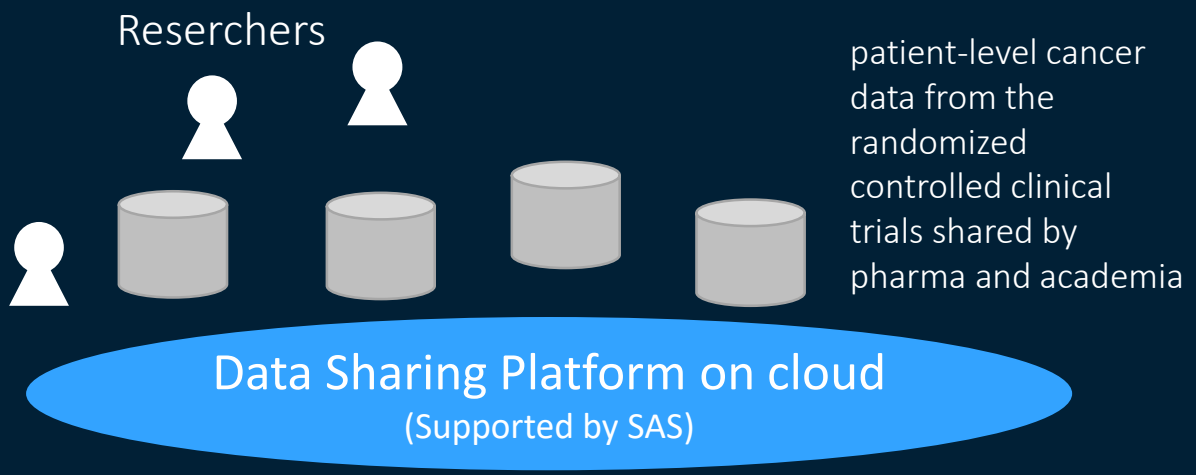


https://www.sas.com/en_us/data-for-good.html

One of Data for Good initiatives: Project Data Sphere

Clinical Trial Data Sharing (CTDS) initiative supported by SAS

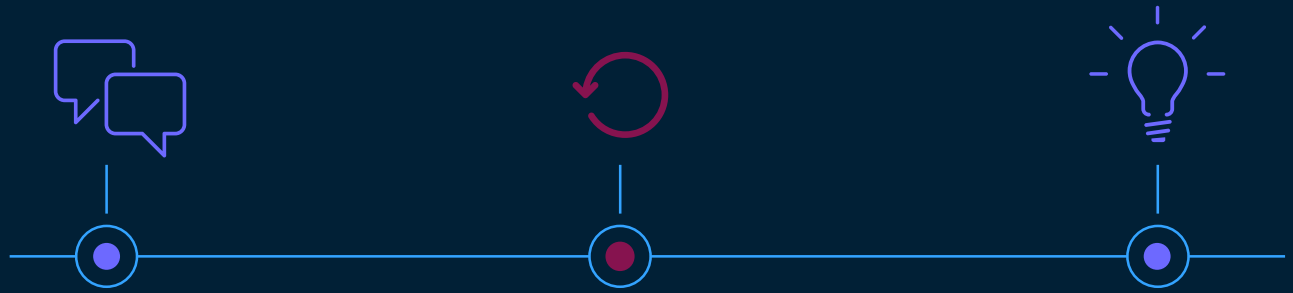
Project Data Sphere is an independent initiative of the CEO Roundtable on Cancer and provides researchers with access to patient-level cancer data.



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

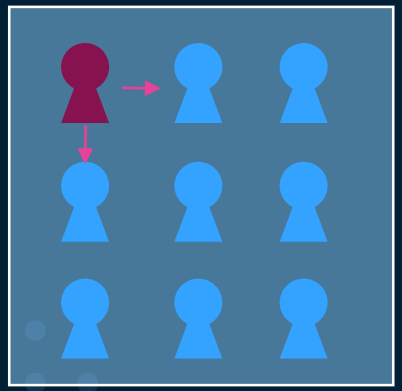
- Personal Protective Equipment (PPE) – gloves, masks, gowns, etc.
- Medical Equipment - bed, ventilators, personal protection, etc.
- Testing and treatment supplies

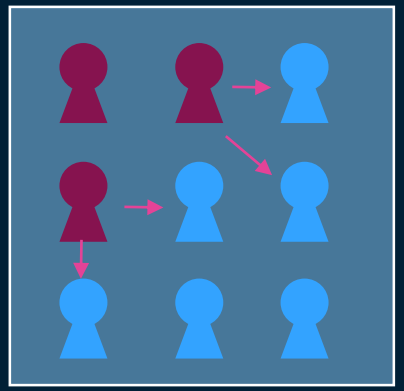
People

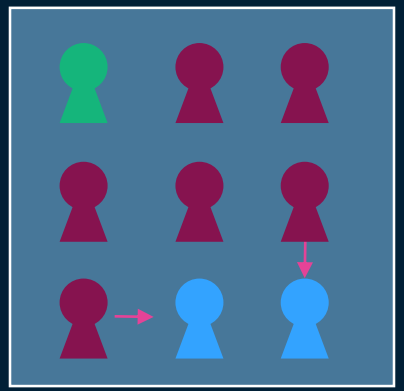
- Overtime and burn out rates
- Contact Tracing to identify people, that have come into contact with confirmed cases of COVID-19
- Staff and skill optimization

Mathematical model of infective disease

Overview of SIR model (1/2)







(Source) Yokota Tomomi's HP(Professor: Tokyo University of Science), etc.

Mathematical model of infective disease

Overview of SIR model (2/2)

β% of the population is infected by one patient in a susceptible polution.

Γ% of infected patients are recovered / isolated / dead.

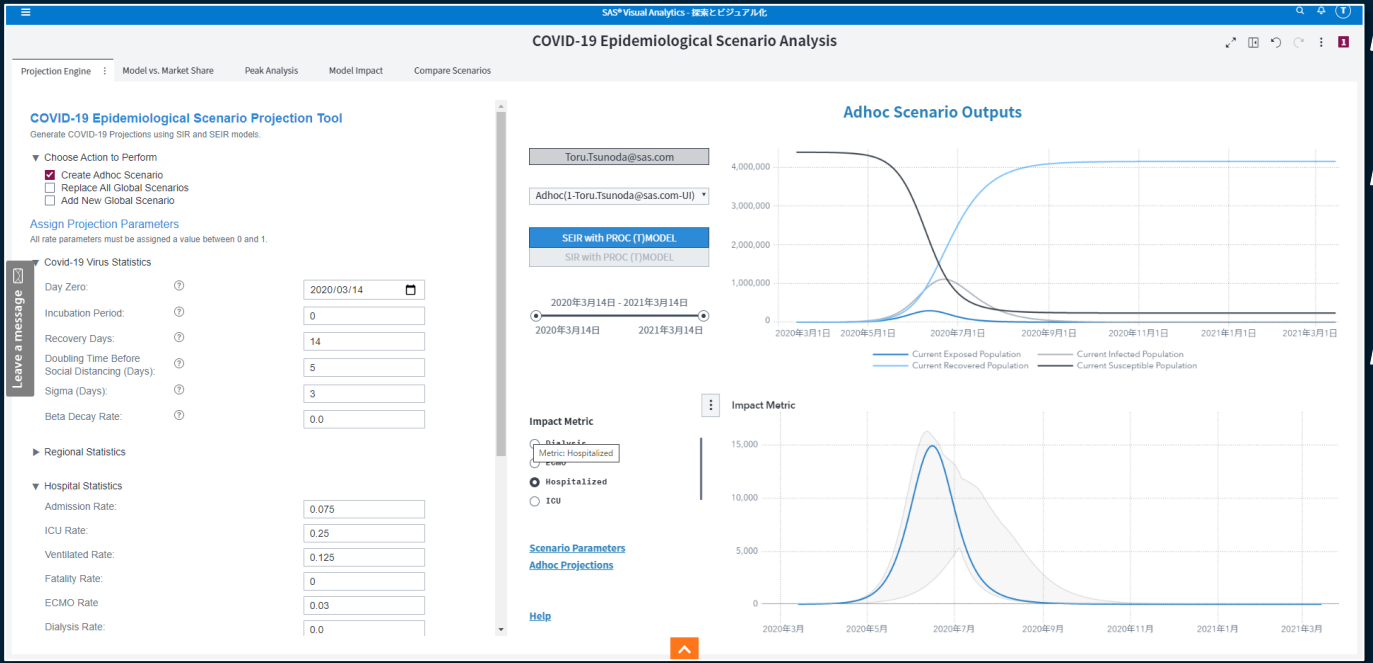
Recovered patients will be never infected again.

$$\underbrace{\frac{dS}{dt} = -\beta SI}_{①} \qquad \underbrace{\frac{dI}{dt} = -\gamma I + \beta SI}_{②} \qquad \underbrace{\frac{dR}{dt} = \gamma I}_{③}$$

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.
(https://www.sas.com/en_us/trials/software/epidemiological-scenario-analysis/form.html)



Disease characteristic parameters

- incubation, recovery, and doubling times

Regional parameters

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

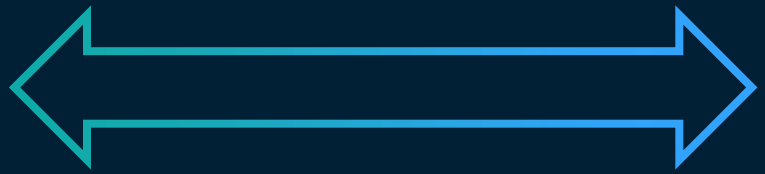
Hospital parameters

- admission, ICU, ventilation, ECMO, dialysis, and mortality percentages and lengths of stay

Contact Tracing for Public Health

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

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)

SAS® Visual Investigator - Investigación y búsqueda de datos - Personas

Inicio | Alertas | Tareas | Gestión | Búsqueda | GUTIERREZ RAMONA ...

0 comentarios | 0 archivos adjuntos

Covid Personas1 | Pantalla sin título | Red Inicial

Vista de red | Seleccionar | Objeto | Expandir

ALDANA BELEN LOPEZ

LOPEZ MIRTA ZULLY

MARIO LOPEZ

Charcas

37658826884

GUTIERREZ RAMONA MARGARITA

ESTABLECIMIENTO GERIATRICO JOSEFINA S R L

Leyenda del nodo

- Alert
- Personas
- Lugar de Trabajo
- Vivienda

Herramientas | Inspector de objetos

Detalle Personas | Pantalla sin título

Detalle Personas

Apellido
GUTIERREZ

Nombre
RAMONA MARGARITA

Nombre Completo
GUTIERREZ RAMONA MARGARITA

Fecha Nacimiento
1/6/1982

Edad
37.00

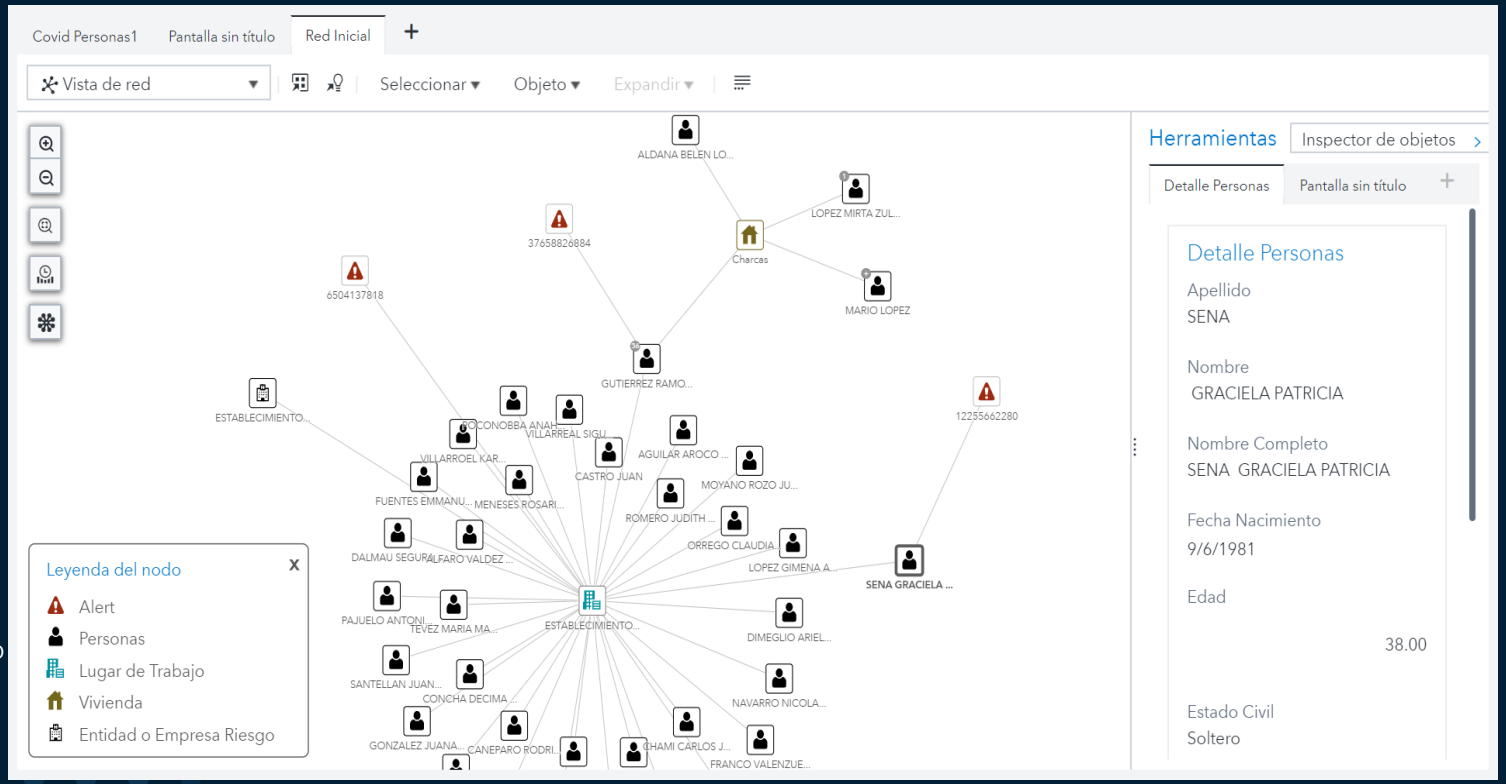
Estado Civil
Casado

Lugar de trabajo
= Workplace

Vivienda
= Living place

Contact Tracing: Image (2/3)

Expand to see all employees (2 others tested positive)

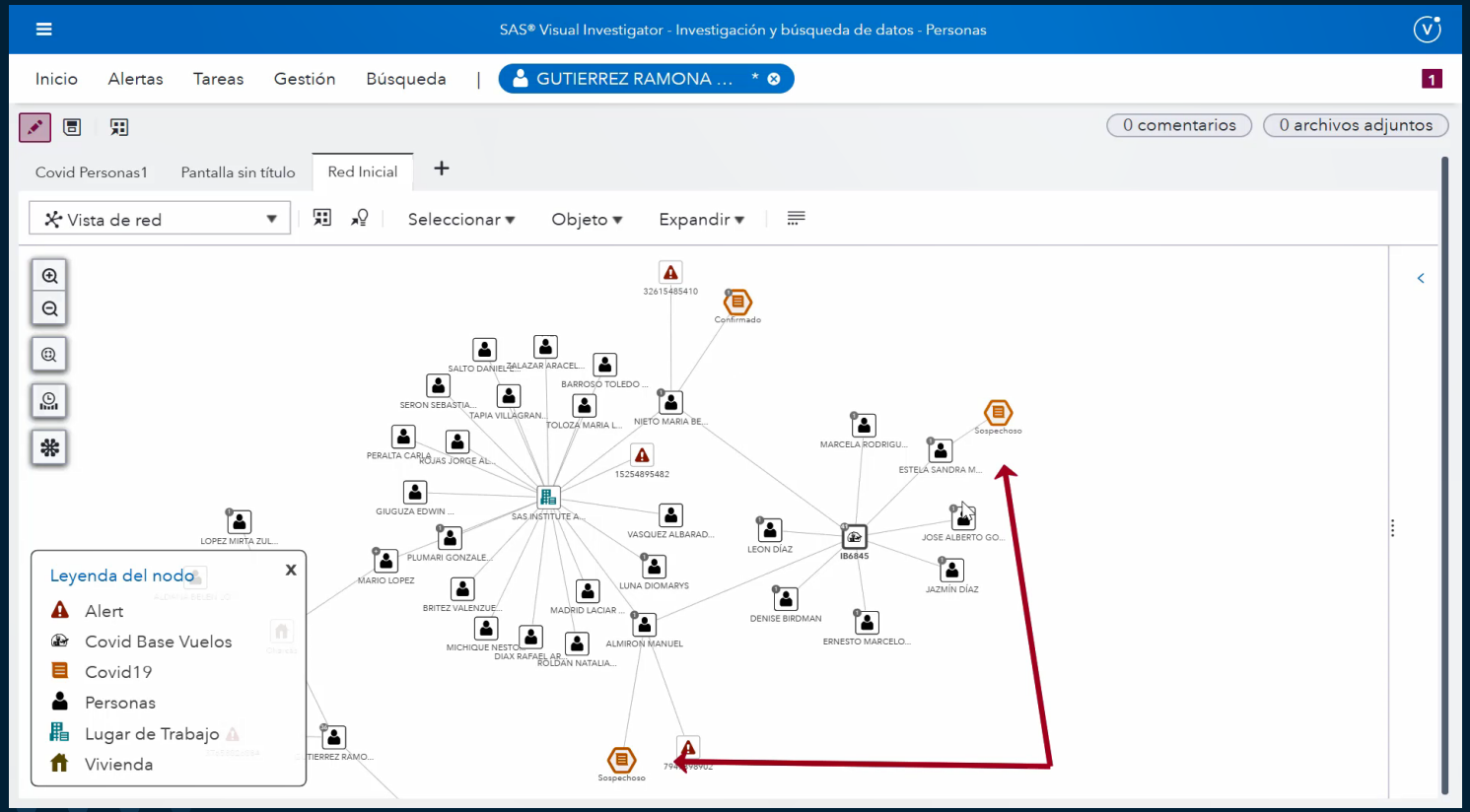


Lugar de trabajo
= Workplace

Vivienda
= Living place

Contact Tracing: Image (3/3)

2 more employees linked to same flight as infected patient



Lugar de trabajo
= Workplace

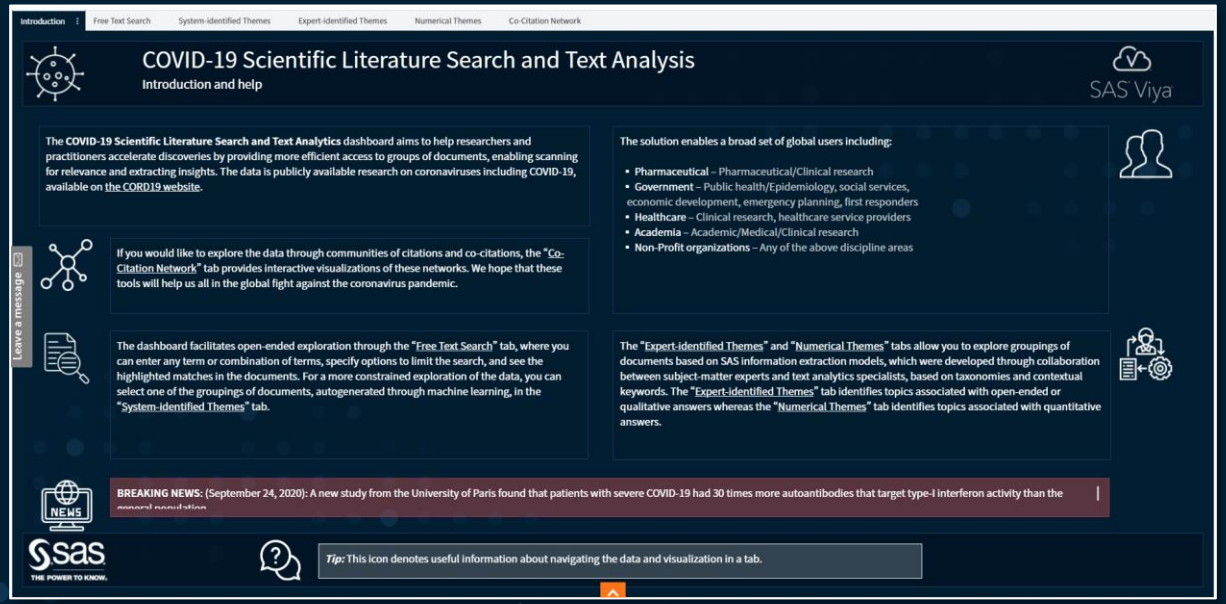
Vivienda
= Living place

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.
(https://www.sas.com/en_us/trials/software/scientific-literature/form.html)



COVID-19 Scientific Literature Search and Text Analysis

Free Text Search

Introduction | Free Text Search | System-identified Themes | Expert-identified Themes | Numerical Themes | Co-Citation Network

COVID-19 Scientific Literature Search and Text Analysis

Search thousands of research papers covering global cases and analysis of SARS-CoV-2

SAS Viya

Please enter your search term: Cytokine Search

Showing 5 of 66379 resu

Word Prefixes:

+ (plus)	Does not match any document that does not have this term. The + symbol must follow the term.
- (minus)	Matches any document that does not have this term. The - symbol must follow the term.
* (asterisk)	Wildcard character that matches any character within a word. **Note:** If a partial word is used without a wildcard in a search query, then no matched (full-word) results are returned.
" (quotation)	Denotes a phrase that must be matched in exact sequence.
\ (backslash)	Used to escape query characters in the query string. Use only if you want the search to include the actual characters. For example, the query new \"iphone 6\" matches fields where new appears and the phrase "iphone 6" also appears (including the double quotation symbols).

NOTE: Search results are truncated to 5,000 characters.

Search in: Title, Text

Search limits: 5

Operator used for query: Any of the words, All these words

Proximity (phrase search only): 0

Display: Relevance, Title, Text, Authors, URL, Institutions

Leave a message

Relevance	Title	Text	Publish Time
0%	Human Coronavirus-229E, -OC43, -NL63, and -HKU1	Glossary Apoptosis A form of programmed cell death that occurs in multicellular organisms. Biochemical events lead to characteristic cell changes (morphology) and death. Autophagy The natural, regulated mechanism of the cell that removes unnecessary or dysfunctional components. It allows the orderly degradation and recycling of cellular components. ER stress A cellular process that is triggered by a variety of conditions that disturb the folding of proteins in the endoplasmic reticulum. Innate immunity Refers to nonspecific defense mechanisms that come into play immediately or within hours upon pathogen recognition in the body. These mechanisms include physical barriers such as skin, chemicals in the blood, cytokine production and immune cells that attack foreign cells in the body.	22280
0%	Chapter 12 Wine, food, and health	That hangovers have been associated with deregulation of cytokine pathways (Kim et al., 2003) , may explain the reported value of pyritinol (a vitamin B 6 derivative) as a treatment (Khan et al., 1973) . Mineral deficiencies have also been correlated with hangovers (Min et al., 2010).	22280
0%	Chapter 6 The immunosuppressed traveler: infection risks with autoimmunity and immunosuppression, vaccinations, and general travel advice	TNF-alpha is a cytokine that plays a key role in the immune response to infection, as well as in the pathogenesis of inflammatory disease. It is produced by activated macrophages and T-cells as a transmembrane precursor protein that is then cleaved to produce a soluble form. TNF-alpha is required for many immune processes including macrophage and phagosome activation, differentiation of monocytes into macrophages, recruitment of macrophages and neutrophils, and formation and maintenance of granulomas [6] . The importance of TNF for granuloma formation explains why patients on certain TNF-alpha inhibitors have an increased susceptibility to TB. TNF-alpha is important for the host defense against intracellular infections [7] .	22280
0%	Chapter 12 Wine, food, and health	That hangovers have been associated with deregulation of cytokine pathways (Kim et al., 2003), may explain the reported value of pyritinol (a vitamin B6 derivative) as a treatment (Khan et al., 1973). Mineral deficiencies have also been correlated with hangovers (Min et al., 2010).	22280
50%	Human Coronavirus-229E, -OC43, -NL63, and -HKU1	Mitogen-activated protein kinase Serine-threonine protein kinases, important molecules in mediating the signal transduction from cell surface to nucleus, regulating cellular activities such as gene expression, mitosis, differentiation, and cell survival/apoptosis. Type I interferon A large subgroup of interferon proteins that help regulate the activity of the immune system, and a pleiotropic cytokine with antiviral, antitumor and immunoregulatory functions. Unfolded protein response A cellular stress response related to the endoplasmic reticulum stress. It has been found to be conserved between all mammalian species, as well as yeast and worm organisms. Viroporin A group of small hydrophobic viral proteins that tend to oligomerize to form hydrophilic pores or ion channels in cellular membrane.	22280

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Data last updated: September 23, 2020

COVID-19 Scientific Literature Search and Text Analysis

System-identified Themes

Introduction | Free Text Search | System-identified Themes | Expert-identified Themes | Numerical Themes | Co-Citation Network

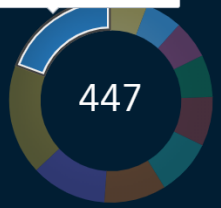
COVID-19 Scientific Literature Search and Text Analysis

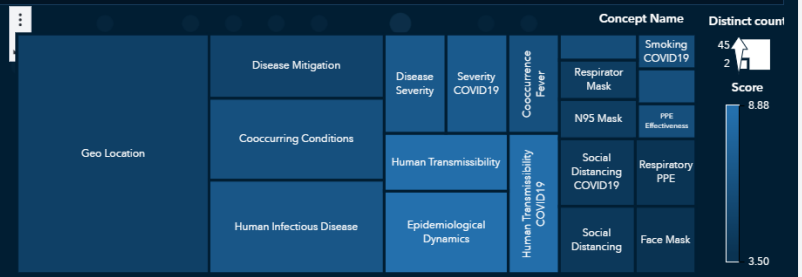
Interactive text category exploration

SAS Viya

Explore themes discovered via unsupervised machine learning in COVID research. Hover over the pie chart sections to view research institutions. Click on the tree map to drill down to key concepts related to these themes. Double-click on a row in the table below to open the publication in a new tab in your browser.

institutions: University of California
Distinct count: 87





Topics

Transmission (28,765)

Leave a message

Text	Keywords	Authors	Title	Publish Time
Within California, Santa Clara county had low frequencies of both mutants, despite having a high CFR relative to San Francisco county. However, Fig. 3 shows that, as observed in Germany, Santa Clara county actually had high frequencies of both of these mutants during the early phase of the epidemic (March) and both mutants decreased rapidly to less than 5% by early April. Nearly 45% of the deaths in this county occurred in long-term care facilities (LTCFs). The peak number of deaths that were not associated with LTCFs occurred in late March (https://www.sccgov.org/sites/covid19/Pages/dashboard-cases.aspx), shortly after the peak 7-day mean average period of the two mutants (Fig. 3).	care	Hu, Y.; Riley, L. W.	Dissemination and co-circulation of SARS-CoV2 subclades exhibiting enhanced transmission associated with increased mortality in Western Europe and the United States	66333
A concerning trend is the alarming rate at which black and Hispanic/Latino Americans are being infected and dying from COVID-19 [25] . There were early data from cities and states across the country indicating higher mortality from COVID19 in black and Hispanic/Latino populations. These included Milwaukee, WI, experiencing a 73% mortality rate in black patients who make up 26% of the population; Chicago, IL (67% of the mortality with 32% of the population); and the states of Louisiana (70% of the mortality with 32% of the population) and Michigan (41% of the mortality with 14% of the population). In the COVID-NET catchment population of the USA, a higher percentage of black patients were infected (33%) compared to the percentage of overall population being black (18%) [23] . This trend has been repeated across the country and has brought into stark reality the devastating impact COVID-19 has had on communities of color [26] . 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 ethnical stigmas among medical professionals, crowded living conditions, income instability, and continued rates of exposure and	care | COVID-19 | healthcare | medical | healthcare | health | communities | COVID-19	Judson, Gregory L.; Kelemen, Benjamin W.; Njoroge, Joyce N.; Mahadevan, Vaikom S.	Cardiovascular Implications and Therapeutic Considerations in COVID-19 Infection	110395

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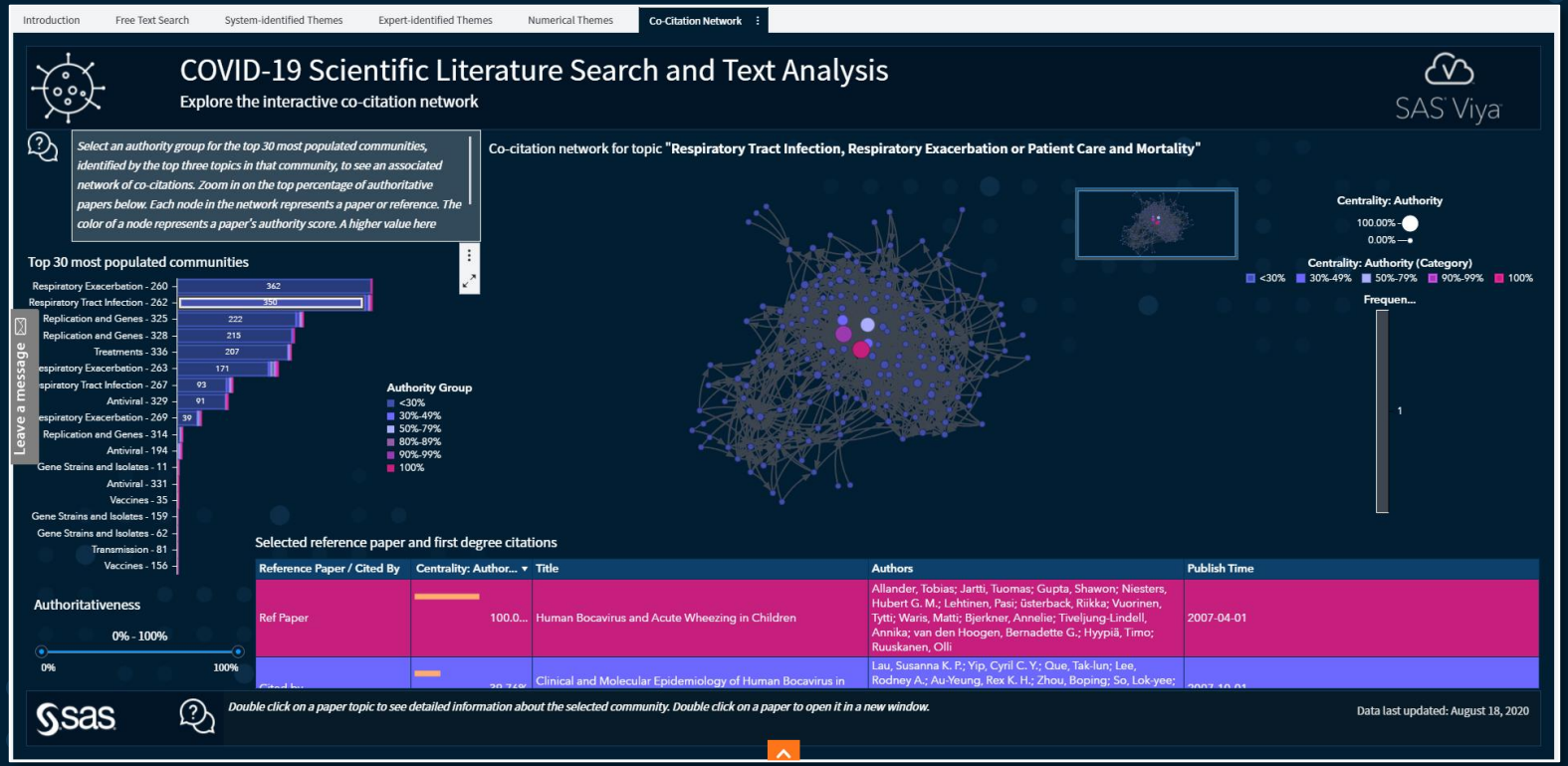
Data last updated: July 15, 2020

COVID-19 Scientific Literature Search and Text Analysis

Co-Citation Network



Online Engagement Analysis

Large Global Life Sciences Company

Key Capability: Online Engagement Analytics

SITUATION

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.

WORK UNDERWAY

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.)

Better understand the audience profile with greater granularity. What were the most effective channels for recruitment?

What Insights could be generated over engagement? What is the best webcast platform and what lessons can be learned for future events ?

SAS Visual Analytics was deployed in AWS to gather and explore insights created in CI 360

Please check COVID-19 Data Analytics Resource Hub
(https://www.sas.com/en_us/covid19.html)

sas.com