



University of Redlands

November 19, 2020

Collecting and Connecting the Dots For COVID-19

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Chief Medical Officer



THE SCIENCE OF WHERE™

GIS is Based on Geography the Science of Our World

... Providing Content and Context

... And a Common Reference System

Helping Us See ... Complexity ...

... Relationships, Patterns and Associations

... Bringing It All Together

Helping Us Understand ...

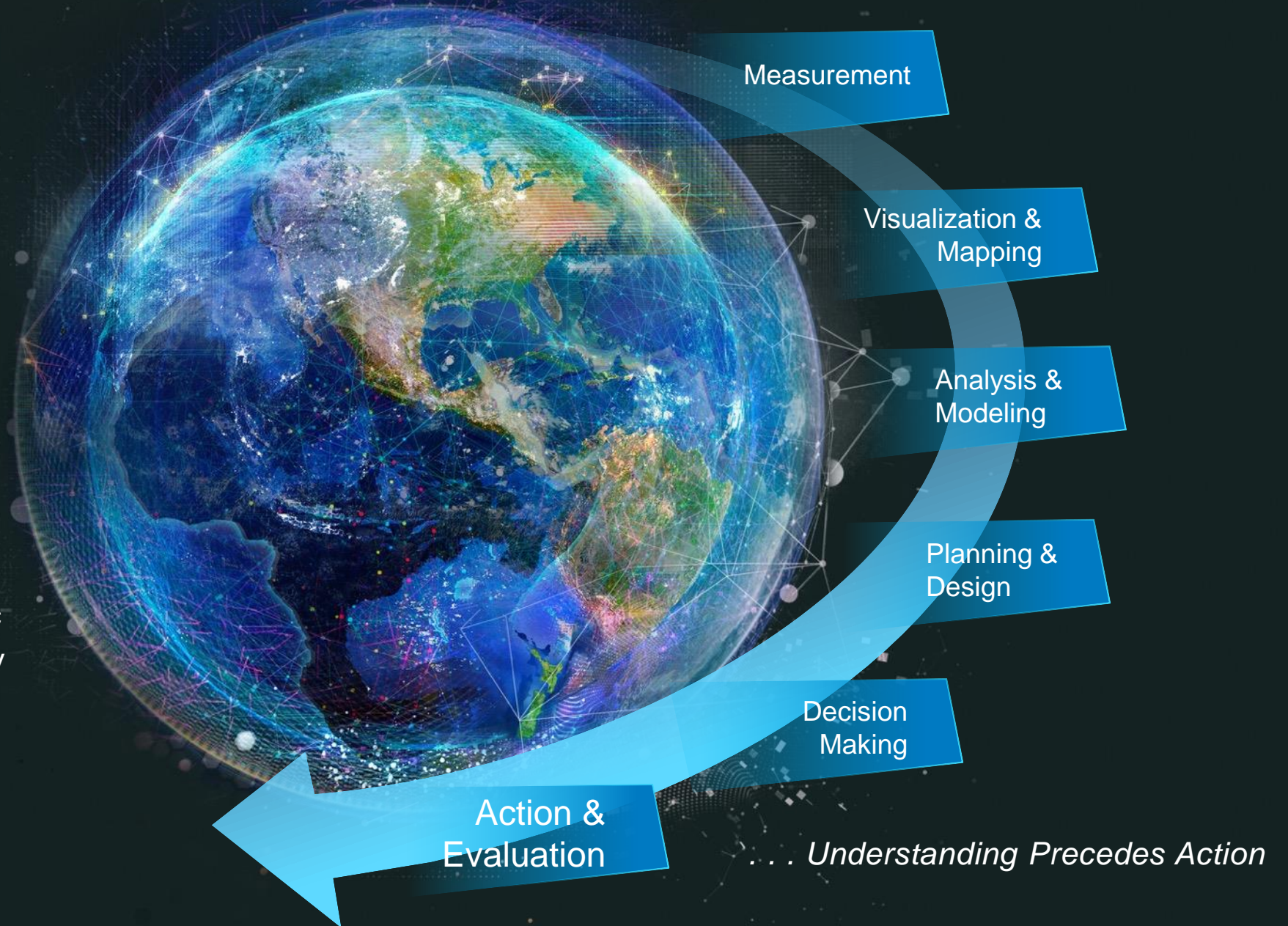
... And Intelligently Respond



GIS

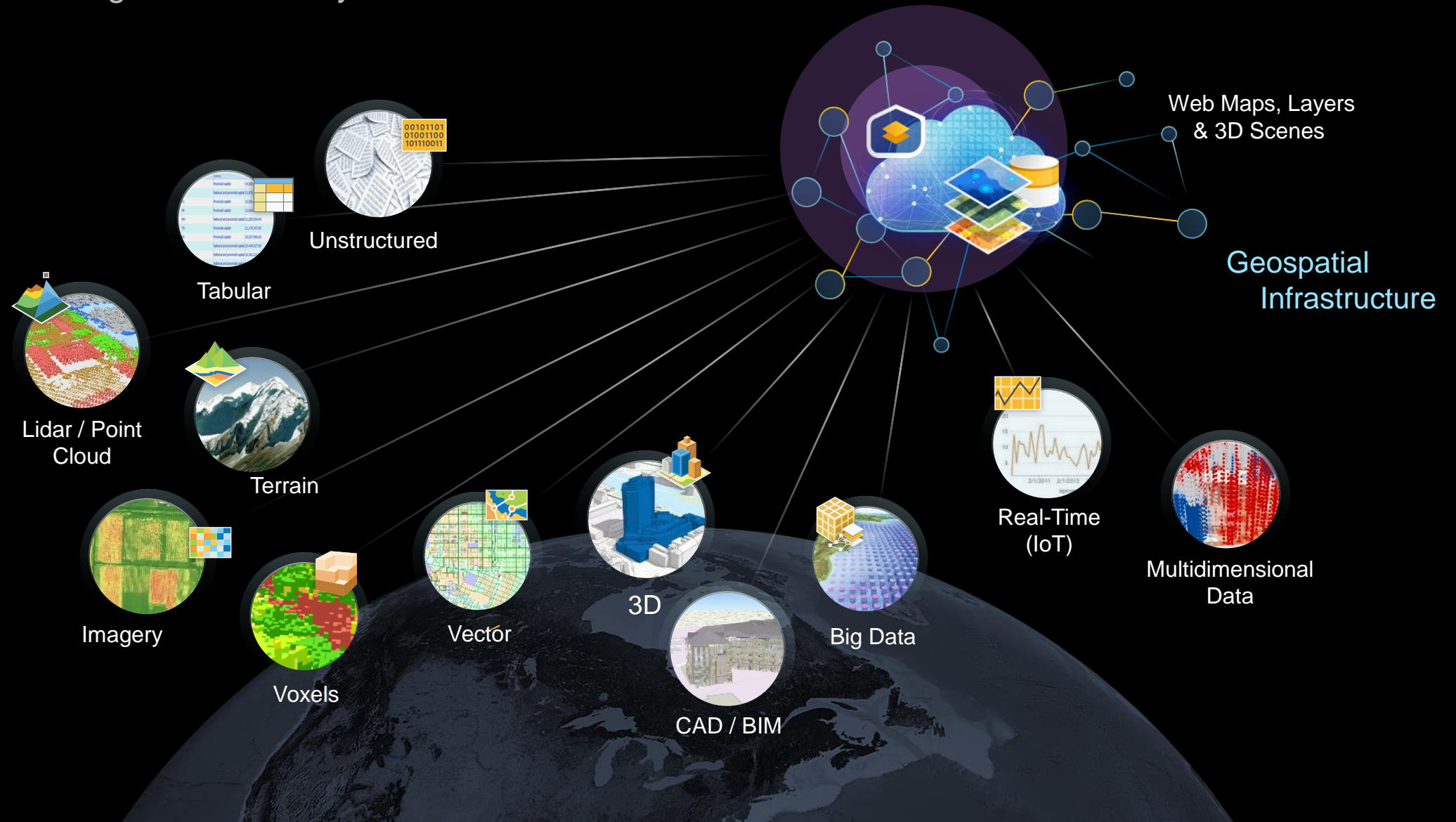
Provides a Framework
and a Process . . .

. . . for Creating and
Applying Geographic
Knowledge Widely



Integrating Every Type and Format of Data

... Making Them Directly Usable as Services



Innovation in a Crisis

Conditions for rapid, impactful change

- Uniting around a purpose
- Seeing the system differently
- Unfreezing the Organization
- Creating a bias toward action



COLLECT



CONNECT



Repeatable Patterns

Mapping &
Monitoring
Disease

Strategic
Planning

Indoor Space
Management

Analyzing
Relationships
& Gaps

Repeatable Patterns

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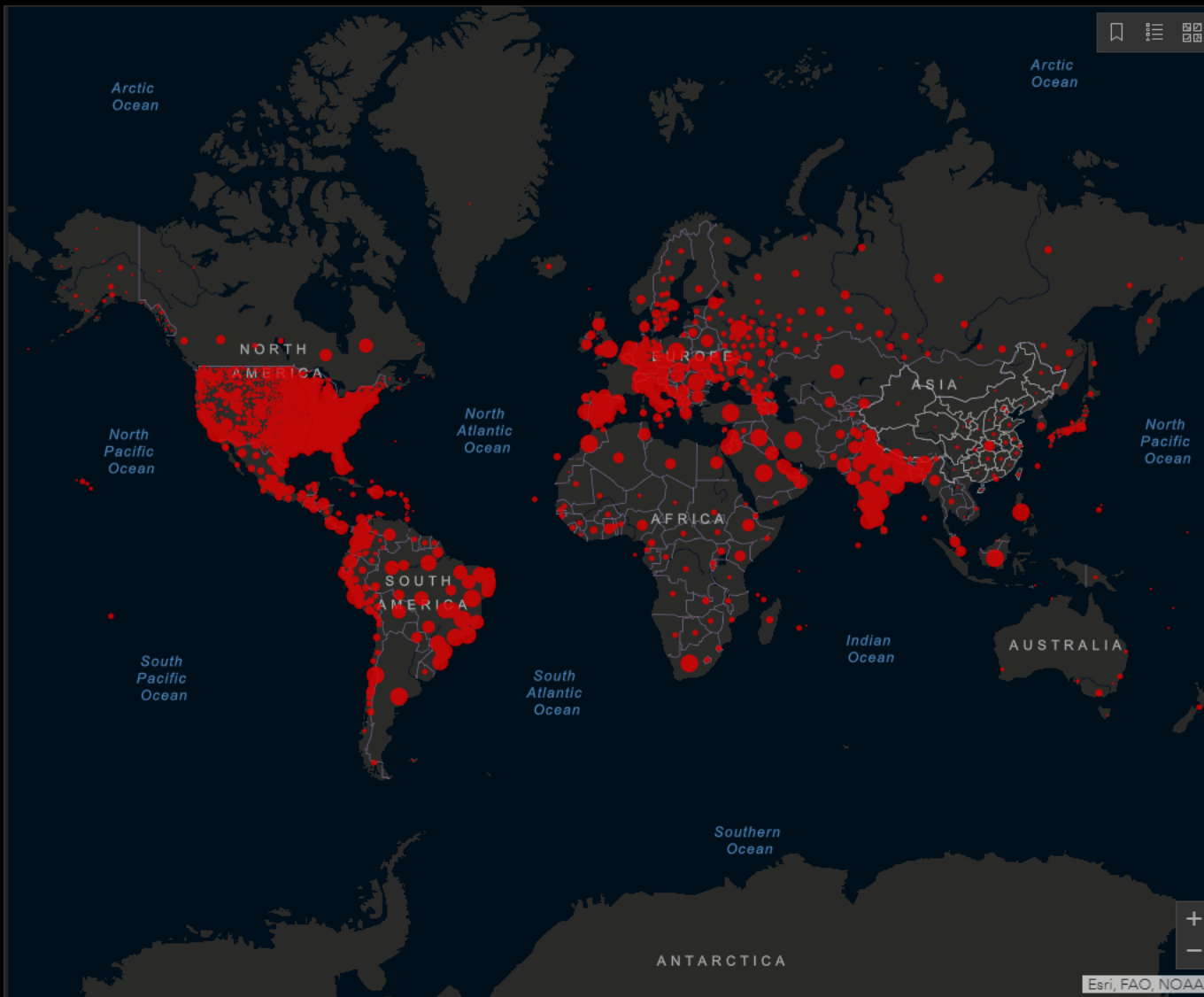
Global Cases
56,178,674

Cases by Country/Region/Sovereignty

- 11,525,149 US
- 8,912,907 India
- 5,945,849 Brazil
- 2,115,717 France
- 1,975,629 Russia
- 1,525,341 Spain
- 1,434,004 United Kingdom
- 1,339,337 Argentina
- 1,272,352 Italy
- 1,218,003 Colombia
- 1,015,071 Mexico
- 939,931 Peru
- 854,745 Germany
- 801,894 Iran
- 772,823 Poland
- 757,144 South Africa
- 586,522 Ukraine
- 540,605 Belgium
- 534,558 Chile
- 526,852 Iraq
- 478,720 Indonesia
- 475,284 Czechia

Admin0 Admin1 Admin2

Last Updated at (M/D/YYYY)
11/18/2020, 6:26 PM



Cumulative Cases Active Cases Incidence Rate Case-Fatality Ratio Testing Rate

191

countries/regions

Lancet Inf Dis Article: [Here](#). Mobile Version: [Here](#). Data sources: [Full list](#). Downloadable database: [GitHub](#), [Feature Layer](#).
Lead by JHU CSSE, Technical Support: [Esri Living Atlas team](#) and JHU APL. Financial Support: JHU, NSF, [Bloomberg Philanthropies](#) and [Stavros Niarchos Foundation](#). Resource support: [Slack](#), [Github](#) and [AWS](#). Click [here](#) to **donate** to the CSSE dashboard team, and other JHU COVID-19 Research Efforts. [FAQ](#). Read more in this [blog](#). [Contact US](#).

Cases and Death counts include confirmed and probable (where reported).
Recovered cases are estimates based on local media reports, and state and local reporting when available, and therefore may be

Global Deaths
1,348,348

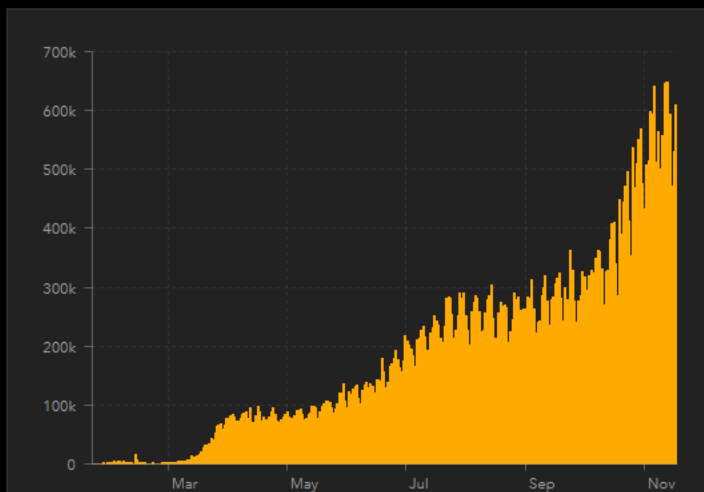
- 250,483 deaths US
- 167,455 deaths Brazil
- 130,993 deaths India
- 99,528 deaths Mexico
- 53,368 deaths United Kingdom
- 47,217 deaths Italy
- 46,772 deaths France
- 42,941 deaths Iran
- 42,039 deaths Spain
- 36,347 deaths

Global Deaths

US State Level
Deaths, Recovered

- 34,187 deaths, **82,022 recovered** New York US
- 20,338 deaths, **889,099 recovered** Texas US
- 18,453 deaths, **recovered** California US
- 17,731 deaths, **recovered** Florida US
- 16,655 deaths, **40,090 recovered** New Jersey US
- 11,468 deaths, **recovered** Illinois US
- 10,407 deaths, **137,422 recovered** Massachusetts US
- 9,463 deaths, **186,022 recovered** Pennsylvania US
- 9,065 deaths, **recovered** Georgia US
- 8,573 deaths, **138,862 recovered** Michigan US

US Deaths, Recovered



Daily Cases

Uptake

World leaders depended on the dashboard



Department of Health and Human Services Secretary's Operations Center at ASPR

Uptake

World leaders depended on the dashboard



Members of Germany's emergency task force sit down for a coronavirus briefing

Uptake

World leaders depended on the dashboard



Coronavirus, due vittime in Italia.
79 contagi in 5 regioni

Coronavirus briefing in Italy

Uptake

World leaders depended on the dashboard



PREPARING FOR A POSSIBLE PANDEMIC

DUBLIN

News in Dublin, Ireland

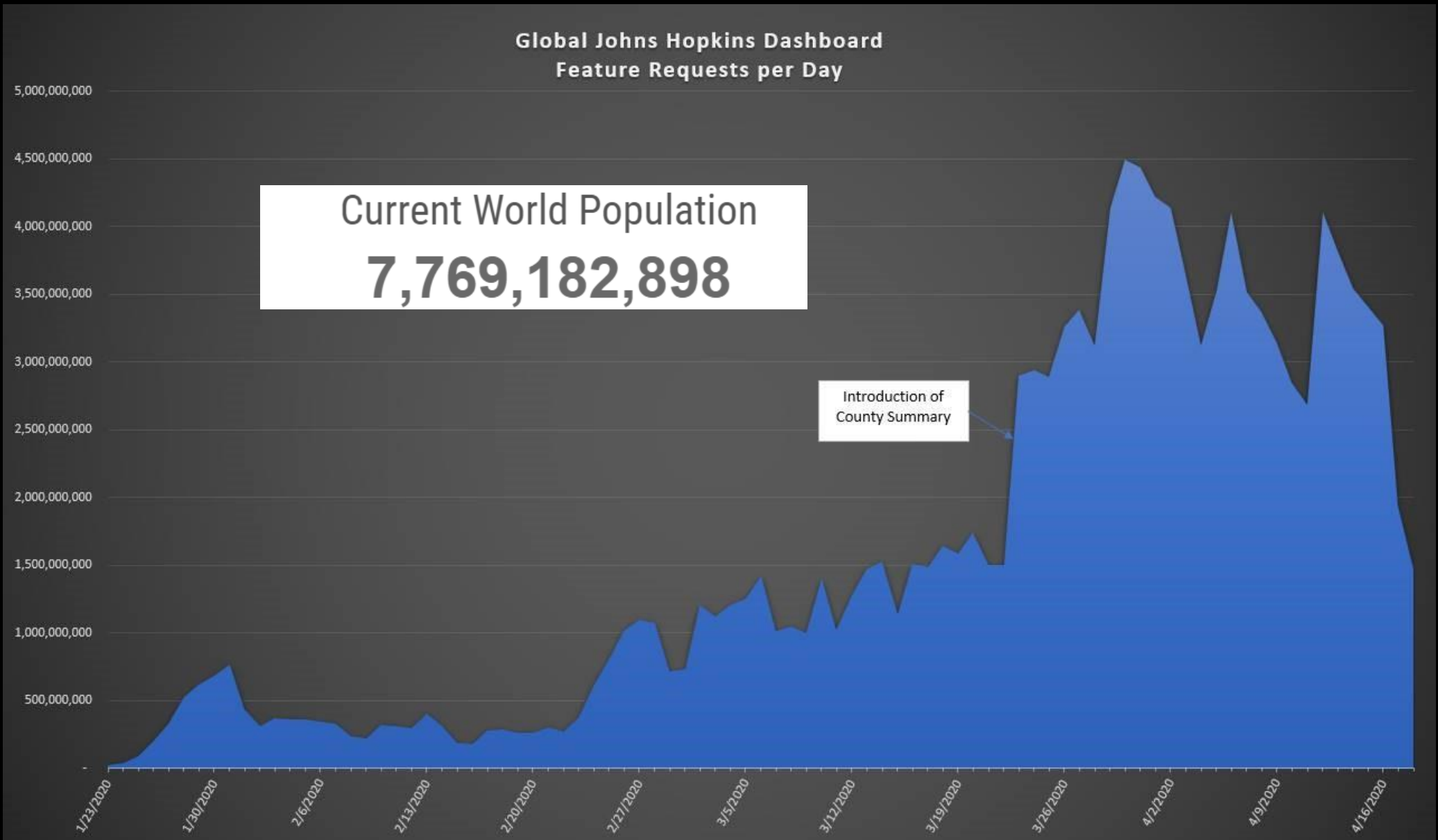
Going Viral

Feature layer requests

Global Johns Hopkins Dashboard
Feature Requests per Day

Current World Population
7,769,182,898

Introduction of
County Summary





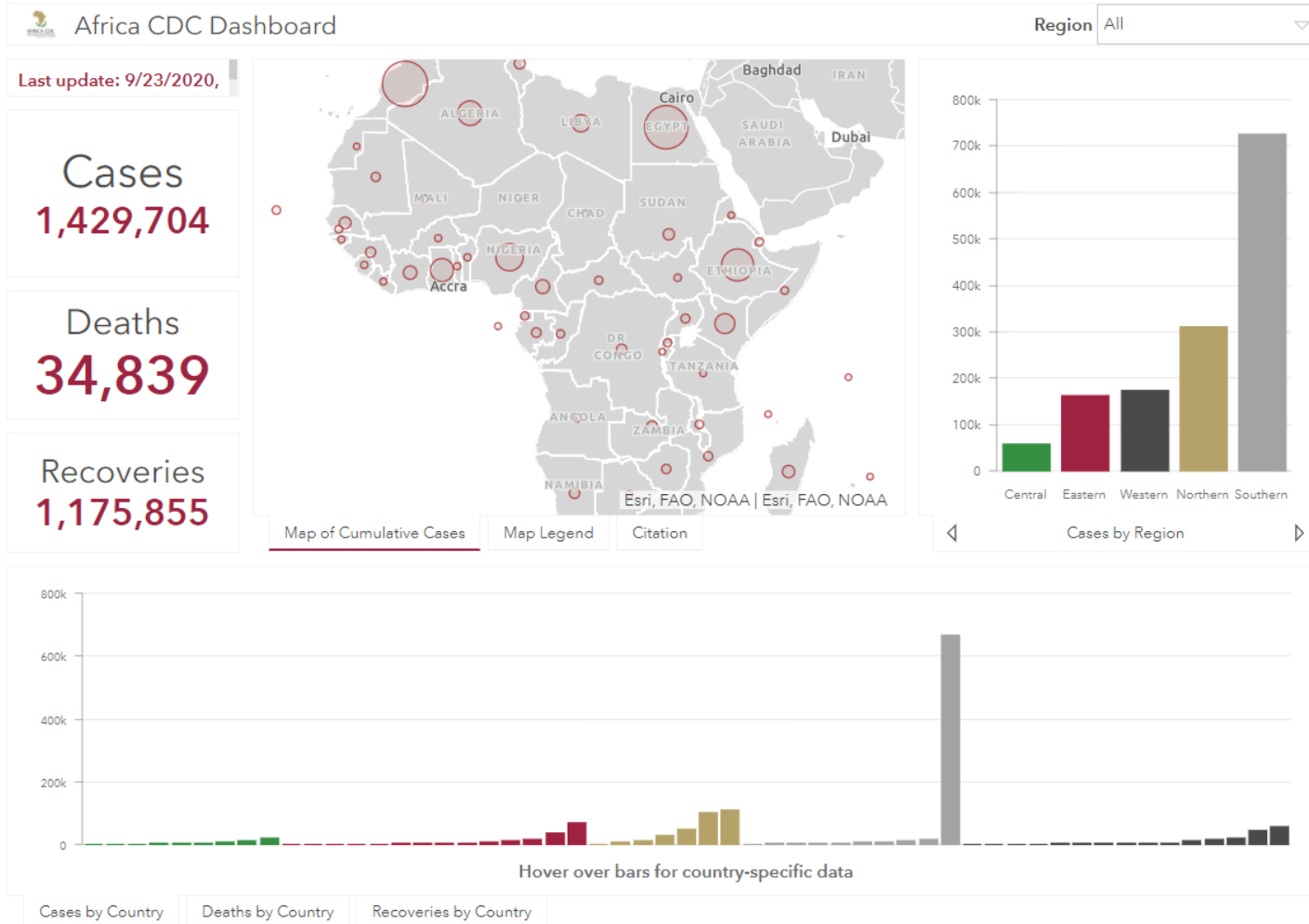
Impact

Key outcomes from this single dashboard

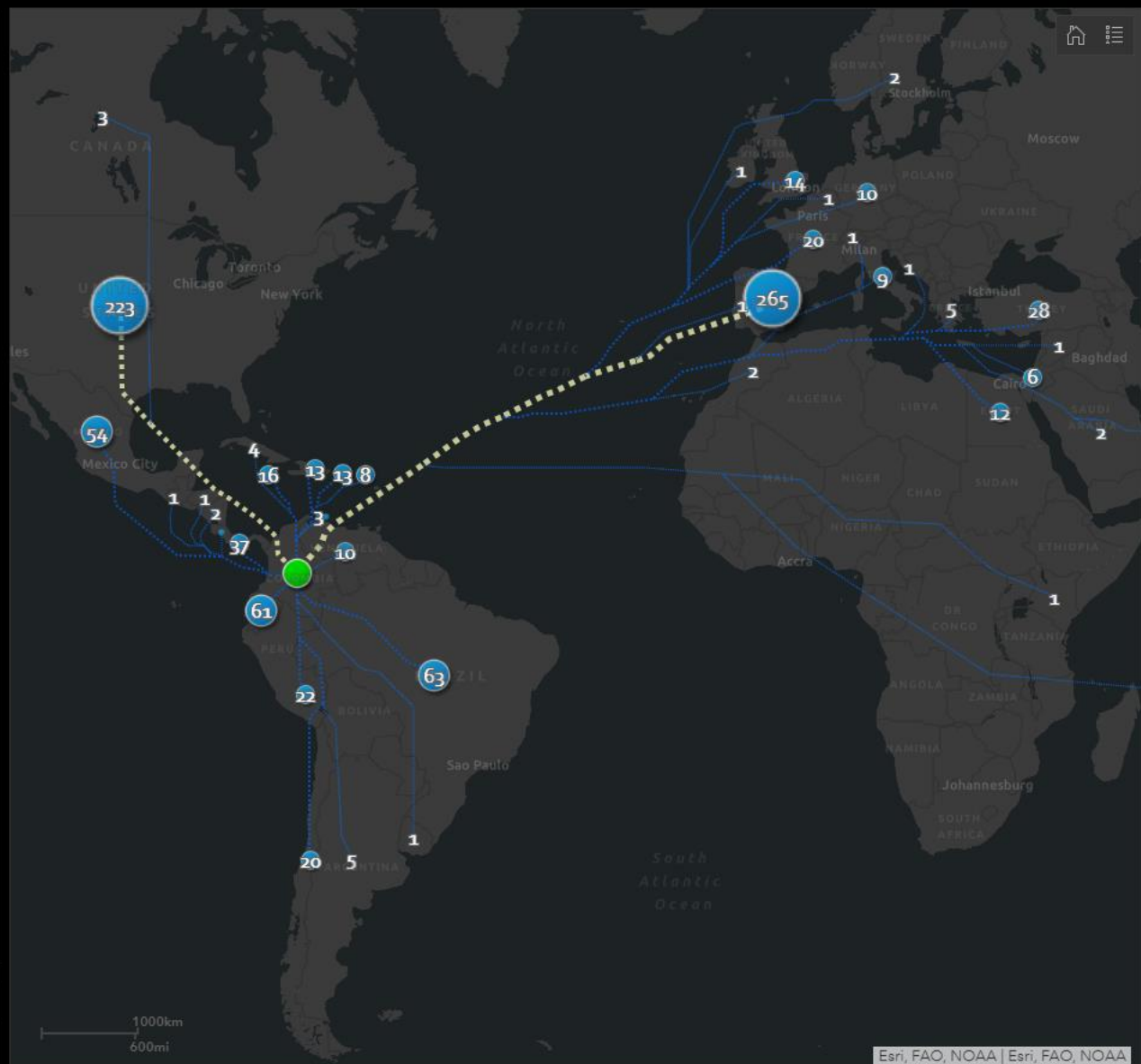
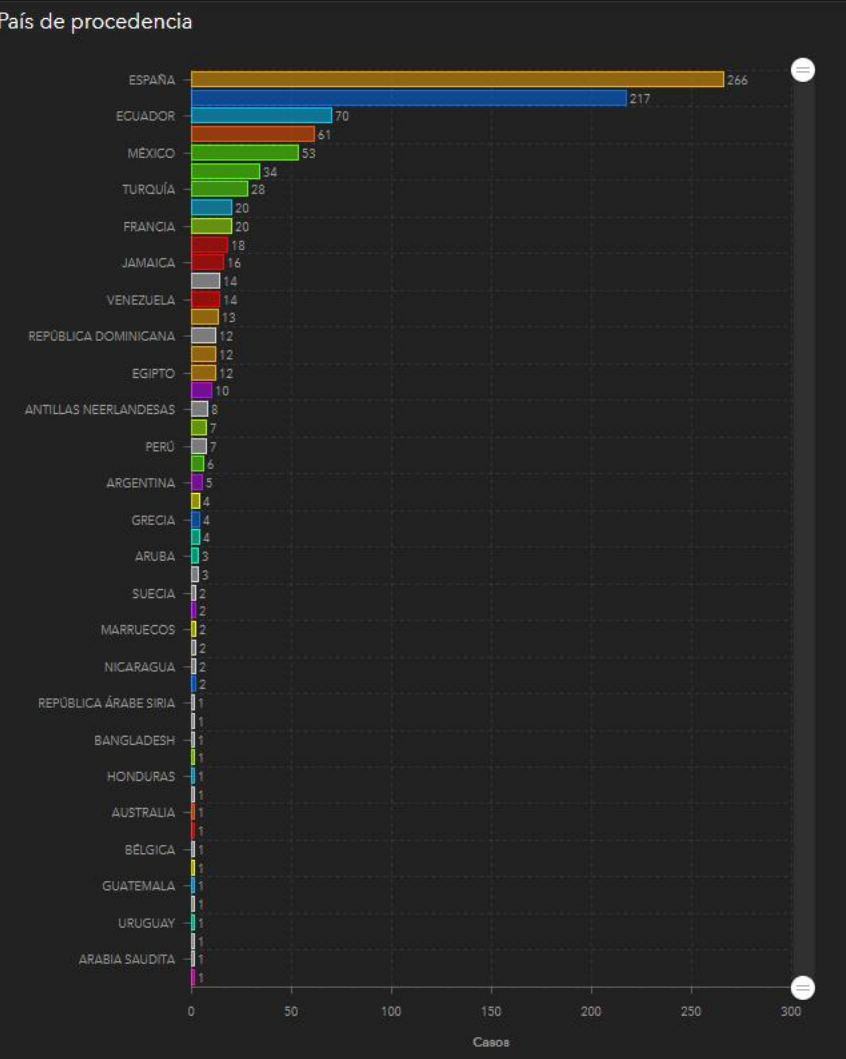
- Demonstrated the value of GIS for health on a global scale
- Promoted data sharing
- Exposed gaps in public health data sharing and interoperability
- Inspired questions about who should be the authoritative data resource
- Built expectations for real-time data

Inspired

The world creates localized dashboards



Casos confirmados de COVID-19 con procedencia importada a Colombia
Esri Colombia



Tipo importado
 981

Tipo relacionado
 40,456

Tipo en estudio
 742,831

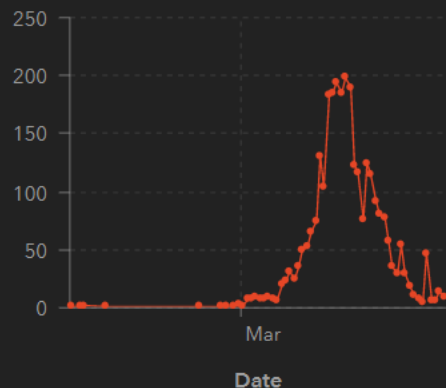
Para los casos de procedencia importada de personas en transito por diferentes países mostrados en el mapa, se tomó el primer país en el reporte del INS, por ejemplo:
Para 'España-Croacia-Bosnia' se toma 'España' como el país de procedencia.

NSW COVID-19 Cases and Community Profile by The University of Sydney

Total Reported Cases*

2,957

* Source <https://data.nsw.gov.au/nsw-covid-19-data>



Daily cases

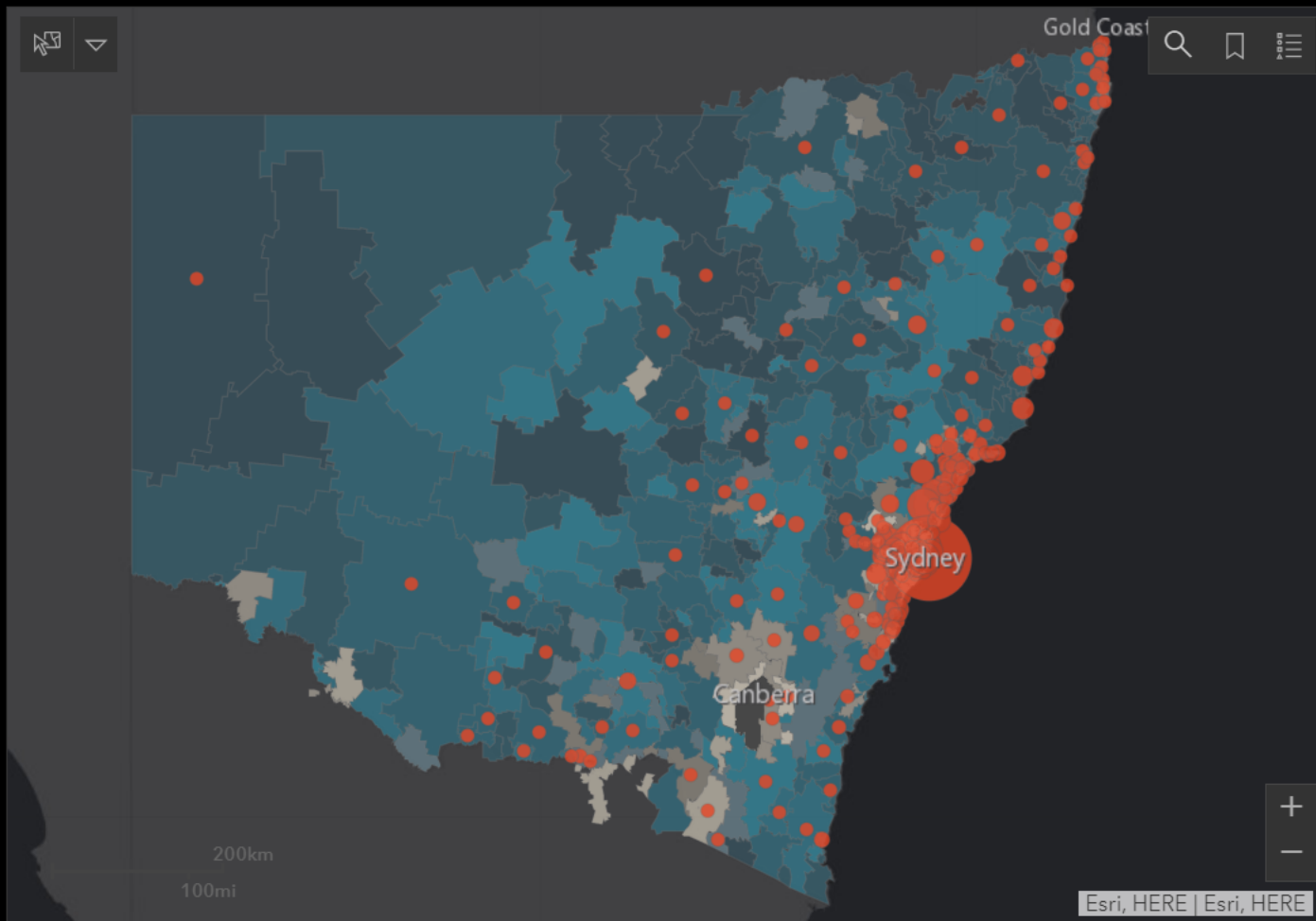
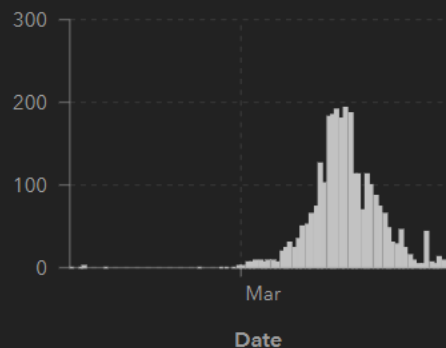
Total cases

Selected Cases in NSW

2,819

Unmapped Cases

138



IRSD

IRSAD

IER

IEO

Population aged 60+ (%)

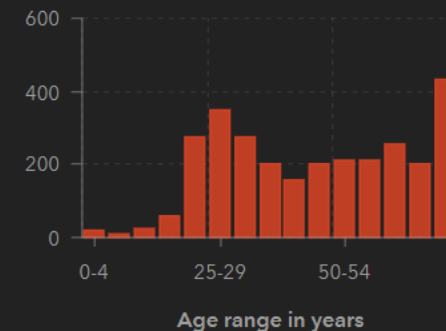
Hover over each chart for further information or **click on the circle in the top right of each panel** to expand the content.

Find a postcode on the map using the search tool. In the popup window, click on the arrow button on the bottom to select the postcode. Cases for this postcode will plot in the lower left. **Zoom in** to spatially select postcodes using the select arrow button in the top left of the map. **Click the cross** to clear.

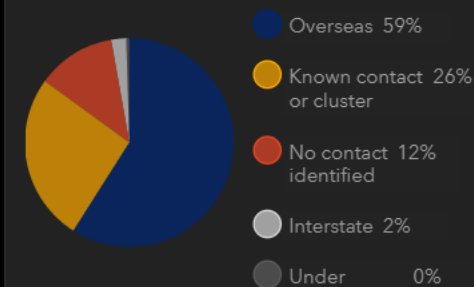


School of Geosciences | Faculty of Science
School of Social and Political Sciences | Faculty of Arts and Social Sciences
School of Medical Sciences | Faculty of Medicine and Health

Total NSW cases by age range



Total NSW cases by likely source of infection



Socio-Economic Indexes for Areas (SEIFA)

The Australian Bureau of Statistics SEIFA indexes rank areas across Australia relative to socio-economic advantage and disadvantage based on census information. There are four indexes each

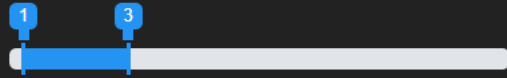
SEIFA

Most recent case provided was reported on 4/17/2020, 5:00 PM (mm/dd/yyyy)

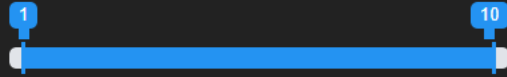
Last update: a minute ago

NSW COVID-19 Cases and Community Profile by The University of Sydney

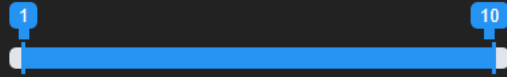
Select IRSD Range



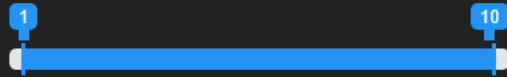
Select IRSAD Range



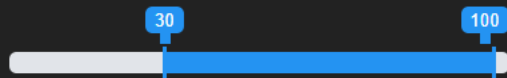
Select IER Range



Select IEO Range



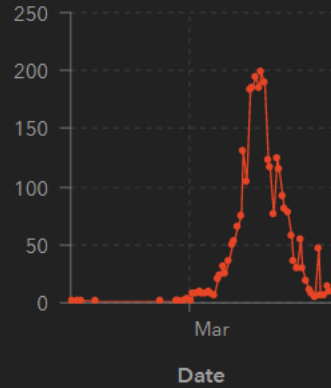
Select Percentage of Population Over 60



Total Reported Cases*

2,957

* Source <https://data.nsw.gov.au/nsw-covid-19-data>



Daily cases

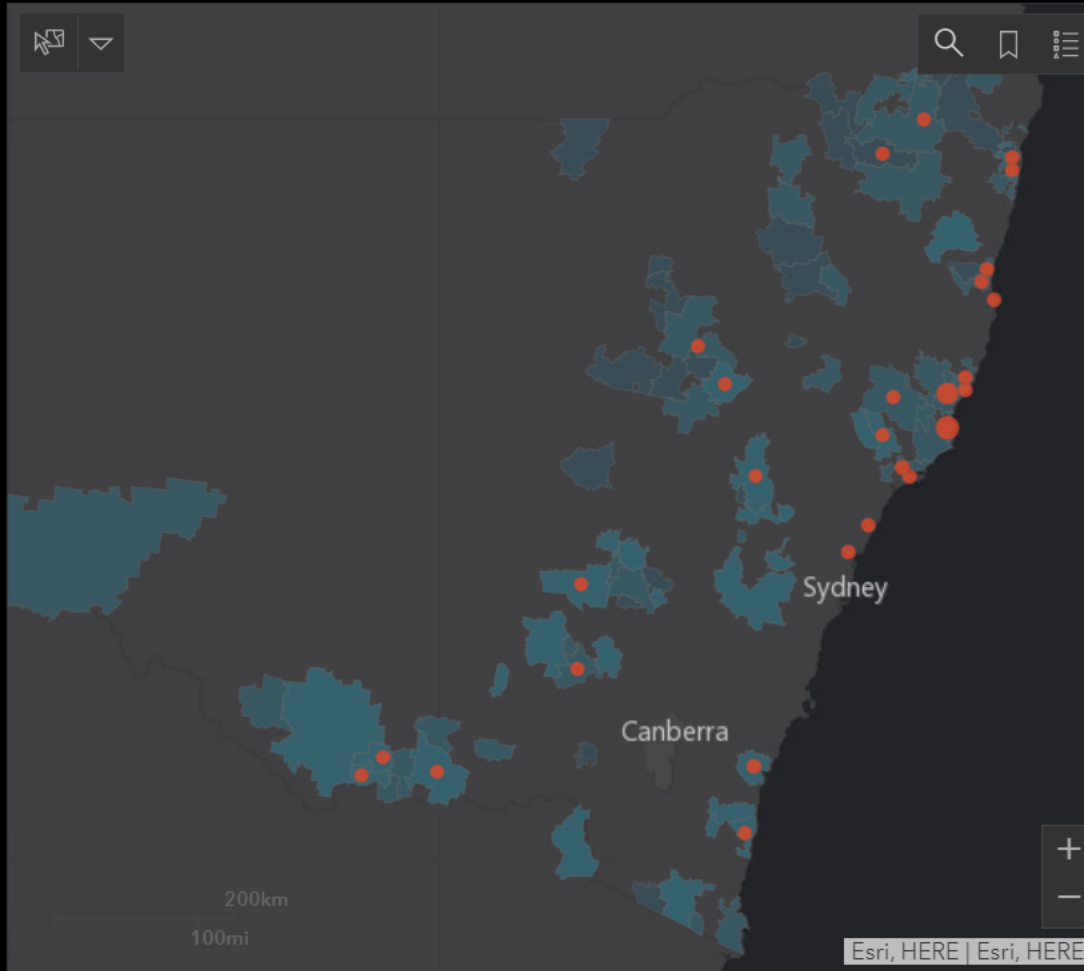
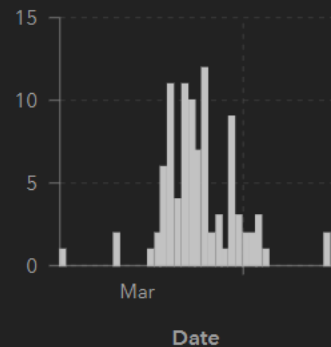
Total cases

Selected Cases in NSW

95

Unmapped Cases

138



IRSD

IRSAD

IER

IEO

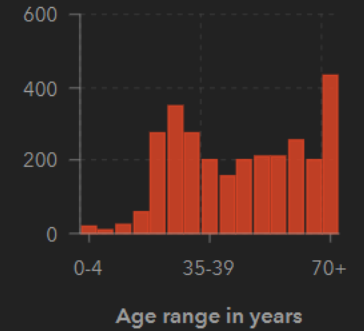
Population aged 60+ (%)

Hover over each chart for further information or **click on the circle in the top right of each panel** to expand the content. **Find a postcode** on the map using the search tool. In the popup window, click on the arrow button on the bottom to select the postcode. Cases for this postcode will plot in the lower left. **Zoom in** to spatially select postcodes using the

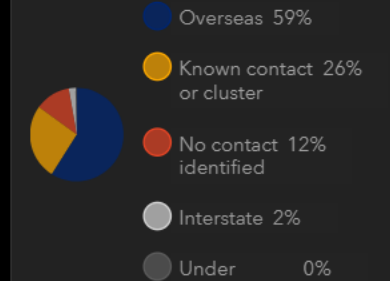


School of Geosciences | Faculty of Science
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School of Medical Sciences | Faculty of Medicine and Health

Total NSW cases by age range



Total NSW cases by likely source of infection



Socio-Economic Indexes for Areas (SEIFA)

The Australian Bureau of Statistics SEIFA indexes rank areas across Australia relative to socio-economic advantage and

SEIFA

Most recent case provided was reported on 4/17/2020, 5:00 PM (mm/dd/yyyy)

Last update: 4 minutes ago

確診/疑似
5,057
▲7

出院
4,758
▲9

住院
160
▼7

危殆
13

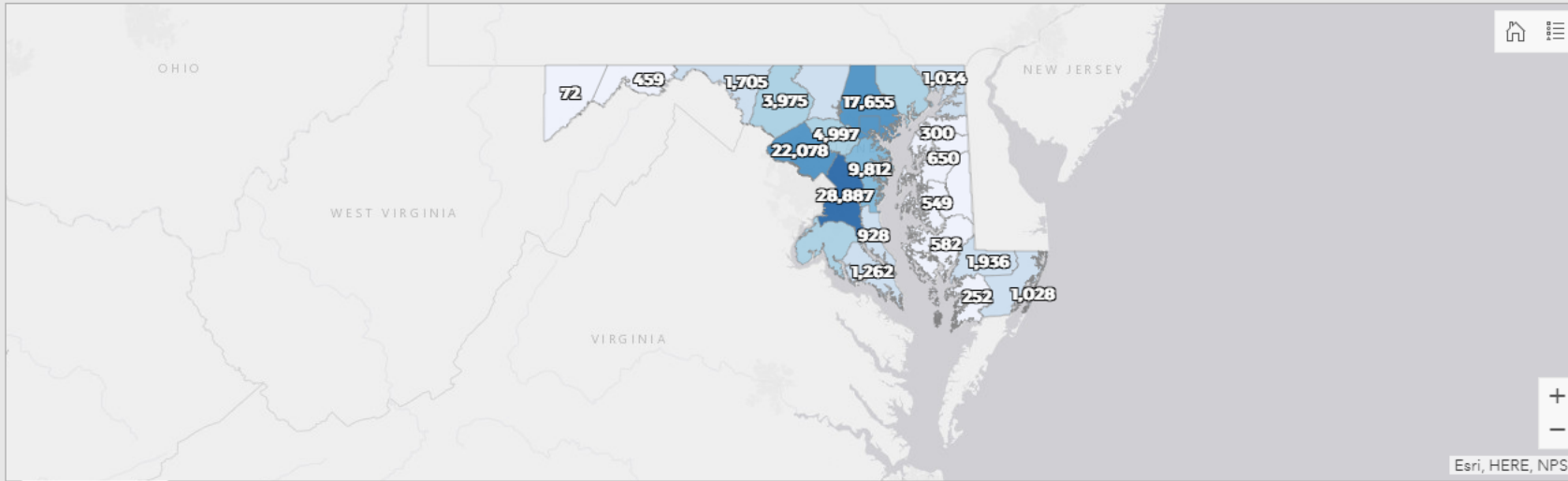
死亡
104
▲0



- 14天內居住 / 到訪過的建築物
- 超過14天居住 / 到訪過的建築物

- 個案 5057: 女 50歲 24/09/2020 確診
- 個案 5056: 女 44歲 24/09/2020 確診
- 個案 5055: 男 52歲 24/09/2020 確診
- 個案 5054: 女 40歲 24/09/2020 確診
- 個案 5053: 女 40歲 24/09/2020 確診
- 個案 5052: 女 31歲 24/09/2020 確診
- 個案 5051: 女 32歲 24/09/2020 確診
- 個案 5050: 女 64歲 23/09/2020 確診
- 個案 5049: 男 4歲 23/09/2020 確診
- 個案 5048: 女 41歲 23/09/2020 確診

Maryland COVID-19 Data Dashboard

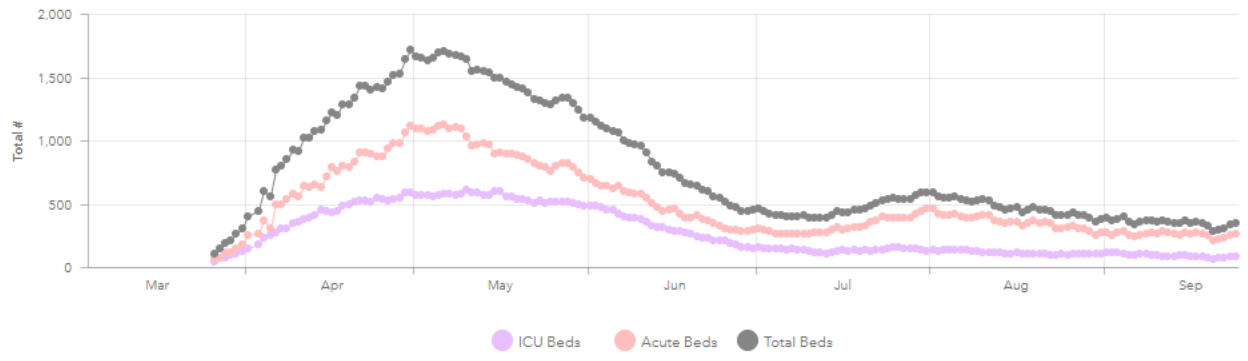


Affected Counties:

- Prince George's - 28,887
- Montgomery - 22,078
- Baltimore - 17,655
- Baltimore City - 15,374
- Anne Arundel - 9,812
- Howard - 4,997
- Frederick - 3,975

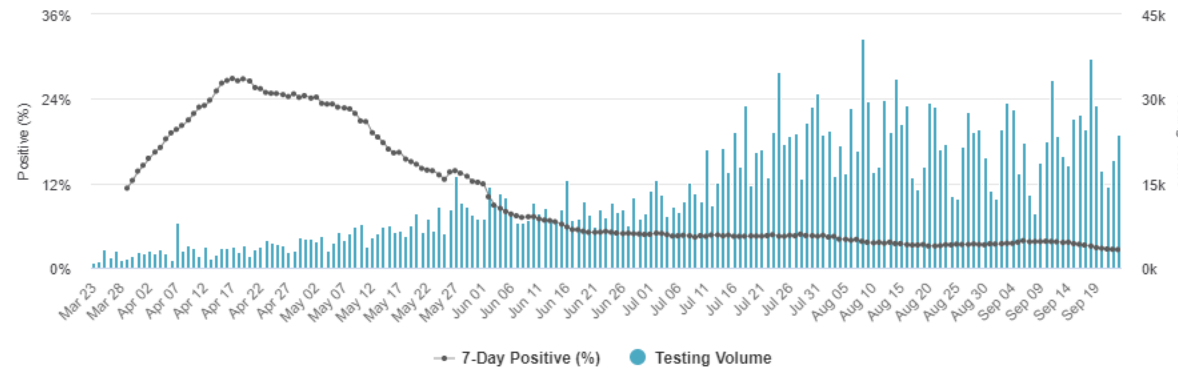
Cases by County | Cases by ZIP Code | Testing by County

ICU and Acute Hospital Beds for COVID-19, Currently in Use



Hospitalizations, Current | Positivity and Testing by Age Group | Age Distribution | Gender Distribution | Racial Distribution

Testing Volume, Tests per Day and Percent Positive Rate (7-Day Avg) - Methodology



Confirmed Cases
121,800
 24hr Change: +503

Persons Tested Negative
1,439,779
 24hr Change: +8,971

Testing Volume
2,464,927
 24hr Change: +23,702

Testing % Positive
2.57%
 24hr Change: -0.03

Confirmed Deaths
3,765
 24hr Change: +9

Currently Hospitalized
349
 24hr Change: 17

Invasive Ventilators

618

Total Units

Ventilators in Reserve

459

Available Units

Intubated

15

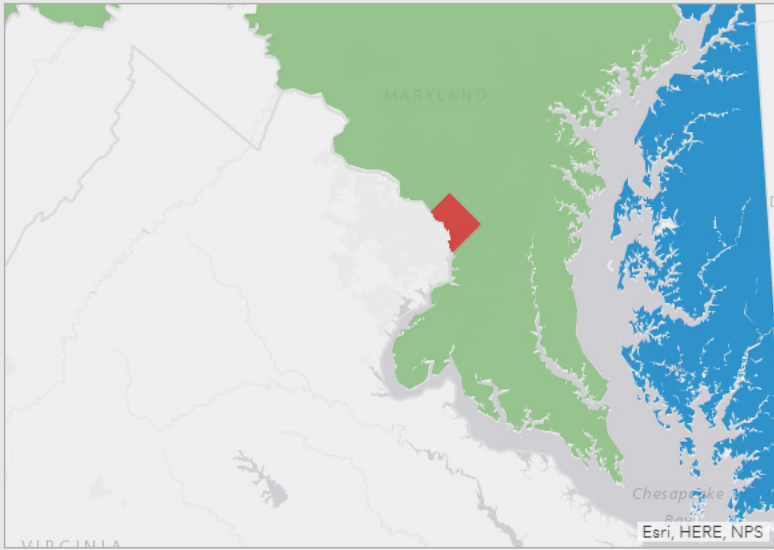
COVID-19(+) Patients

Non-Intubated

105

COVID-19(+) Patients

Data are self-reported daily by hospitals. Therefore, values may not represent total participation.



Select Region

District of Columbia: 17%
2 of 12 hospitals

Eastern Shore: 71%
5 of 7 hospitals

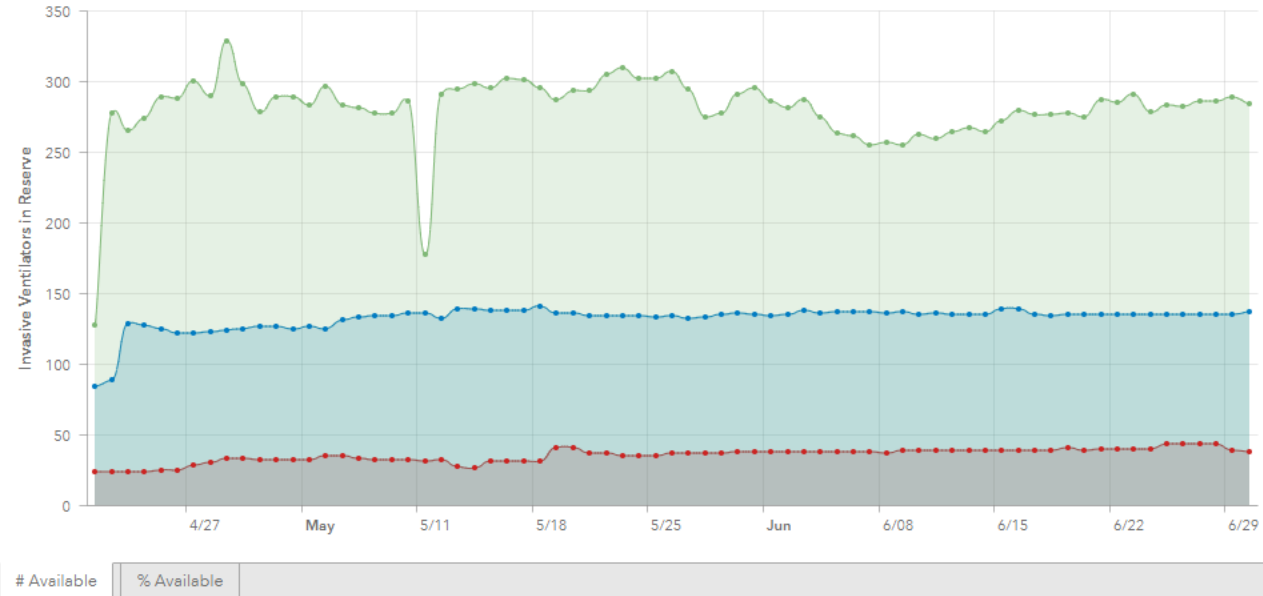
Western Shore: 12%
5 of 42 hospitals

Today's Participation

Historic Participation

Last Updated:
June 30, 2020 @ 12:01AM

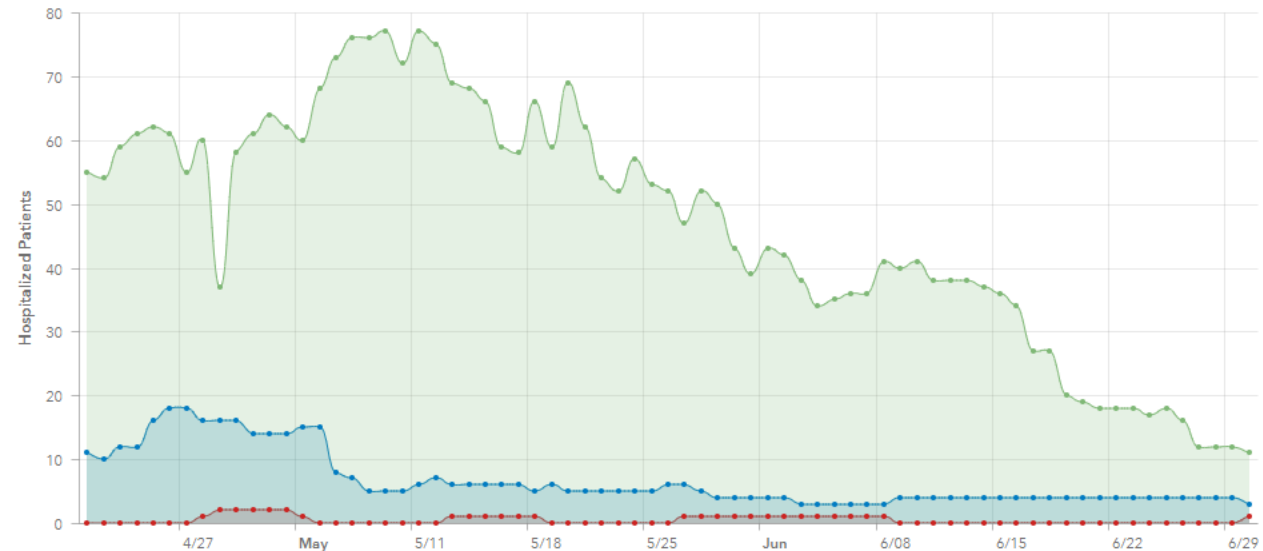
Invasive Ventilator Availability



Available

% Available

Intubated & COVID-19(+)



Intubated

Non-Intubated

Maryland COVID-19 in Congregate Facility Settings: Week of July 1, 2020

Confirmed Staff Cases

1,961

Confirmed Staff Deaths

16

Confirmed Resident Cases

3,783

Confirmed Resident Deaths

866

Affected Facilities

Week of July 1, 2020

Anchorage Healthcare Center

Staff Cases: 7

Staff Deaths: 0

Resident Cases: 25

Resident Deaths: 4

Arbor Terrace Fulton

Staff Cases: 16

Staff Deaths: 0

Resident Cases: 19

Resident Deaths: 4

Arbor Terrace Waugh Chapel

Staff Cases: 6

Staff Deaths: 0

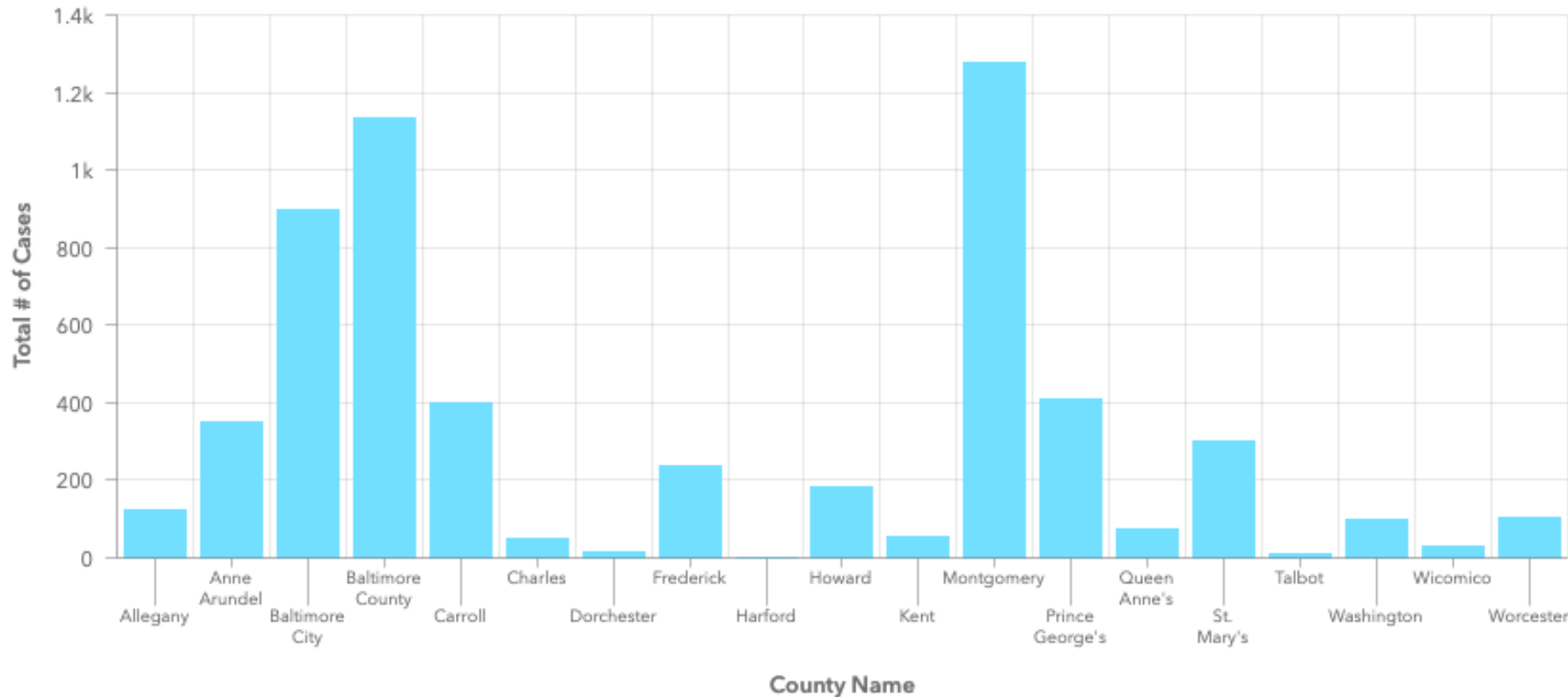
Resident Cases: 3

Resident Deaths: 1

Arden Courts of Pikesville

Staff Cases: 3

Staff Deaths: 0



Select a bar in the graph to filter the list of facilities and the number totals by county
Click in empty space in the graph to reset to the statewide totals

Facilities: Nursing, Assisted Living, Group Homes

Facilities: State and Local

Total Confirmed

740,902

Last update: 4 minutes ago

Croatia -

Confirmed :

2,777

Active : **515**

Deaths : **107**

Recovered :

2,155

Cyprus -

Confirmed : **996**

Active : **144**

Deaths : **19**

Recovered : **833**

France -

Confirmed :

194,109

Active : **92,778**

Deaths : **29,736**

Recovered :

71,595

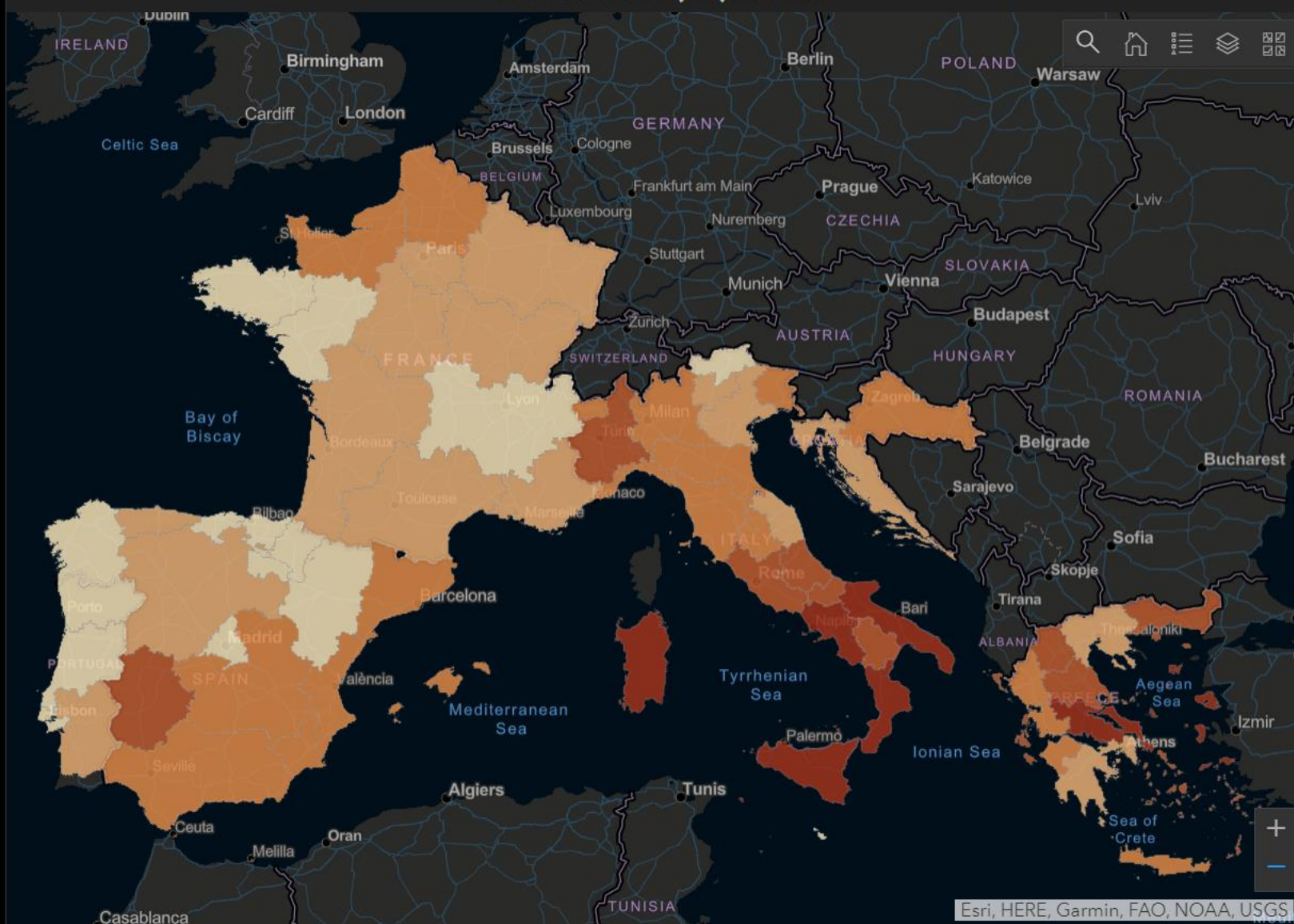
Greece -

Confirmed :

2,300

Last update: 4 minutes ago

Neet Rates (%) 2019



Neet Rates (%) 2019

Greece (cases per Nuts-2 region)

Voreio Aigaio : **15** (14) (1) ()

Notio Aigaio : **15** (15) (0) ()

Peloponnisos : **200** (199) (1) ()

Thessalia : **186** (184) (2) ()

Stereia Ellada : **85** (85) (0) ()

Attiki : **1,695** (1,614) (81) ()

Kriti : **21** (20) (1) ()

Ionia Nisia : **14** (12) (2) ()

Dytiki Ellada : **85** (80) (5) ()

Anatoliki Makedonia, Thraki : **333** (311) (22) ()

Kentriki Makedonia : **210** (192) (18) ()

Dytiki Makedonia : **144** (137) (9) ()

Last update: 4 minutes ago



Greece



The 'COVID-19_Regional_Labour' dashboard presents regional statistics for Coronavirus Covid-19 in Greece, Cyprus, Italy and Spain. It includes certain useful indices, such as the per capita shares, while it aspires to study the impact of Covid-19 upon (youth) employment.

The data are from Eurostat, Johns Hopkins University (JHU), WHO, Statista, Wikipedia, relevant national authorities etc.

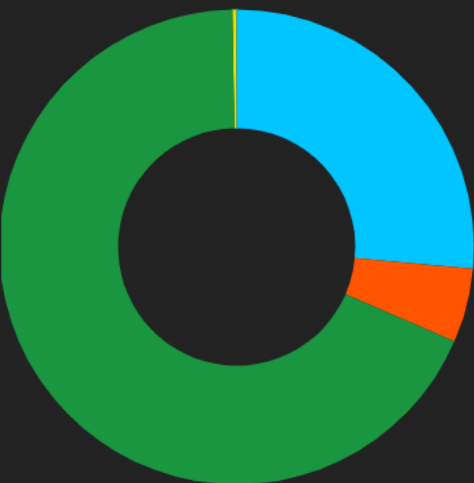
COVID-19_Regional_Labour and its contents herein, including all data, mapping, and analysis, copyright 2020 University of the Aegean/ YOUTHShare

2,370
CONFIRMED

629
ACTIVE

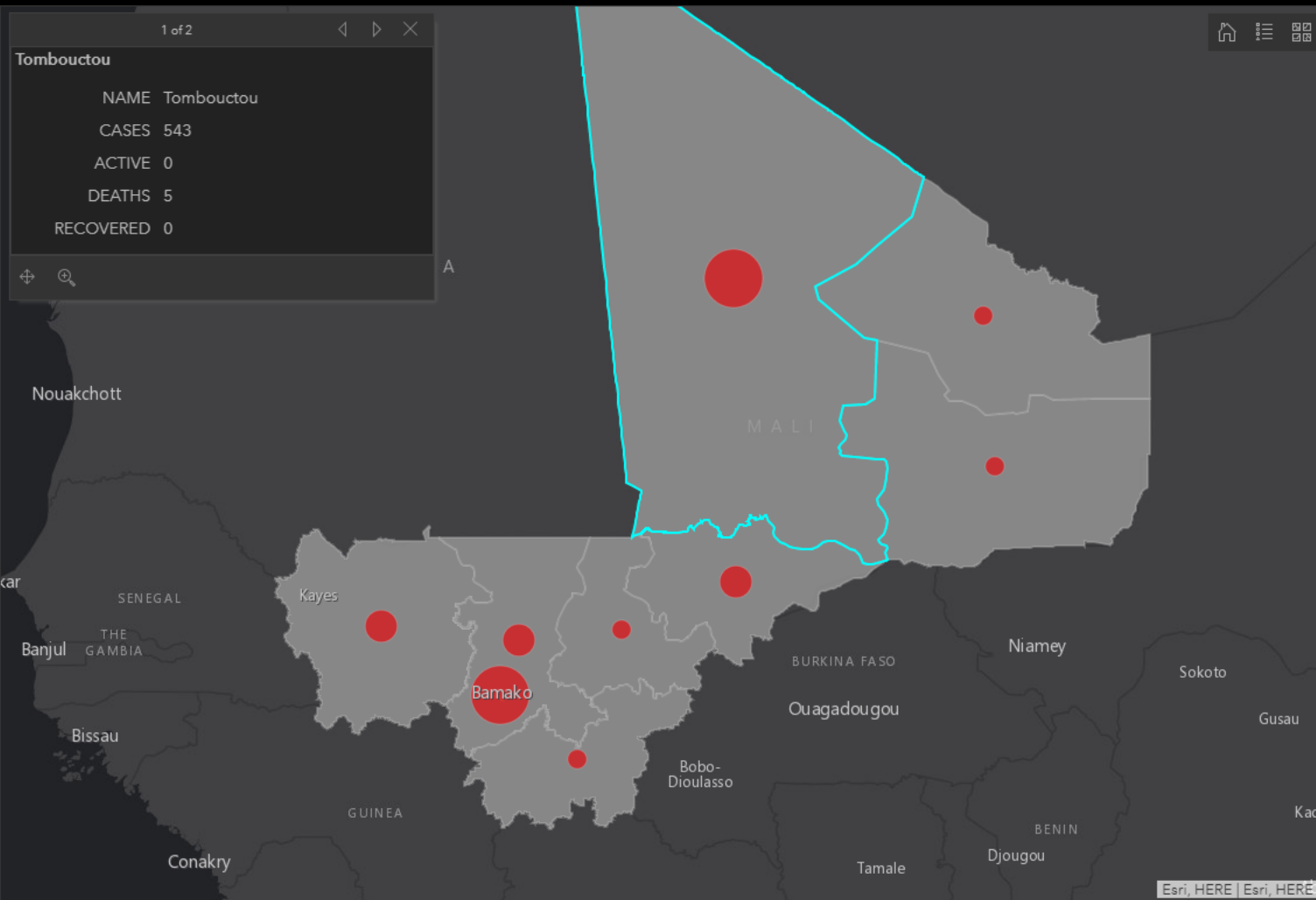
120
DEATHS

1,621
RECOVERED

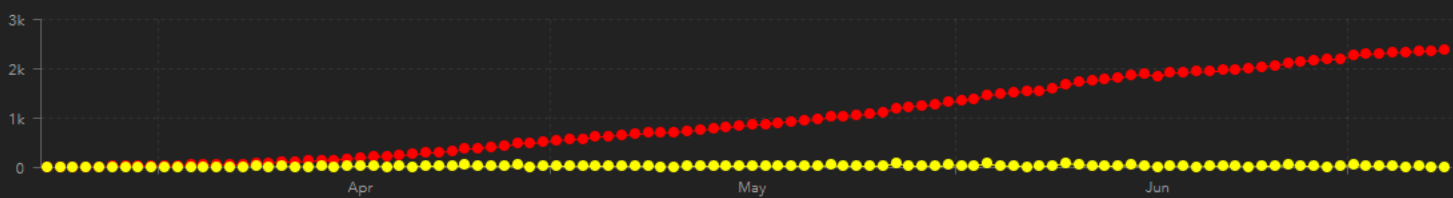


ACTIVE CASES 629 DEATHS 120
RECOVERED 1.6k EVACUATED 7

Cases Gender Regions



Cumulative Confirmed Cases Bamako Cumulative Confirmed Cases Regional Cumulative Confirmed Cases



Daily Cumulative Confirmed and New Cases Demographics (Age) Daily Active, Recovered, and Deaths Case Status (Regions)

9

Affected Regions

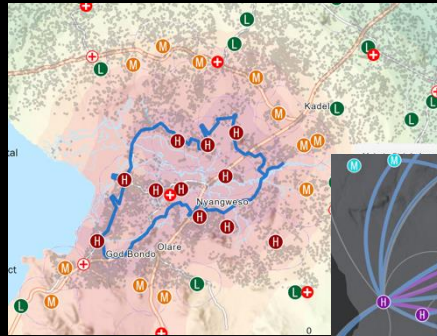
Cases by Region

- Bamako Region**
1,145 Confirmed, 79 Deaths, 1,489 Recovered
- Timbuktu Region**
543 Confirmed, 5 Deaths, 0 Recovered
- Mopti Region**
245 Confirmed, 18 Deaths, 0 Recovered
- Koulikoro Region**
159 Confirmed, 3 Deaths, 57 Recovered
- Kayes Region**
112 Confirmed, 4 Deaths, 1 Recovered
- Sikasso Region**
50 Confirmed, 2 Deaths, 0 Recovered
- Kidal Region**
47 Confirmed, 0 Deaths, 0 Recovered
- Gao Region**
33 Confirmed, 3 Deaths, 0 Recovered
- Ségou Region**
24 Confirmed, 5 Deaths, 0 Recovered

Repeating the Pattern For mapping and monitoring disease

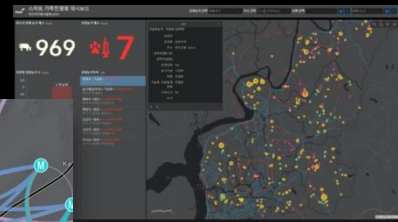
Infectious Disease

Malaria Transmission



UC Irvine
Kenya

African Swine Flu

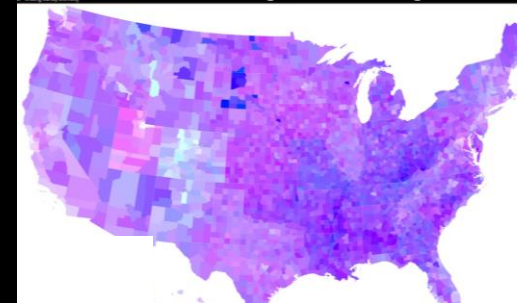


Paju
South Korea

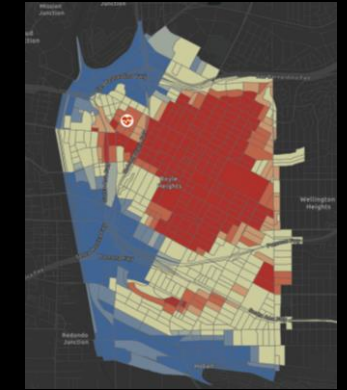


Chronic Disease

Smoking & Drinking



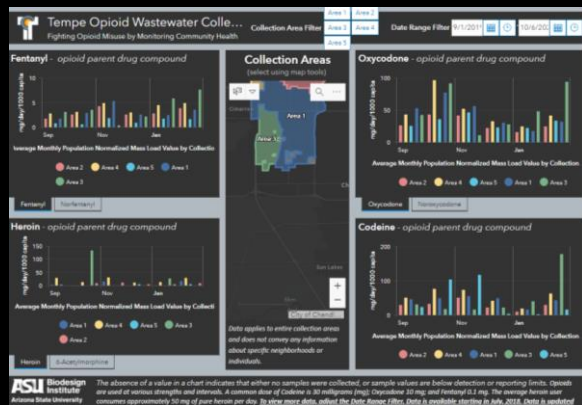
Diabetes Hot Spots



Boyle Heights
California

Environmental/ Contextual Concerns

Opioids in Wastewater



Arizona State University
Tempe, AZ

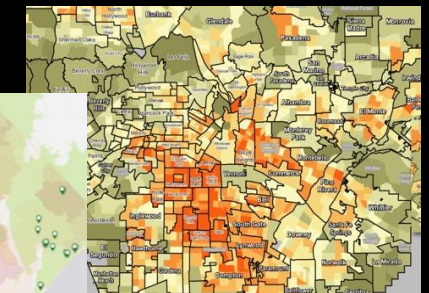
Operational Efforts

Hospital Admissions and Patient Status



Aeroterra
Argentina

Lead Poisoning



Department of Public Health
Los Angeles

Low Birthweight Babies



State of South Carolina

Repeatable Patterns

Mapping &
Monitoring
Disease

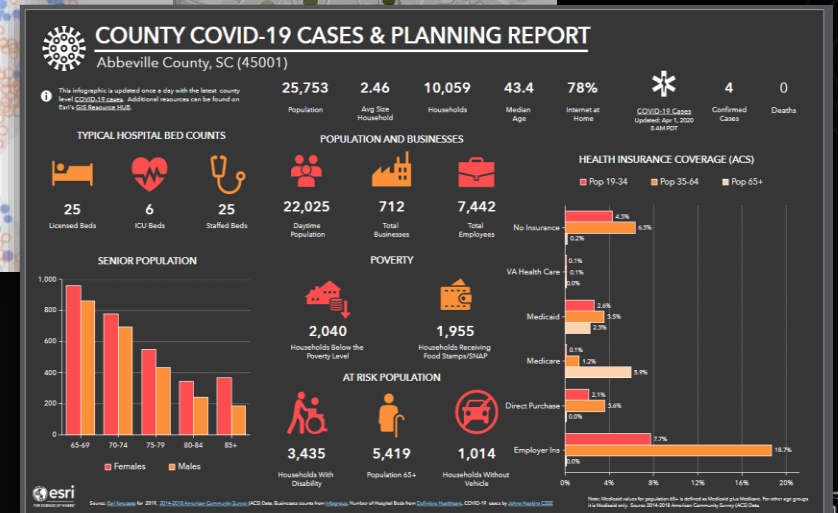
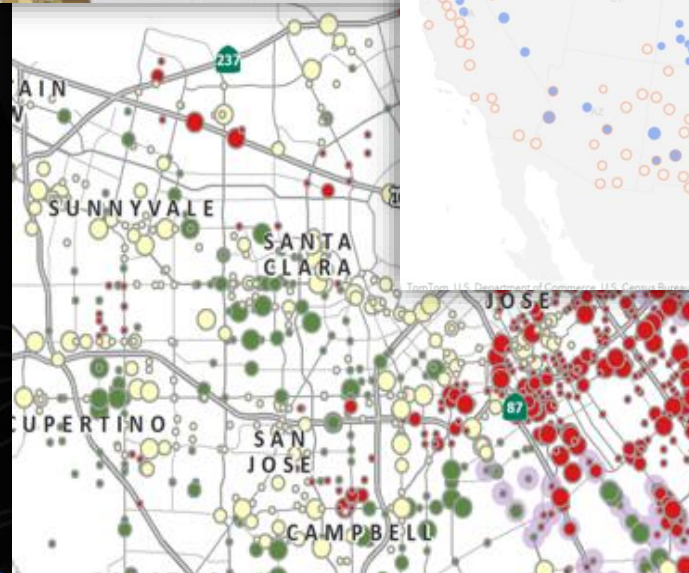
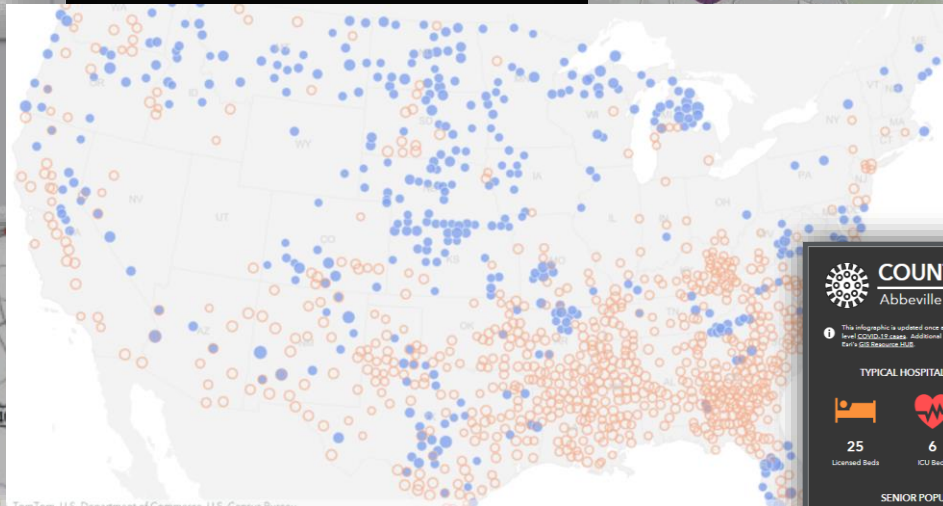
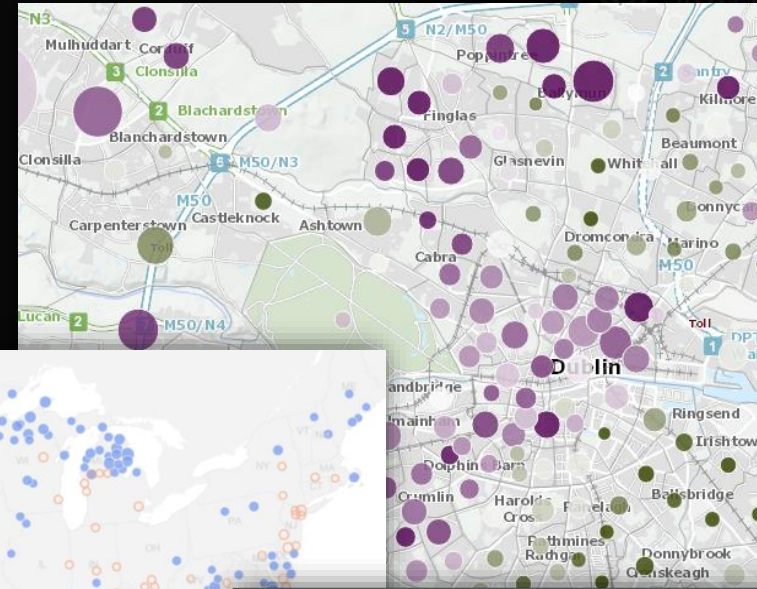
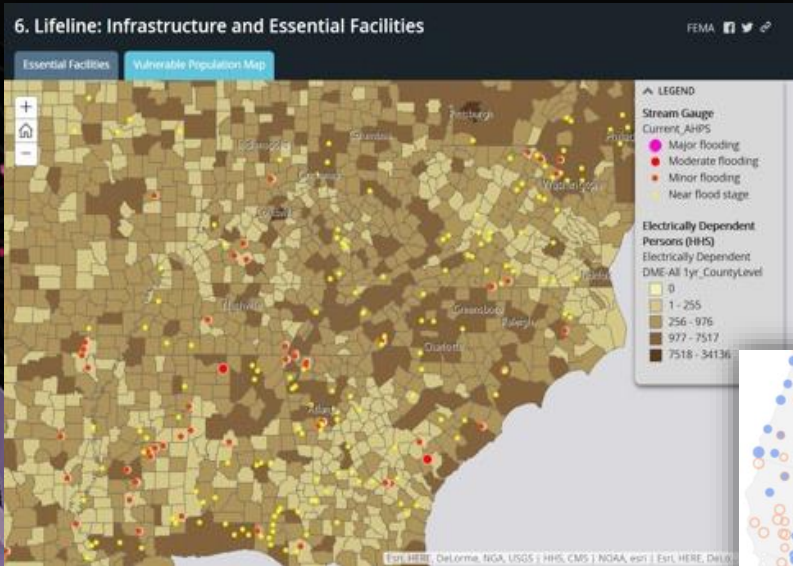
Strategic
Planning

Indoor Space
Management

Analyzing
Relationships
& Gaps

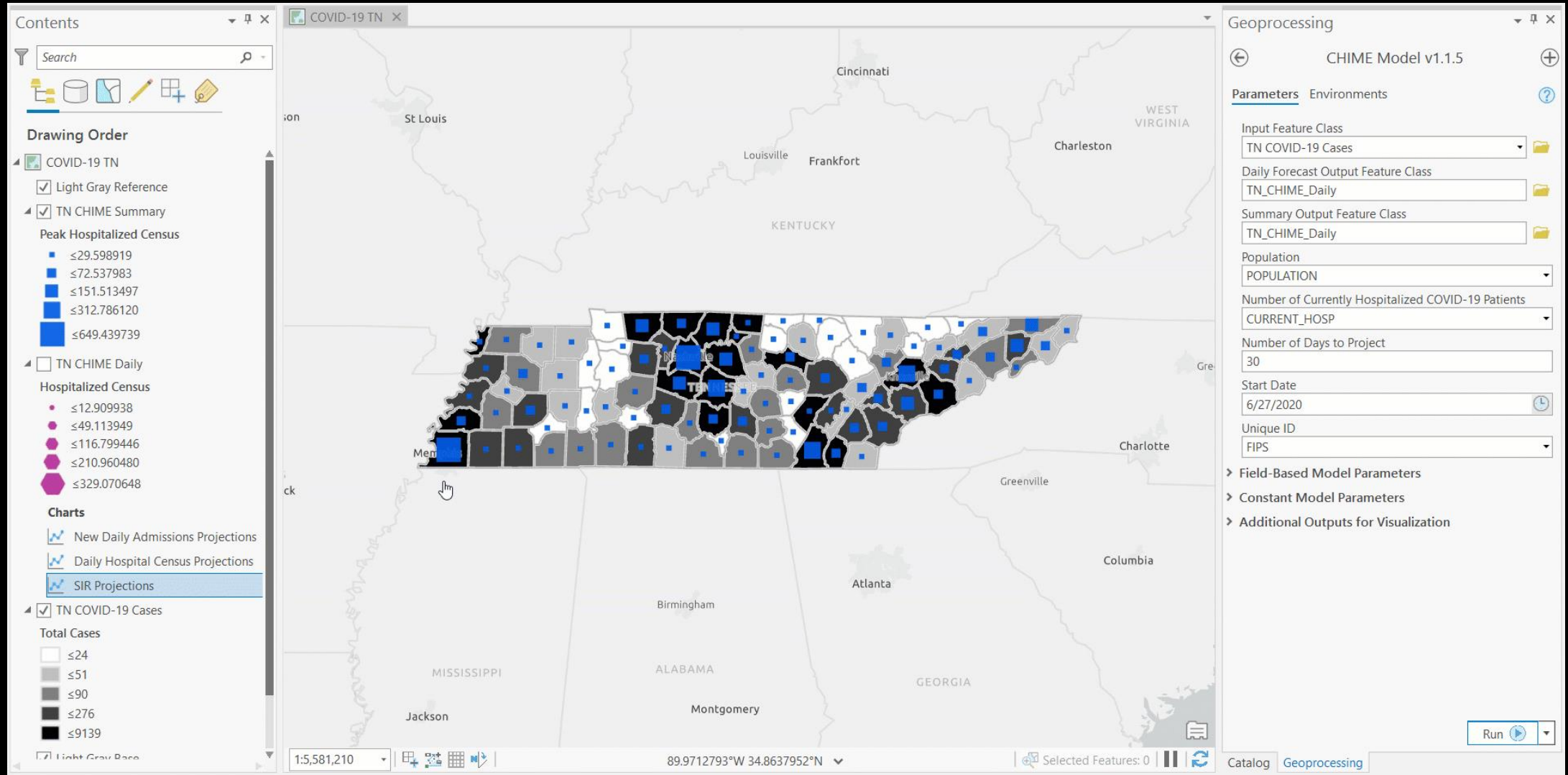
Map Vulnerable Populations

Promoting health equity for all



Mapping Capacity

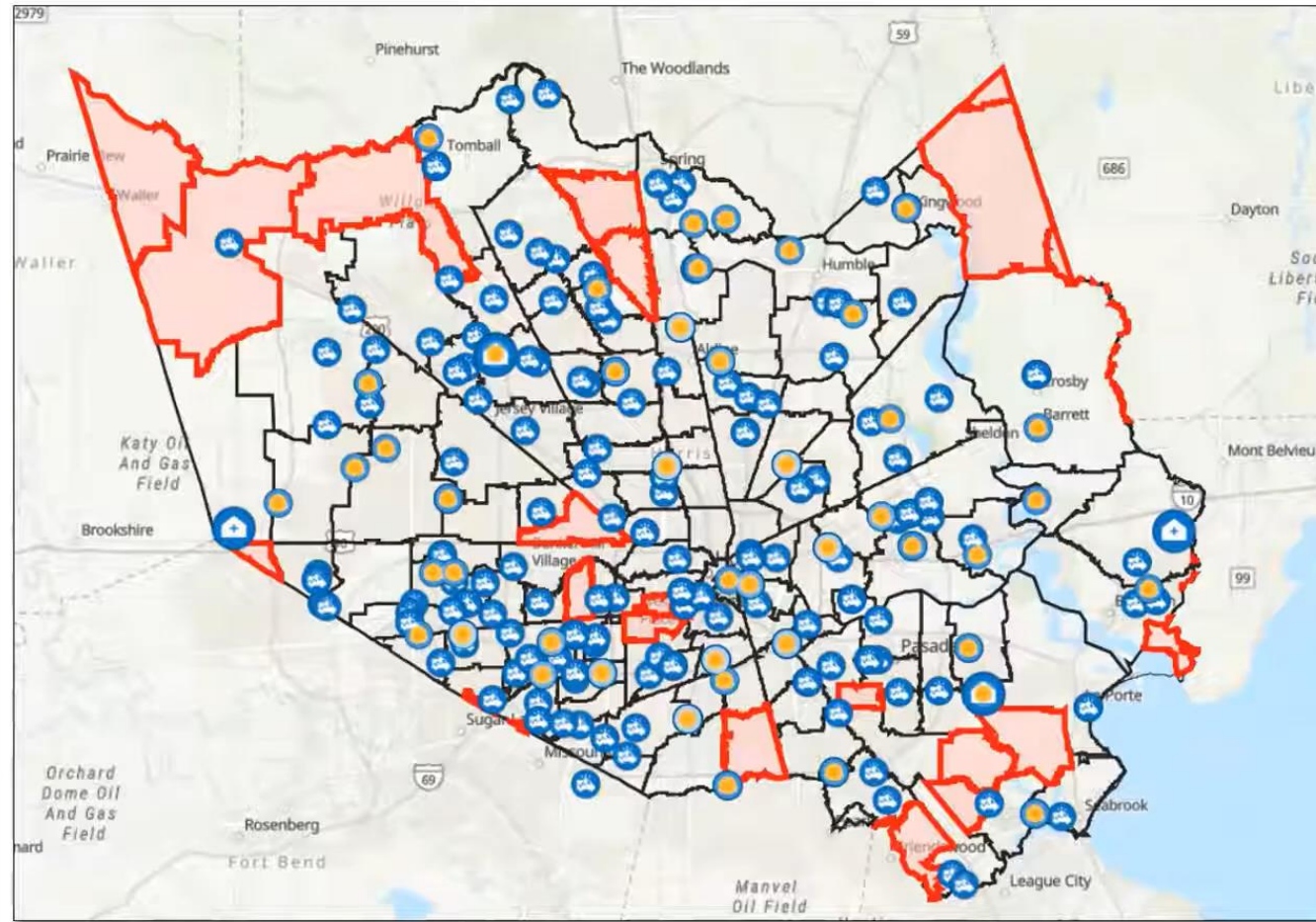
Determine your ability to respond



Predicting Spread and Impacts on Hospitals

Mapping Capacity

Harris County, Tx coins term "Testing Deserts"



HARRIS COUNTY ZIP CODES WITH NO TESTING SITES RECORDED

VIEW OF SITES ORGANIZED BY HCPH, COH, TDEM, & OTHERS

COVID-19 Test Sites (Open After Aug 1)



COVID-19 Test Sites (All)



Stationary



Other

Zip Codes (No Scheduled Testing)



Harris County Zip Code Boundaries



Analyze Relationships

Social distancing and weather

The screenshot displays the ArcGIS Pro interface. The main map area shows a dark-themed map of California with county boundaries. The 'Contents' pane on the left lists several layers, with 'Unacast Visitation Grade thru 2020-05-' selected. Below this, a legend shows five categories: A (blue), B (light blue), C (yellow), D (orange), and F (red), along with '0, No Data' (grey). The 'Bookmarks' pane at the bottom left shows a bookmark named 'Southern CA Looking East'. The top toolbar includes various tools for navigation, layer management, and analysis. The status bar at the bottom indicates the current scale and coordinates.

Feature Layer: Social_Distancing_and_Temperature_Voxel - Temperature Voxel Unacast Visi...

Isarow@esri.com_geoxc (Esri Geo Experience Center)

Clipboard: Paste, Copy, Copy Path

Navigate: Explore, Bookmarks, Go To XY

Layer: Basemap, Add Data, Add Preset, Add Graphics Layer

Selection: Select, Select By Attributes, Select By Location, Attributes, Clear

Inquiry: Measure, Locate, Infographics, Coordinate Conversion

Labeling: Pause, Lock, View Unplaced, More, Convert

Offline: Download Map, Sync, Remove

Contents: Search, Drawing Order

- NOAA Daily Temperature Voxel 3-19 to
- San Bernardino County
- Unacast Visitation Grade thru 2020-05-

Grade

- A
- B
- C
- D
- F
- 0, No Data

Bookmarks: Search

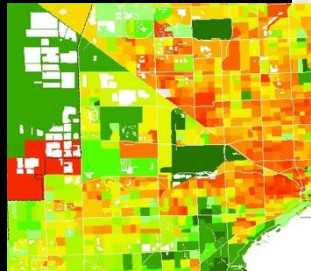
- Temperature Voxel Unacast Visits
 - Southern CA Looking East
 - Coastal View
 - Temperature Voxel

1,575,216 m | 111.5806616°W 32.0314343°N | -0.021 m | Selected Features: 0

Repeating the Pattern

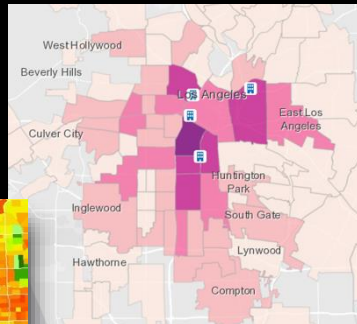
For analyzing relationships and gaps

Social Vulnerability



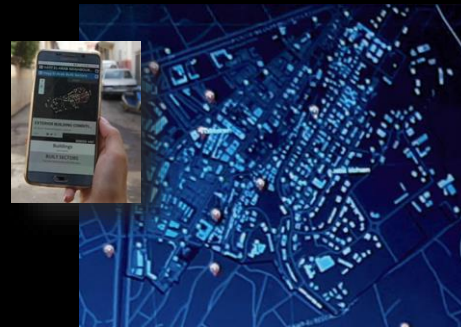
Arcadis
Florida

Racial and Ethnic Disparities



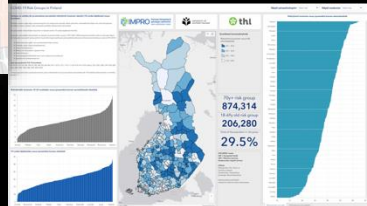
USC
California

Disadvantaged Neighborhood Survey



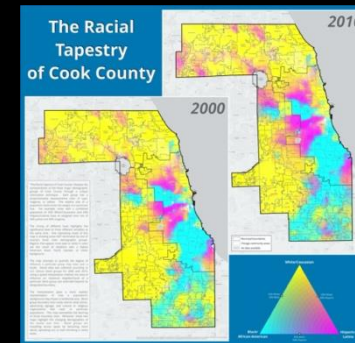
UN-Habitat
Lebanon

Vulnerable Populations



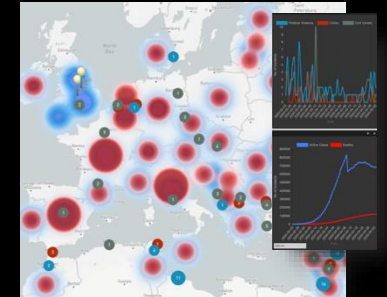
University of Eastern Finland
Finland

Racial Tapestry



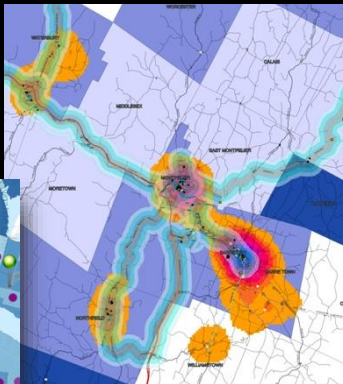
Cook County
Government
Illinois

Pandemic and Civil Unrest



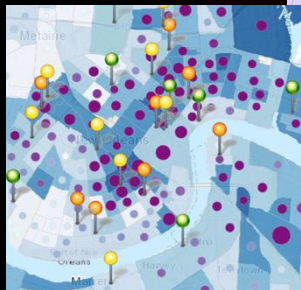
HawkSight
Europe

Access to Food Retailers



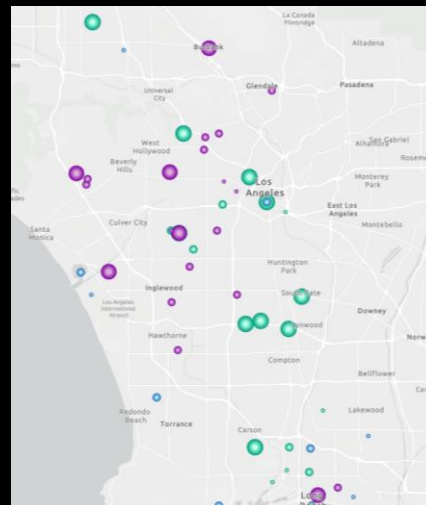
Central Vermont
Regional Planning
Commission
Vermont

Food Access

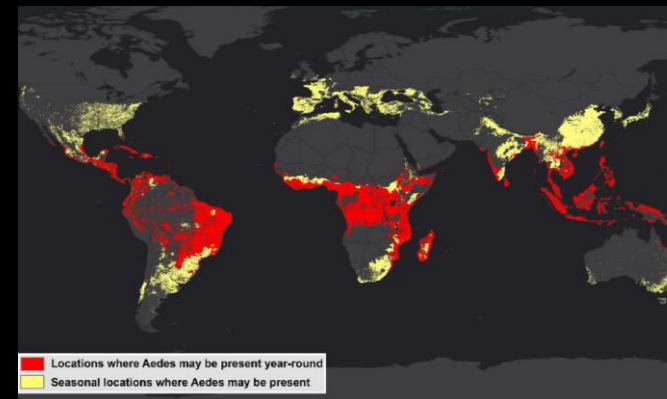


W.K. Kellogg Foundation
Louisiana

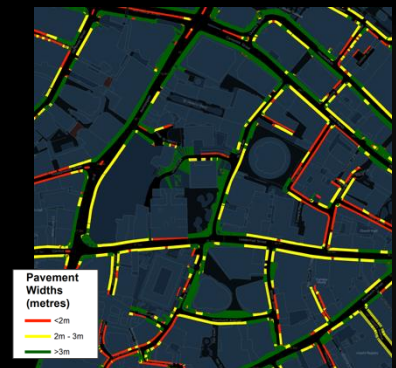
Risk Factors for Homelessness



Aedes Mosquito Habitats



Social Distancing
Sidewalk Analysis



City of London Corporation
United Kingdom

Repeatable Patterns

Mapping &
Monitoring
Disease

Strategic
Planning

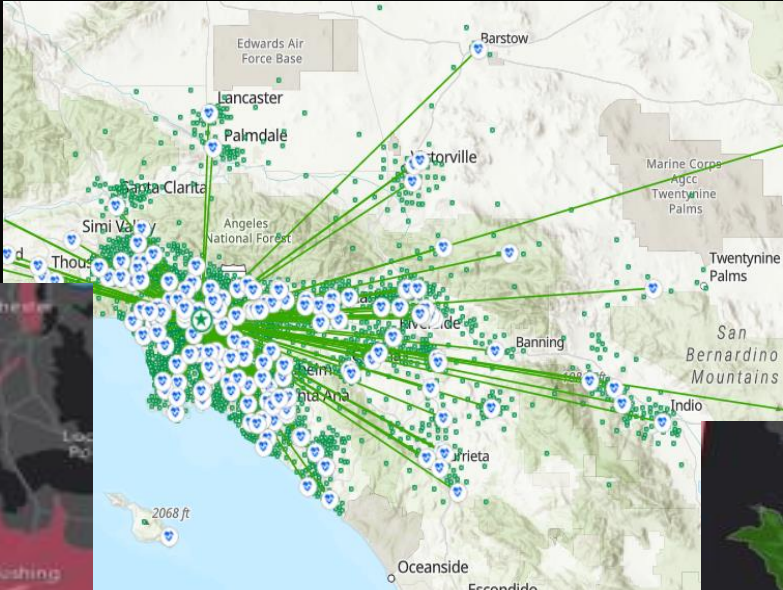
Indoor Space
Management

Analyzing
Relationships
& Gaps

Strategic Planning

Site new resources

Allocation of Critical Resources



Selecting Centers








Access to Care



Strategic Planning

Calculate population demand (need)








Transmission Risk

-  Population density
-  Housing density
-  **Group living**
e.g. prisons, immigrant interment camps, refugee housing
-  Spatial Interaction Index
-  People commuting on public transit

Socioeconomic Risk

-  Households below poverty level
-  Households where English is not the primary language
-  Households without health insurance
-  Education level
-  High risk jobs
e.g. health care workers, flight attendants, cashiers/service workers

Susceptibility Risk

-  Population density
-  **Seniors (65+)**
as a proportion of general population
-  **Chronic/comorbid conditions**
 -  Asthma/respiratory disease prevalence as a proportion of general population
 -  Diabetes prevalence (or projected diabetes drug purchases as proxy)
 -  Heart disease prevalence (or projected salt restricted diet and cholesterol drug purchases as proxy)
-  **Immunocompromising conditions**
e.g. cancer, HIV

Exposure Risk

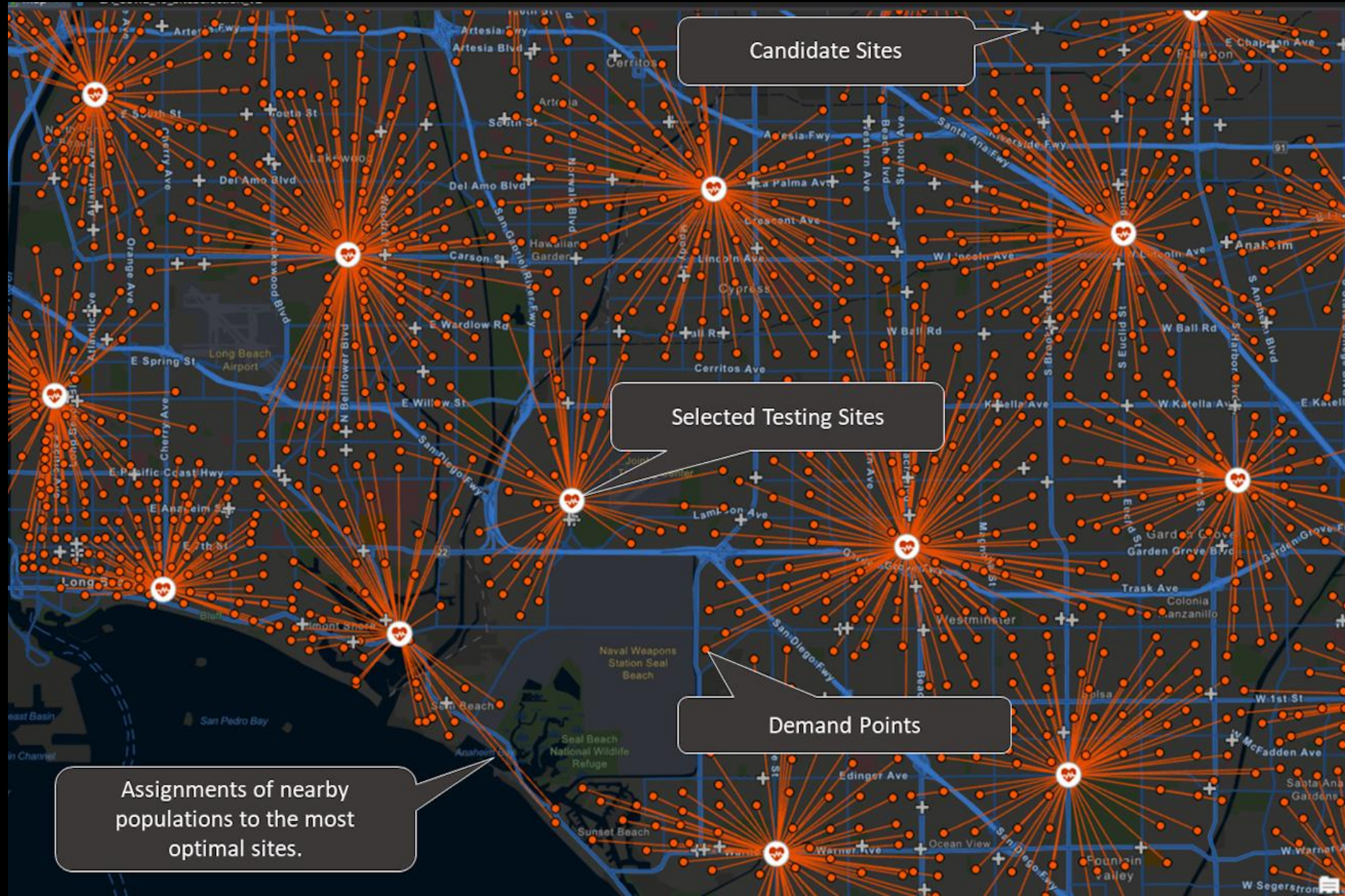
-  **Relative case distance field**
(Relative Case Distance Index field is the summed distance from each constituency centroid to the closest 10% of all COVID-19 case)
-  **Latest case rate (by age group)**
published by an authoritative epidemiological agency

Insufficient Resource Risk

-  Healthcare resource index
-  Staffed beds per 1000 people
-  Bed space availability per 1000 people
-  ICU beds per 1000 people
-  ICU bed space availability per 1000 people
-  Ventilators per 1000 people
-  Medical staff per 1000 people
-  Surgical masks/gloves/gowns/face shields/eye gear per 1000 people

Strategic Planning

Perform location-allocation



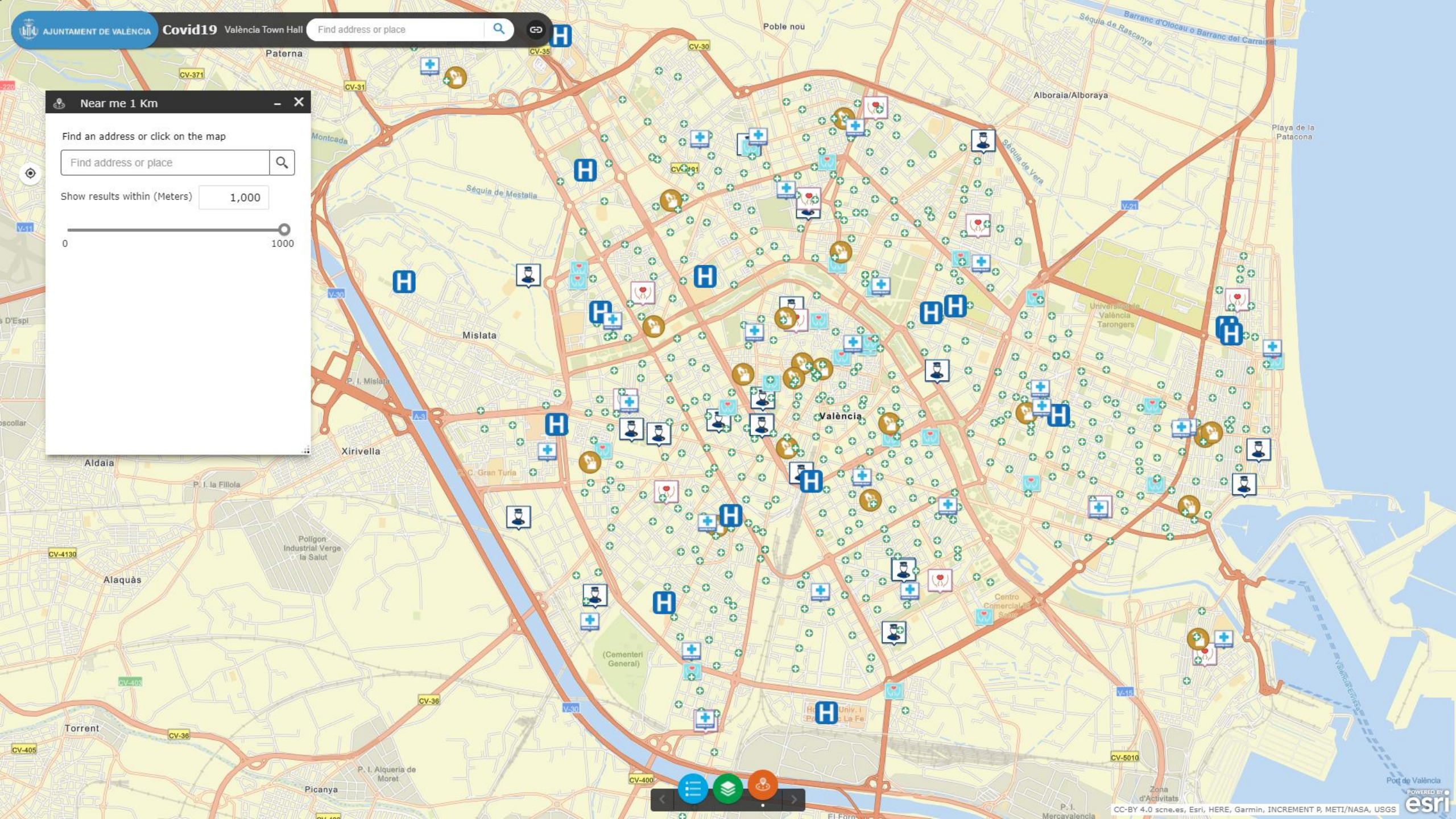
Near me 1 Km

Find an address or click on the map

Find address or place

Show results within (Meters) 1,000

0 1000



Near me 1 Km

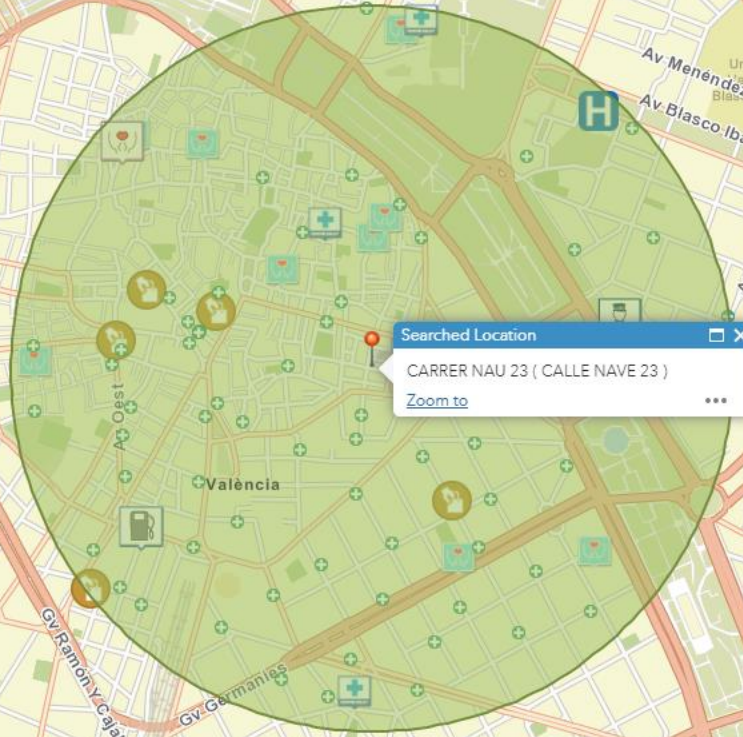
Find an address or click on the map

CARRER NAU 23 (CALLE NAVE 23) X

Show results within (Meters) 1,000

0 1000

- Centros Salud (3) >
- Hospitales (1) >
- Farmacias (62) >
- Mercados (8) >
- Centro Municipal Servicios Sociales (1) >
- Residencias Personas Mayores (9) >



Searched Location

CARRER NAU 23 (CALLE NAVE 23)

Zoom to



Real-Time Data | Shorter wait times for testing in Slovakia





HOW-TO
STEPS

CONTACT TRACING

- 01** COLLECT & MANAGE DATA
- 02** PERFORM ANALYTICS
- 03** EVALUATE & MAKE DECISIONS

01

COLLECT LOCATIONS


Ask for Location During Your Case and Contact Interview

CDC 2019-nCoV ID:

.....PATIENT IDENTIFIER INFORMATION IS NOT TRANSMITTED TO CDC.....

Patient first name _____ Patient last name _____ Date of birth (MM/DD/YYYY): _____

.....PATIENT IDENTIFIER INFORMATION IS NOT TRANSMITTED TO CDC.....

 **Human Infection with 2019 Novel Coronavirus Case Report Form**

| | |
|-----------------------------|-----------------------------------------|
| Reporting Jurisdiction | Case state/local ID |
| Reporting Health Department | CDC 2019-nCoV ID |
| Contact ID ^a | NNDSS loc. rec. ID/Case ID ^b |

^aOnly complete if case-patient is a known contact of prior source case-patient. Assign Contact ID using CDC 2019-nCoV ID and sequential contact ID, e.g., Confirmed case CA102034567-02. ^bFor NNDSS reporters, use GenV2 or NETSS patient identifier.

Interviewer Information

| | | | |
|----------------------------|--------|------------|--------|
| Name of Interviewer: Last: | First: | Telephone: | Email: |
| Affiliation/Organization: | | | |

Exposure Information

In the **14 days prior to illness onset**, did the patient have any of the following exposures (check all that apply)

- Domestic travel (outside state of normal residence). Specify state(s): _____
- International travel. Specify country(s): _____
- Cruise ship or vessel travel as passenger or crew member. Specify name of ship: _____
- Workplace
If yes, is the workplace critical infrastructure (e.g., healthcare setting, grocery store)?
 Yes, specify workplace setting: _____ No Unknown
- Airport/airplane
- Adult congregate living facility (nursing, assisted living, or long-term care facility)
- School/university/childcare center
- Correctional facility
- Community event/mass gathering
- Animal with confirmed or suspected COVID-19. Specify animal: _____
- Other exposures, specify: _____
- Unknown exposures in the 14 days prior

Case Classification and Identification

What is the current status of this person?
 Lab-confirmed case* Probable case

If probable, select reason for case classification:

- Meets clinical criteria AND epidemiologic evidence with no confirmatory lab testing*
- Meets presumptive lab evidence[‡] AND either clinical criteria OR epidemiologic evidence
- Meets vital records criteria with no confirmatory lab testing

*Detection of SARS-CoV-2 RNA in a clinical specimen using a molecular amplification detection test
[‡] Detection of specific antigen in a clinical specimen, OR detection of specific antibody in serum, plasma, or whole blood indicative of a new or recent infection

Under what process was the case first identified? (check all that apply)

- Clinical evaluation Routine surveillance
- Contact tracing of case patient Other, specify: _____
- EpiX notification of travelers. If yes, DGMQID: _____
- Unknown

Report date of case to CDC (MM/DD/YYYY): ____/____/____
Date of first positive specimen collection (MM/DD/YYYY): ____/____/____ Unknown N/A

Hospitalization, ICU, and Death Information

| | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Was the patient hospitalized? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | If hospitalized, was a translator required? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | Was the patient admitted to an intensive care unit (ICU)? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown |
| If yes, admission date 1 _____ discharge date 1 _____ (MM/DD/YYYY) _____ | If yes, specify which language: _____ | If yes, admission date 1 _____ discharge date 1 _____ (MM/DD/YYYY) _____ |
| Did the patient die as a result of this illness? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown | If yes, date of death (MM/DD/YYYY): ____/____/____ <input type="checkbox"/> Unknown date | |

02 VISUALIZE LOCATIONS

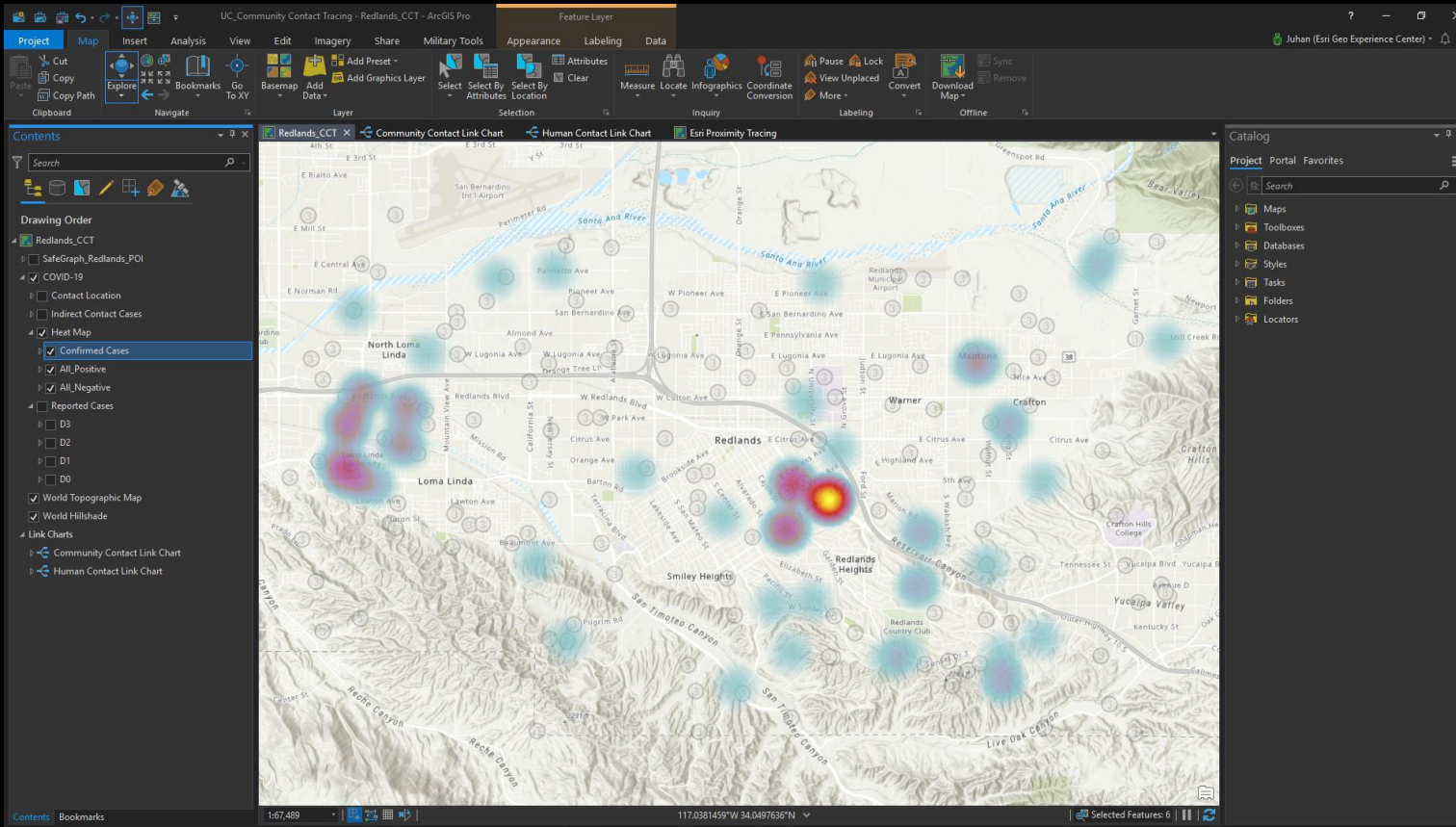
Use Location Services to Geocode Addresses

The screenshot displays the ArcGIS Pro interface for a project titled "ICAP_ContactTracing - Redlands_0520". The main map area shows a topographic map of Redlands, California, with numerous red circular markers and numbered circles (1, 2, 3) indicating geocoded locations. The interface includes a Project window at the top with tabs for Project, Map, Insert, Analysis, View, Edit, Imagery, Share, Military Tools, Crime Analysis, Appearance, Labeling, and Data. The Contents pane on the left shows a drawing order with layers for "Redlands_0520", "D3L", "D3", "Covid", "D2", "D1", and "D0". The Data table at the bottom provides a list of geocoded addresses and their corresponding coordinates.

| CaseID | SourceID | Name | Age | Gender | LongAddr | Latitude | Longitude |
|--------|----------|---------------------------------------|-----|--------|-------------------------------------------------------|----------|------------|
| 1 | 136 | 71 Amelia Weaver | 48 | M | 9050 Emerald, Mentone, CA, 92359, USA | -117.995 | 34.0821 N |
| 2 | 137 | 45 Maxine Mentzaza | 22 | M | 441 Lantern Crest Dr, Redlands, CA, 92373, USA | -117.164 | 34.0762 N |
| 3 | 138 | 74 Taylor Lyons | 45 | F | 1442 Raehee Ave, Redlands, CA, 92374, USA | -117.154 | 34.06715 N |
| 4 | 139 | 50 Shari Lamb | 50 | F | 9050 Emerald, Mentone, CA, 92359, USA | -117.095 | 34.08983 N |
| 5 | 140 | 106 Eddie Fleming | 50 | F | 1130 E Central, San Bernardino, CA, 92408, USA | -117.261 | 34.08594 N |
| 6 | 141 | 94 Eric Taylor | 37 | F | 24190 Paulson Dr, Loma Linda, CA, 92354, USA | -117.276 | 34.04807 N |
| 7 | 142 | 38 Max Stewart | 67 | F | 847 E Bher Dr, San Bernardino, CA, 92408, USA | -117.267 | 34.07125 N |
| 8 | 143 | 67 Cynthia Hall | 50 | F | 1500 Crafton Ave, Mentone, CA, 92359, USA | -117.118 | 34.07523 N |
| 9 | 144 | 29 Gregg Valdes | 22 | M | 1000 W San Bernardino Ave, Redlands, CA, 92374, USA | -117.197 | 34.07819 N |
| 10 | 145 | 102 Abraham Barber | 40 | M | 32205 Yucapae Blvd, Yucapae, CA, 92399, USA | -117.101 | 34.03367 N |
| 11 | 146 | 111 Arturo Norman | 65 | F | 1378 Ward Way, Mentone, CA, 92359, USA | -117.093 | 34.07237 Y |
| 12 | 147 | 108 Michele Wilson | 57 | M | 30666 6th Ave, Redlands, CA, 92374, USA | -117.135 | 34.04517 N |
| 13 | 148 | 116 Lucas Lewis | 25 | F | 1222 Opal Ave, Mentone, CA, 92359, USA | -117.133 | 34.06912 Y |
| 14 | 149 | 132 Claire Allison | 66 | M | 10614 Curtis St, Loma Linda, CA, 92354, USA | -117.248 | 34.06063 N |
| 15 | 150 | 63 Claude Giroux | 47 | M | 31040 E Sunset Dr N, Redlands, CA, 92373, USA | -117.125 | 34.02369 N |
| 16 | 151 | 62 Tabitha McGuire | 58 | M | 26950 San Bernardino Ave, Redlands, CA, 92374, USA | -117.216 | 34.07962 N |
| 17 | 152 | 88 Rudy Warner | 49 | F | 11711 Sand Canyon, Mentone, CA, 92359, USA | -117.103 | 34.04231 N |
| 18 | 153 | 90 Myron Dunn | 52 | M | 13202 Helen Ct, Redlands, CA, 92373, USA | -117.138 | 34.01278 N |
| 19 | 154 | 75 Lucille Garcia | 32 | M | 1898 Marigold Ave, Redlands, CA, 92374, USA | -117.231 | 34.0837 N |
| 20 | 155 | 63 Bryant May | 32 | F | 28992 San Timoteo Canyon Rd, Redlands, CA, 92373, USA | -117.171 | 34.00719 N |
| 21 | 156 | 80 Jenna Becker | 43 | M | 28653 Romero, Redlands, CA, 92373, USA | -117.222 | 34.04509 N |
| 22 | 157 | 81 Orlando Burton | 24 | M | 26490 Veronica Ct, Loma Linda, CA, 92354, USA | -117.226 | 34.03925 N |
| 23 | 158 | 91 Balila Patrick | 22 | M | 1614 Glover St, Redlands, CA, 92374, USA | -117.178 | 34.07793 N |
| 24 | 159 | 51 Sara Zimmerman | 59 | M | 10955 King St, Redlands, CA, 92374, USA | -117.126 | 34.05466 N |
| 25 | 160 | 101 Nethe Stevenson | 58 | F | 11150 Campus, Loma Linda, CA, 92354, USA | -117.267 | 34.05112 Y |
| 26 | 161 | 110 Gertrude Parks | 29 | F | 1025 W Fern Ave, Redlands, CA, 92373, USA | -117.191 | 34.0436 N |
| 27 | 162 | 73 Dewey Richards | 34 | F | 912 Sunset Hills Ln, Redlands, CA, 92373, USA | -117.172 | 34.01849 Y |
| 28 | 163 | 142 Nina Ave, Mentone, CA, 92359, USA | 29 | F | 2142 Nina Ave, Mentone, CA, 92359, USA | -117.117 | 34.06618 N |
| 29 | 164 | 56 Olvia Medina | 28 | F | 9348 Sapphire Ave, Mentone, CA, 92359, USA | -117.108 | 34.08408 Y |
| 30 | 165 | 53 Harvey Benson | 38 | M | 31437 Live Oak Canyon Rd, Redlands, CA, 92373, USA | -117.118 | 34.00545 N |
| 31 | 166 | 106 Morris Torres | 67 | M | 25338 Cole St, Loma Linda, CA, 92354, USA | -117.252 | 34.05417 Y |
| 32 | 167 | 118 Bradley Drake | 67 | F | 912 Campus Ave, Redlands, CA, 92374, USA | -117.171 | 34.06477 N |
| 33 | 168 | 121 Adam Burke | 40 | F | 1477 E Harry Shepard, San Bernardino, CA, 92408, U | -117.254 | 34.0945 N |
| 34 | 169 | 132 Julie Reyes | 62 | F | 2260 Tiffany Ln, Colton, CA, 92324, USA | -117.271 | 34.03081 N |
| 35 | 170 | 40 Maureen Fields | 29 | M | 12854 San Timoteo Canyon Rd, Redlands, CA, 92373, USA | -117.193 | 34.0183 N |

02 PERFORM ANALYTICS

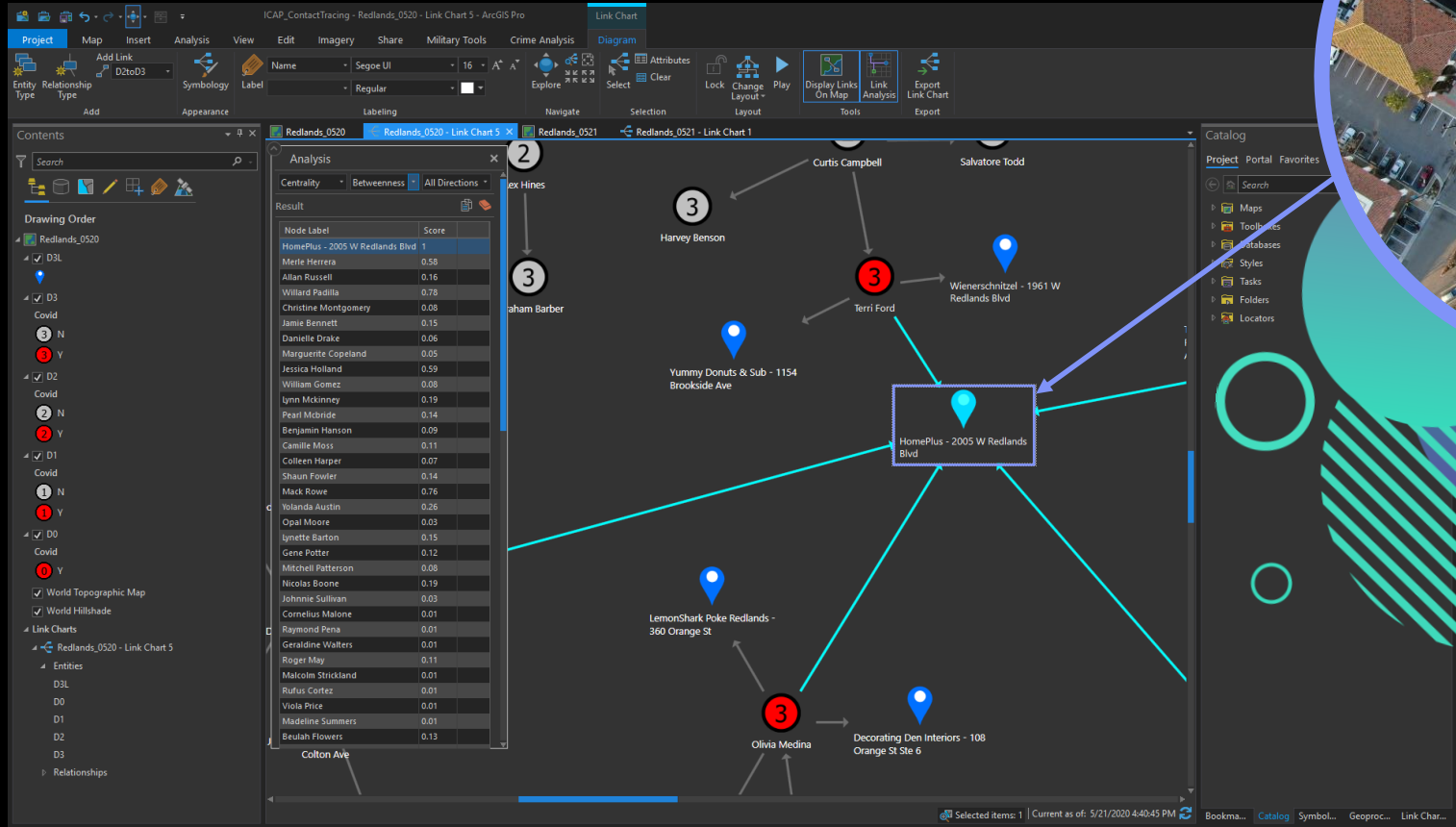
Identify High-Risk Areas In the Community



Showing Density of Cases

02 UNDERSTAND CONNECTIONS

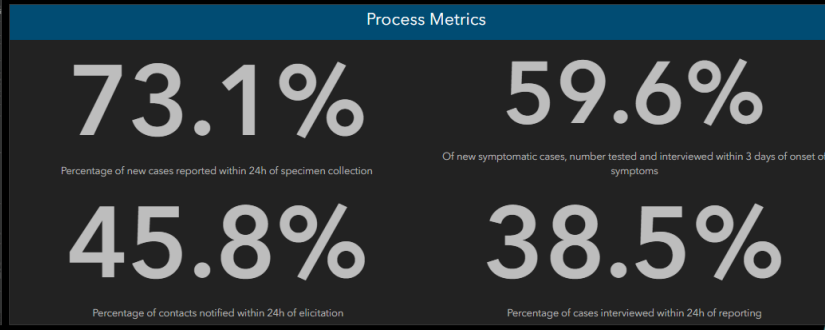
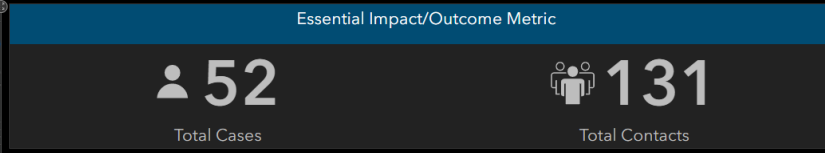
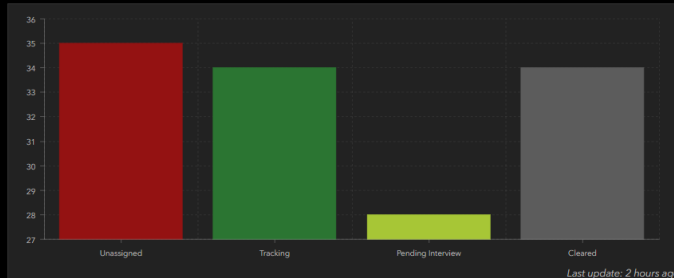
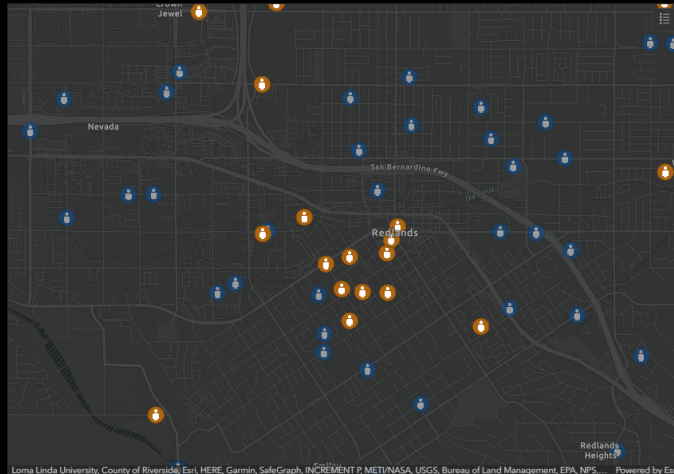
Perform Link Analysis & Apply Graph Theory



Showing Person-to-Person-to-Place Connections

03 EVALUATE AND MAKE DECISIONS

Share Information, Insights, and Metrics



Global COVID-19 Vaccination

Equitable and efficient vaccine distribution

1. Identify facilities capable of storing and distributing vaccine
2. Identify and prioritize critical populations
3. Identify gaps in access and formulate alternative distribution options
4. Implement a vaccine management and inventory system
5. Provide transparency and accurate communication



Population Estimates

Microplanning for prioritization of vaccine delivery

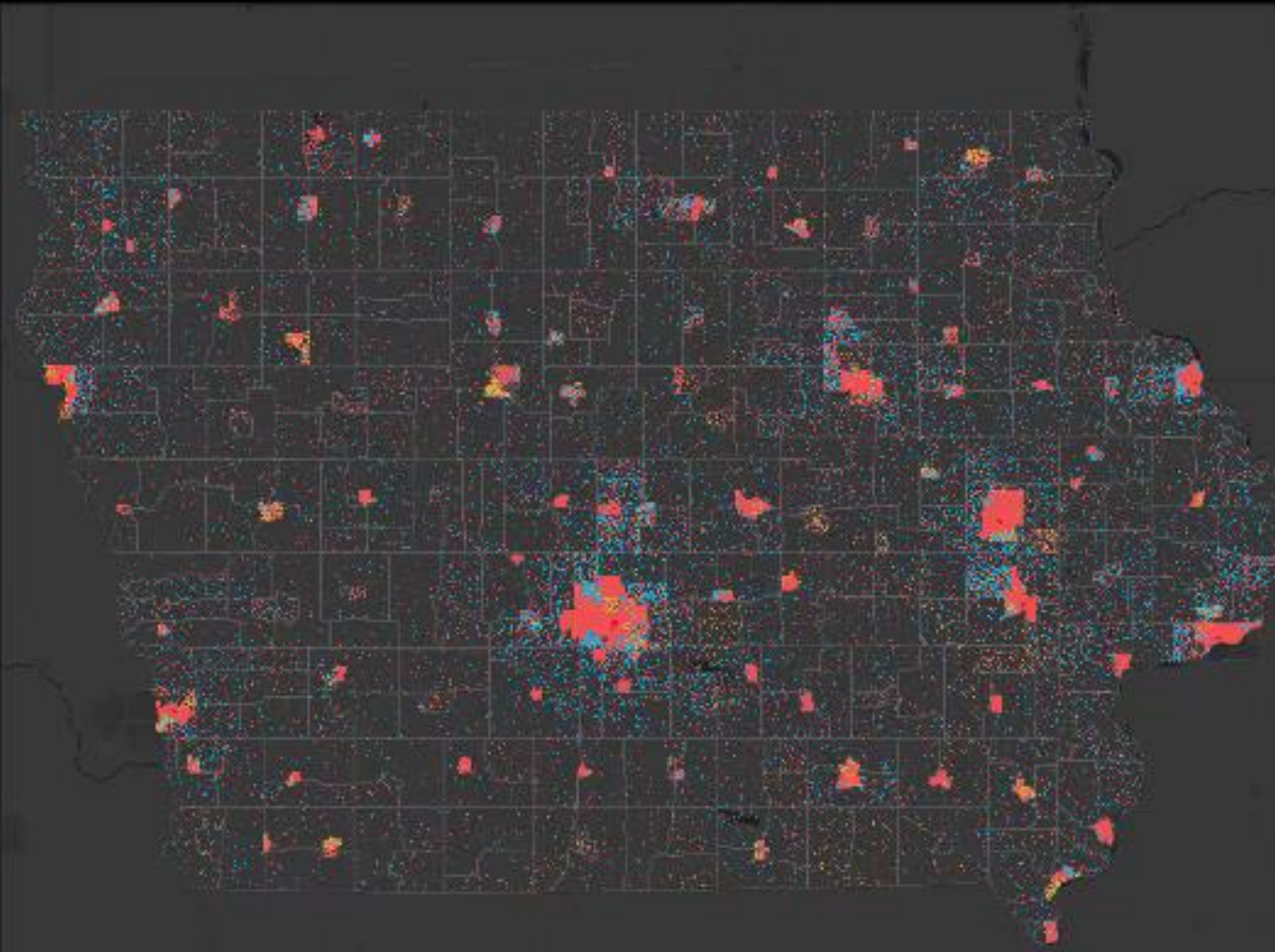
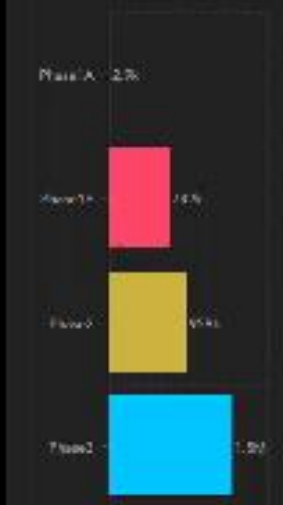
COVID-19 Vaccination Population Estimates - Demonstration Use Only

All Phases Phase 1A Phase 1B Phase 2 Phase 3

About the Map

- Phase 1A
- Phase 1B
- Phase 2
- Phase 3

1 Dot = 15 Residents



County of Skyline DNR, Fish, H&F, Game, P&O, NOAA, USGS, FAA, NPS

Powered by Esri

Total Population

3,238,386
Individuals

Order Estimations
*100 doses per order unit

| Dose 1 | Dose 2 |
|-------------|-------------|
| 3.2M | 3.2M |

32,384 Units* 32,384 Units*

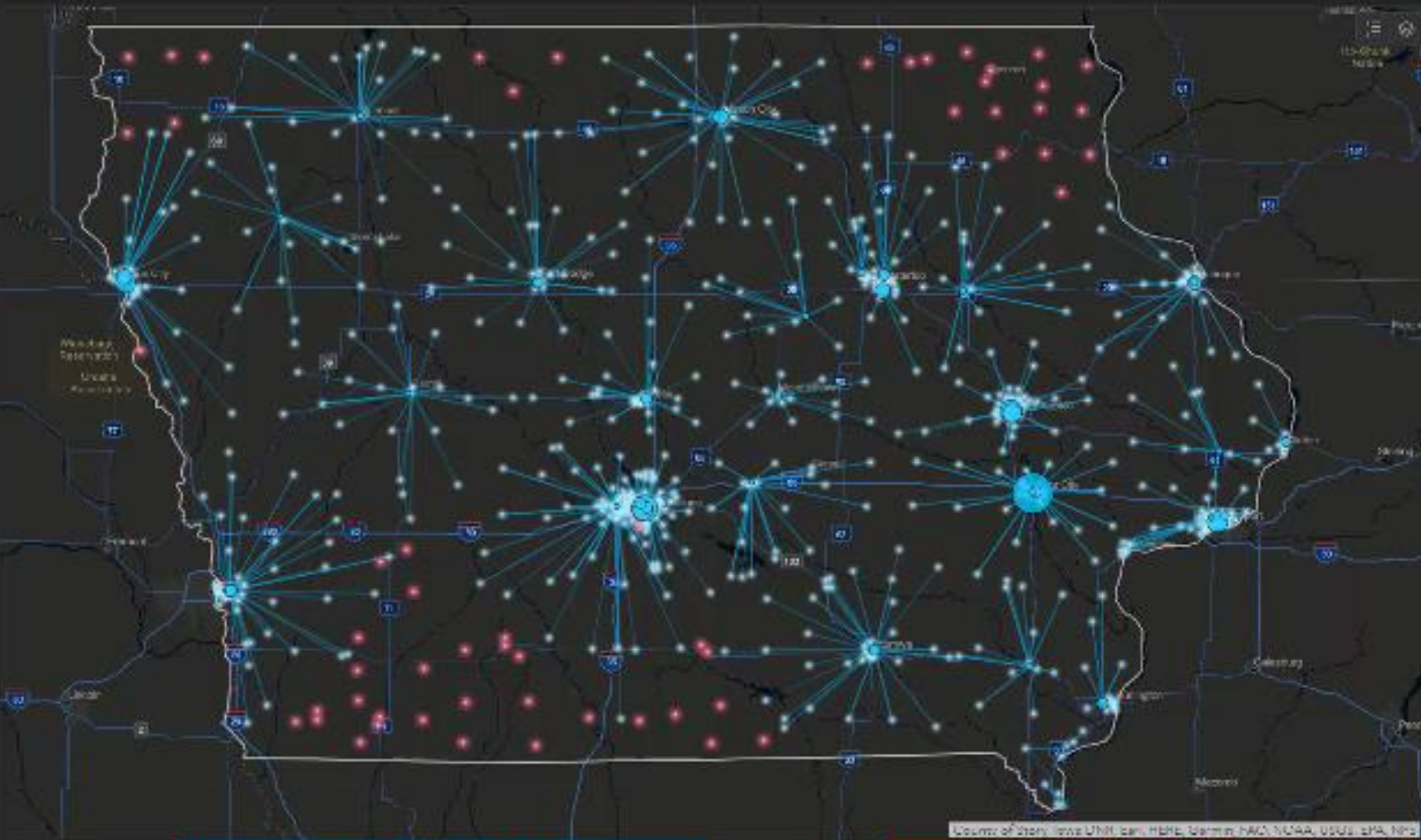
This example uses real-world data and introduces the CDC (2015-17) Vaccination Program [Immunization Playbook for Jurisdiction Operations](#) to determine population phases. It is not intended for planning use. [Learn more in the About tab.](#)

Scenario Planning

Covering the critical populations

Vaccine Distribution Scenario Planner Demonstration User Only

Select a facility



Phase One Profile

703,248
Served Population

2,921
Phase 1A

700,327
Phase 1B

Demographics

2,946
Healthcare Workers*

5,555
Hospitalized Population

402,076
Critical Workforce

584,278
Senior Population

94%

703,248
within 60 minutes of driving to a facility

6%

41,113
over 60 minutes of driving to a facility

Add New Vaccine Distribution Site

Reach underserved or distant populations

The screenshot displays a web application interface for adding new vaccine distribution sites. The main area is a map of Iowa, showing major highways and cities. Numerous red circular markers are scattered across the state, representing existing or potential distribution sites. The interface includes a top navigation bar with the title 'Add New Vaccine Distribution Site' and a 'Demonstration Use Only' label. On the left side, there are standard map controls: a zoom in (+) and zoom out (-) button, a home button, and a location search input field. A scale bar is located in the bottom left corner. The bottom of the screen features a 'Facility Simulation' panel with a 'Site Facility' dropdown menu and a 'Distance' field set to 50 Miles. The Esri logo is visible in the bottom right corner.

Track & Manage Inventory

Monitor supplies and expiration dates

Needs

- **Accept Inventory In:** Quickly enter vaccine barcodes, distribution kits, PPE
- **Check Inventory Out:** Track when supplies are taken from inventory for use
- **Monitor Inventory Status:** Check status by facility or region in real-time

COVID Vaccine Inventory

Facility Name: Arrowhead Regional Medical Center

New Scan
Scan each box separately.
Scan Vaccine Barcode here

Barcode Data

Barcode Value: 00356-8594-15,C3356AA,12/31/9999

NDC: 00356-8594-15

Lot Number: C3356AA

Placeholder Date: 12/31/9999

Cold Storage Counts

Vaccine Boxes: 29

Vials: 5.7k

1.4k exp in 15 days | 3.9k exp in 30 days | 4.5k exp in 15 days

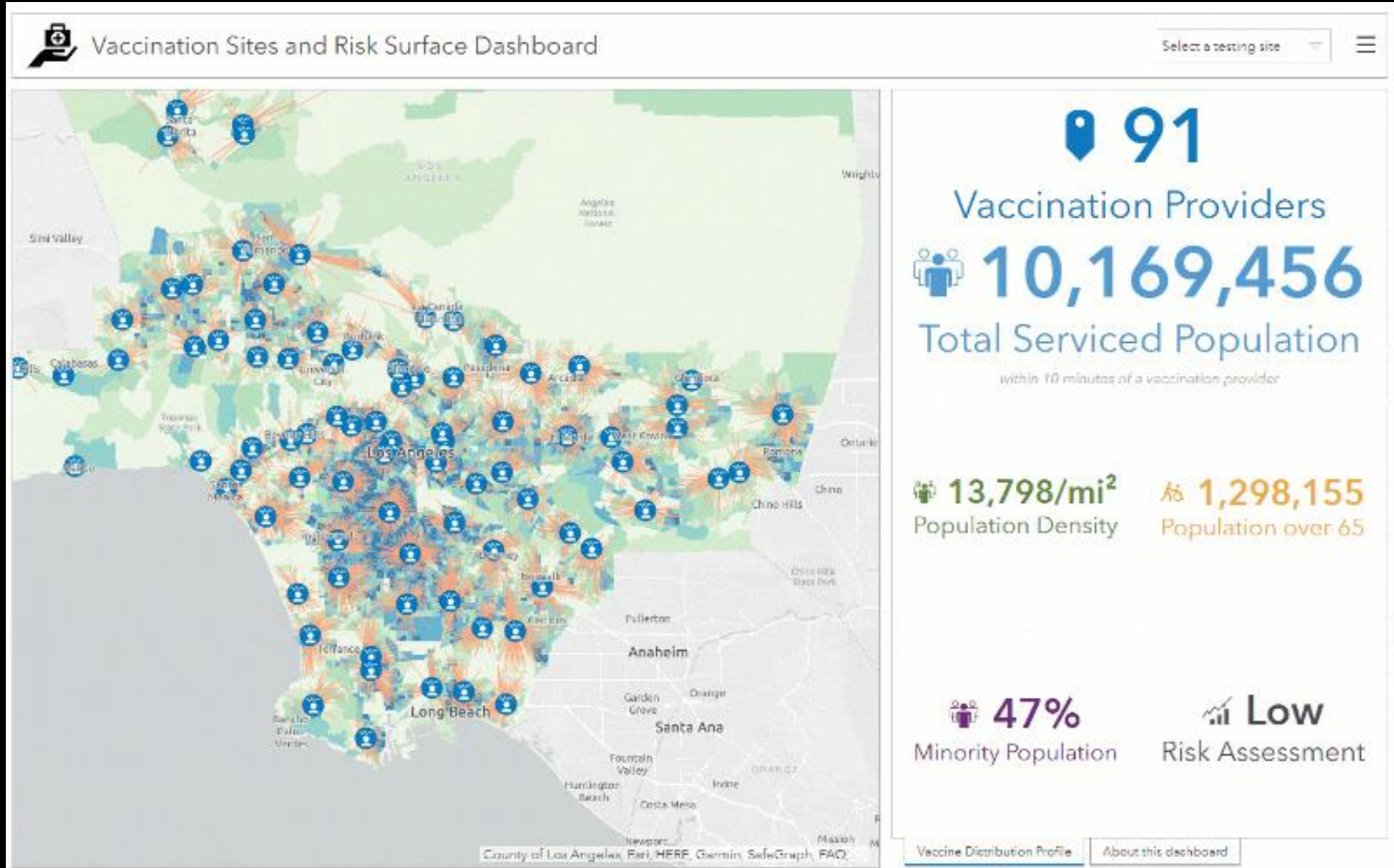
Doses: 28.3k

Kit Contents

| | | | | | | |
|--------------|---------|----------|-------------------|----------------|--------------|-----------------------|
| Kit Contents | 17.9k | 17.9k | 35.7k | 680 | 340 | 170 |
| | Needles | Syringes | Alcohol Prep Pads | Surgical Masks | Face Shields | Diluting Liquid Units |

Vaccine Progress

How is the community doing?



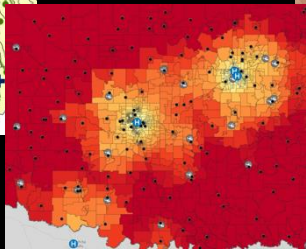
Repeating the Pattern For strategic planning

Health
Facilities Siting



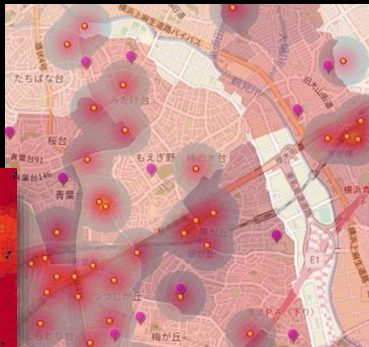
OSEP
Kenya

Trauma
Center
Coverage



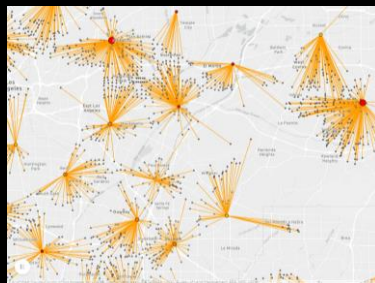
Coalition for National
Trauma Research
Oklahoma

Infants & Disaster
Prevention Centers

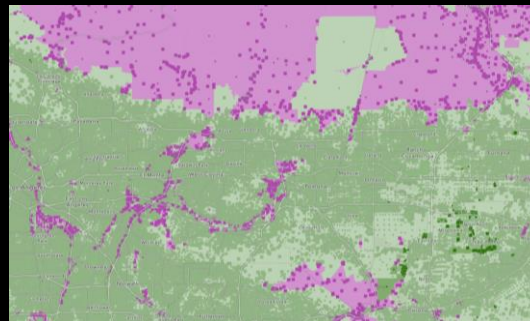


Toin Gakuen
Japan

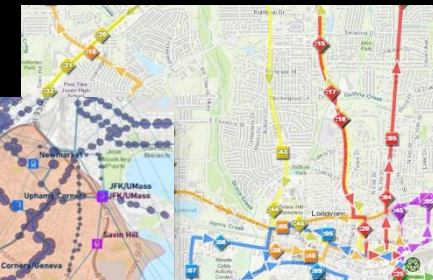
Assessing Travel Burden



Telehealth - Broadband Coverage

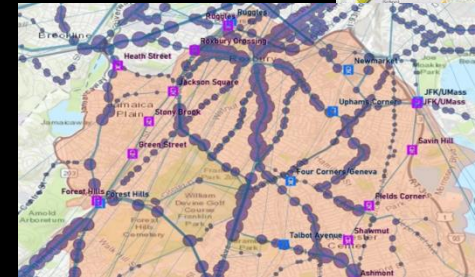


Managing Bus Routes



City of Longview
Texas

Public Transit
& Ride Sharing



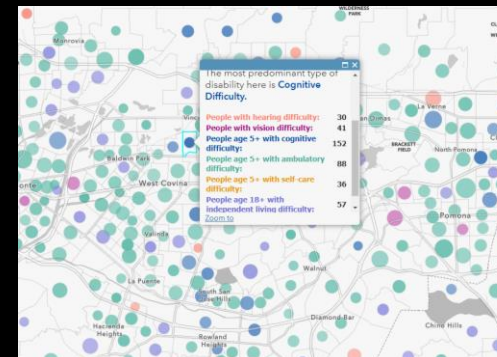
SPIN
Massachusetts

Optimal
Routing &
Scheduling



SynerGIS
Vienna

Predominant Population Disability



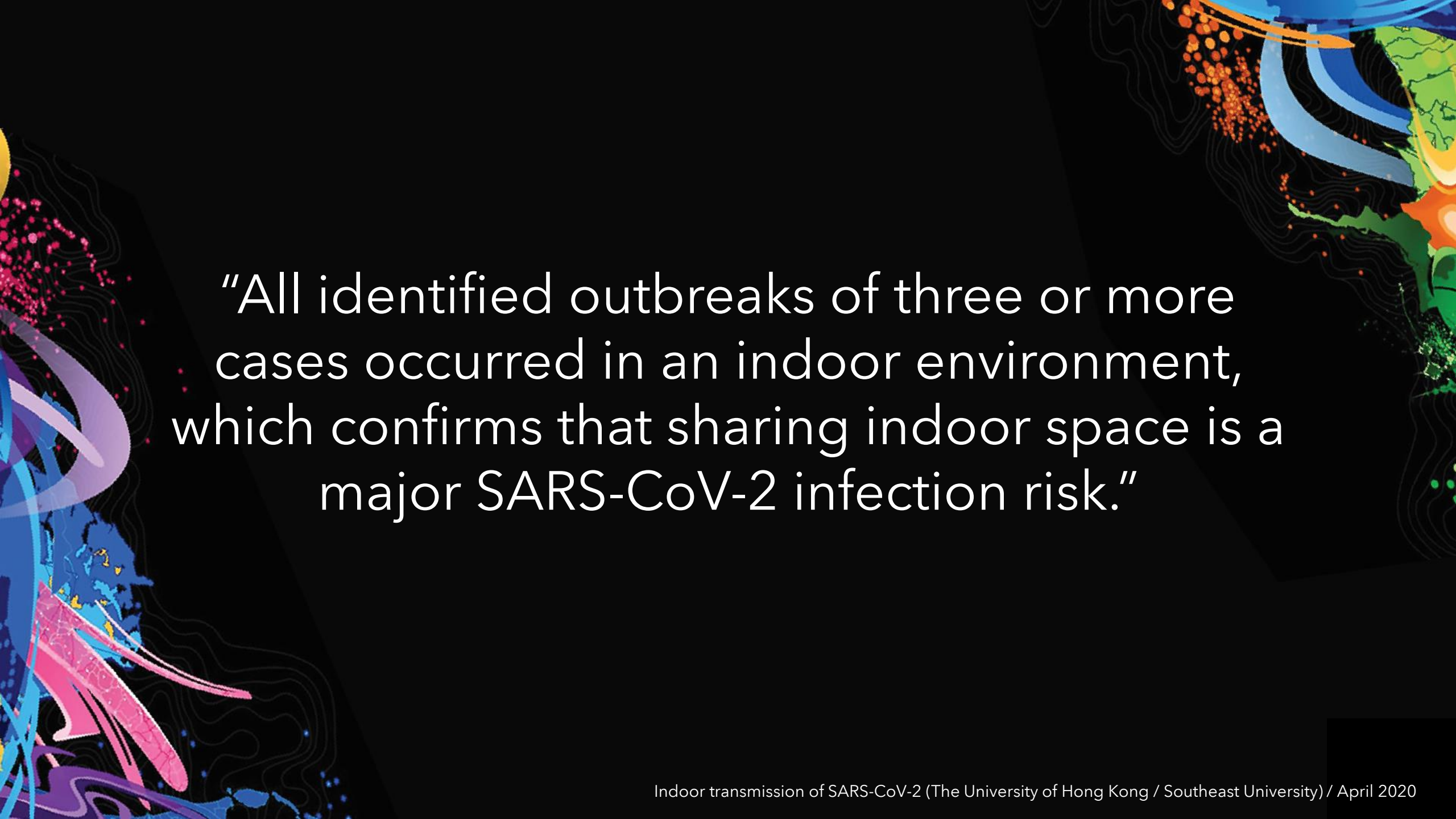
Repeatable Patterns

Mapping &
Monitoring
Disease

Strategic
Planning

Indoor Space
Management

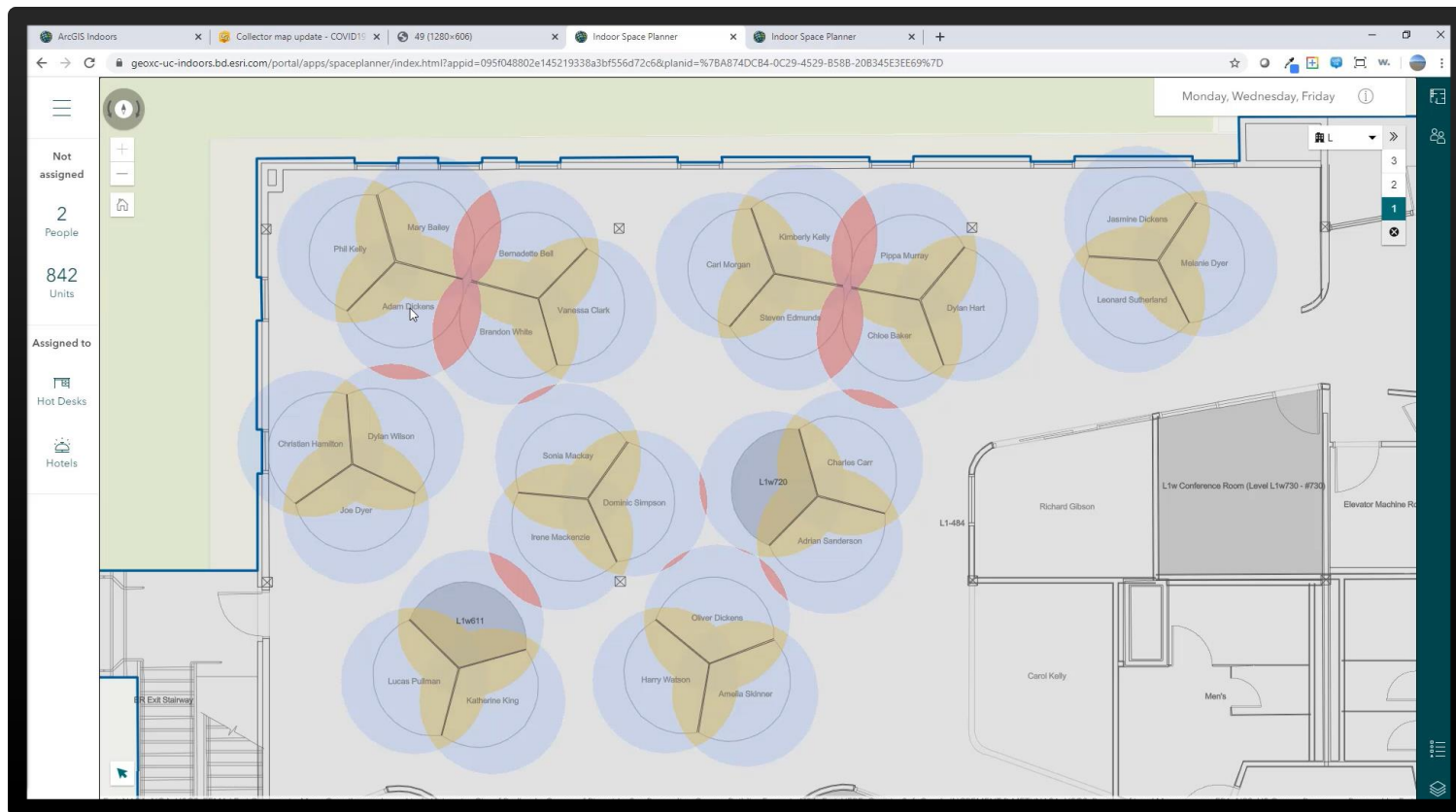
Analyzing
Relationships
& Gaps



“All identified outbreaks of three or more cases occurred in an indoor environment, which confirms that sharing indoor space is a major SARS-CoV-2 infection risk.”

Space Planning For strategic planning

- Analyze seating arrangements
- Make adjustments
- Keep employees safe



Manage Sanitation & Safety Operations

Respond more quickly to needs

The computer monitor displays the '10.8 ArcGIS Indoors Work Order Dashboard'. The dashboard includes a left sidebar with 'Open Work Orders List' and 'Completed Work Orders List'. The main area features a map of a building floor plan with a pop-up window for 'WO 20: Room Cleaning/ Sanitation Required for Conference Room. High Volume of People'. The pop-up window shows details such as 'Work Order Title', 'Work Order Status: Assigned', 'Work Order Priority: High', 'Assigned Group: Sanitation', 'Assigned Worker: astewart@esri.com', 'Date Submitted: 6/29/2020, 10:45 AM', and 'Due Date: 6/29/2020, 5:00 PM'. Below the map is a summary table for various service categories:

| Sanitation | Electrical | Information Tech | Mechanical | Plumb |
|----------------------|----------------------|----------------------|----------------------|----------------------|
| 2 | 1 | 3 | 2 | |
| Vertical Floor Aware | Vertical Floor Aware | Vertical Floor Aware | Vertical Floor Aware | Vertical Floor Aware |

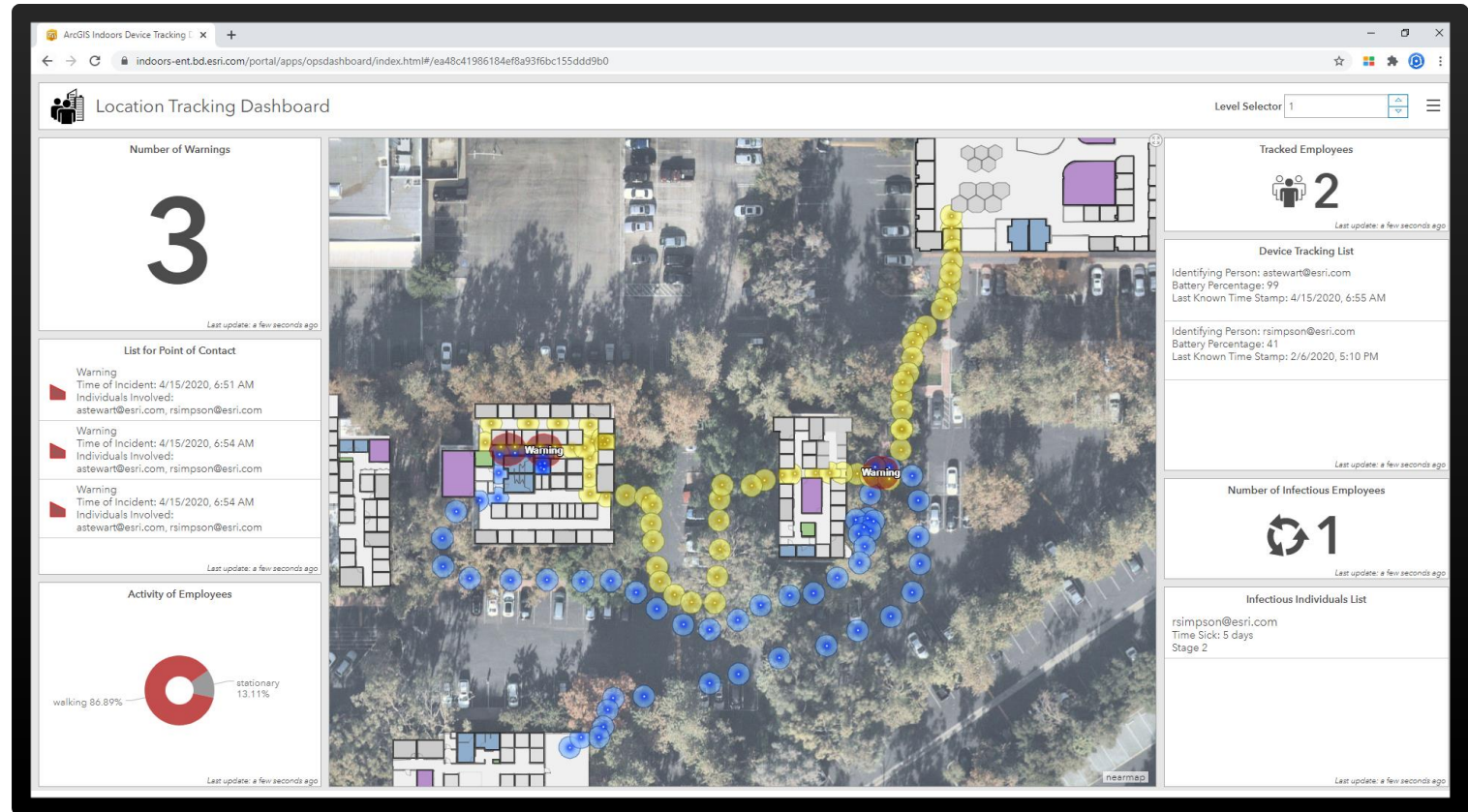
The smartphone displays a mobile app interface showing the current location as 'Operating Room 1362' and a route to the location, estimated to be less than 1 minute. The app also shows a map of the building floor plan with a red location pin and a green route line.

- Plan health & safety protocols
- Request services
- Track progress

Device Tracking & Proximity Tracing

Assist in contact tracing efforts

- Track devices indoors and outdoors across your campus
- Measure dwell times and proximity
- Find areas of high traffic



Repeating the Pattern For indoor space management

BIM Visualization



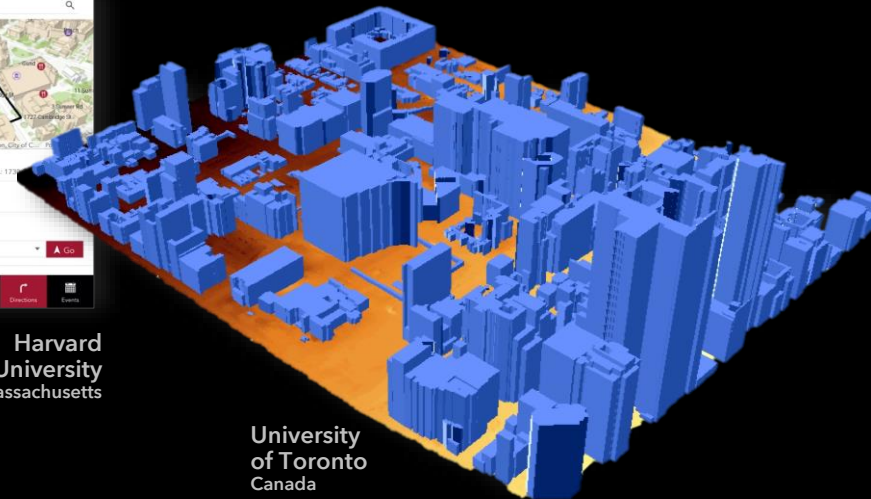
Geodata
Norway

Campus
Navigation
App



Harvard
University
Massachusetts

Campus Visualization



University
of Toronto
Canada

Emergency
Evacuation



Universitas
Gadjah Mada
Indonesia

EHR Integration for Patient Flow



Loma Linda University Health
California



Lessons Learned

Applying them to build resilience



Northridge Earthquake

1994

Local Emergency Preparedness



9.11

2001

Integrating Our Information Infrastructure



Hurricane Katrina

2005

Better National Preparedness



Arab Spring

2010-12

The Power of the Crowd



Camp Fire

2018

Importance of Communication and Coordination

... *Creating Resilient Communities and Interconnected Societies*



2019-2020+ **COVID-19**

- Never Prepared Enough
- Interconnect Systems Across Communities
- Finer-Scale Mapping
- Accurately Assess the Risks
- Coordinate Local, State, National and International Responses
- Greater Coordination and Sharing
- Science-Based Decision Making

COLLECT



CONNECT



