新冠病毒数据分析系列公益讲座 COVID-19 Data Analysis Webinars

第四讲、疫情数据空间显示分析

主讲人：关蔚禾，哈佛大学地理分析中心执行主任

付品德，美国ESRI开发部项目主管

点评人：隋殿志，阿肯色大学研究副校长、

地理科学系杰出教授

主持人：林晖，江西师范大学地理与环境学院院长

合办单位：江西师范大学地理与环境学院

北京时间 2020年5月22日上午9-10点

提纲/Outline

1. 疫情数据地图网站回顾 Overview of selected COVID-19 data mapping and visualization websites (Wendy Guan)
2. 疫情数据时空动态显示 How to animate COVID-19 spatial temporal data using ArcGIS Online (Pinde Fu)
3. 疫情数据时空地图制作 How to map COVID-19 data with space and time in ArcGIS Pro (Wendy Guan)
4. 空间疫情数据解读 Beyond visualization: understanding COVID-19 with spatial analysis (Wendy Guan)

Summary and discussions after each section 每节附小结和讨论

Section 1. Overview of selected COVID-19 data mapping and visualization websites

疫情数据地图网站回顾

Wendy Guan

上网查询 新冠疫情地图

Baidu.com

[全球新冠病毒最新实时疫情地图_丁香园]

2天前 - 丁香园、丁香医生整合各权威渠道发布的官方数据,通过疫情地图直观展示,持续更新最新的新型冠状病毒肺炎的实时疫情动态。

3g.dxy.cn/newh5/view/p... - 百度快照

[新冠疫情地图的最新相关信息]

- [以强大3D感知助力疫情追踪 万博思图正式上线新冠全...] 网易 15小时前
  为了追踪全球疫情演变,同时帮助国内做好国际人口流动管控,近日,万博思图正式上线新冠全球3D数据地图疫情,以强大的系统交互、酷炫的视觉体验,实现对...
- [霍普金斯大学疫情地图背后:核心团队是两位中国年轻人] 环球网 1天前
- [为了从新冠疫情中痊愈,我们必须想象另一个不同的世界] 新浪新闻 17小时前
- [凤凰网-全球新冠肺炎疫情实时动态] 凤凰网 2天前
- [新冠肺炎疫情加剧美国社会不平等] 新浪新闻 11小时前

[绘制全球疫情实时地图的中国留学生|疫情|传染病|新冠肺炎_新浪新闻]

1天前 - 董恩盛(右)和杜鸿儒(左)在约翰斯·霍普金斯大学疫情追踪地图背后付出大量心血和劳动。(受访者供图) 美国约翰斯·霍普金斯大学的新冠肺炎疫情追踪地图,...

news.sina.com.cn/w/202... - 百度快照

[实时更新|新冠肺炎疫情地图]

今年年初,武汉爆发新冠肺炎疫情,全国打响疫情防控阻击战,目前形势持续向好。... 盗刷新冠肺炎患者信用卡,美国纽约一护士面临指控 20:39 美国关于新冠肺炎疫情的涉...

新浪 - 百度快照

[新冠疫情全球爆发_凤凰网资讯_凤凰网]

新冠疫情全球爆发全球聚焦 欧洲 东亚 印度 中东 其他地区 全球聚焦 全球疫情地图:海外200余国家和地区确诊病例超365万 19评 埃塞俄比亚承认击落运送防疫物资货机 ...

手机凤凰网 - 百度快照

[实时更新|新冠肺炎疫情动态地图_网易新闻]

5月8日,吉林省公布1例本地新冠肺炎确诊病例。按照国家新冠肺炎疫情分区分级标准,将舒兰市风险等级由低风险调整为中风险。 查看详细报道 2020-05-09...

news.163.com/special/e... - 百度快照

Google.com

ncov.dxy.cn ▾ Translate this page

[全球新冠病毒最新实时疫情地图_丁香园]

丁香园、丁香医生整合各权威渠道发布的官方数据，通过疫情地图直观展示，持续更新最新的新型冠状病毒肺炎的实时疫情动态。

coronavirus.1point3acres.com › ... ▾ Translate this page

[新型冠状肺炎COVID-19世界疫情实时动态| 一亩三分地]

新型冠状肺炎世界疫情实时动态,截至到2020-05-09 08:45，美国确诊病例已 ... 统计数据疫情地图实时动态应急物资趋势相关视频. Why our US death numbers are ...

voice.baidu.com › newpneumonia ▾ Translate this page

[实时更新： 新型冠状病毒肺炎疫情地图]

实时更新：新型冠状病毒肺炎疫情地图.

news.sina.cn › zt_d › yiqing0121 ▾ Translate this page

[实时更新|新冠肺炎疫情地图 - 新浪新闻]

今年年初，武汉爆发新冠肺炎疫情，全国打响疫情防控阻击战，目前形势持续向好。

feiyan.wecity.qq.com

[新冠肺炎疫情动态]

... 地图. 国内动态. 海外动态. 抗疫专区. 全国新冠肺炎疫情. 截至2020-05-04 21:05:20 数据统计. 现有确诊. 累计确诊 ... 确诊3555812例，死亡247308例. 世界疫情地图.

news.qq.com › page › feiyan ▾ Translate this page

[实时更新： 新冠肺炎疫情最新动态]

国内疫情. 海外疫情. 疫情. 最新进展. 定点医院. 病患轨迹. 较真辟谣. 复工复学. 数据来源： WHO和霍普金斯大学网站. 国内疫情. 海外疫情. 了解疫情动态，请前往.

Results from Google Search: covid-19 maps

COVID-19 Map - Johns Hopkins Coronavirus Resource Center

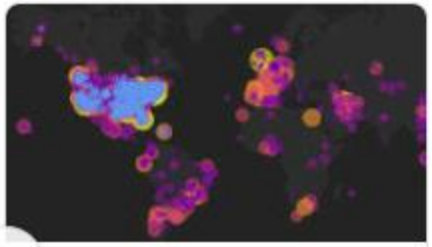
Johns Hopkins Coronaviru...

Cases in the US

CDC

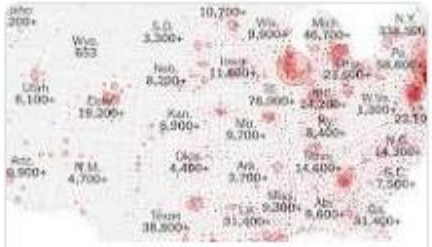
Coronavirus Map: Tracking the Global Outbreak

The New York Times



Novel Coronavirus (COVID-19)

HealthMap



Coronavirus in the U.S.: Latest Map and Case Count

The New York Times

1Point3Acres: Global COVID-19 Tracker & Interactive Charts | Rea ...

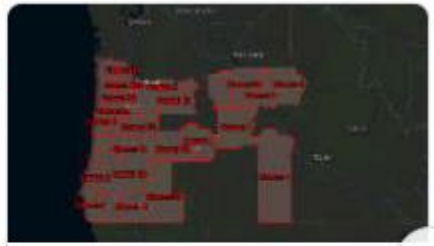
coronavirus.1point3acres.

Florida's COVID-19 Data and Map Dashboard

ArcGIS Experience Builder

Coronavirus United States - live map tracker from Microsoft Bing

Bing



Oregon Coronavirus Case Tracking

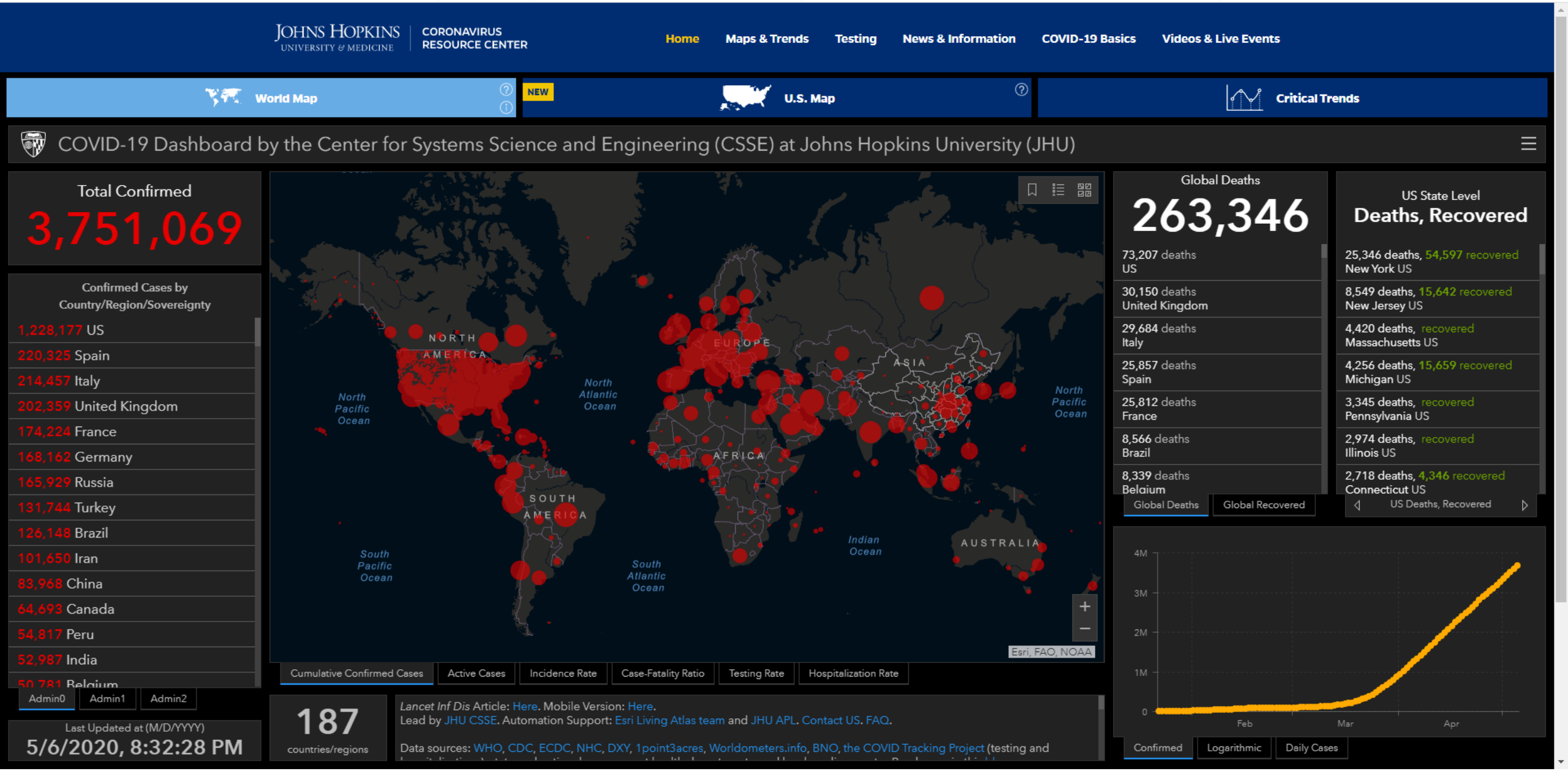
ArcGIS Experience Builder

Coronavirus in the U.S.: Map of how many cases have been confirmed across the country

NBC News

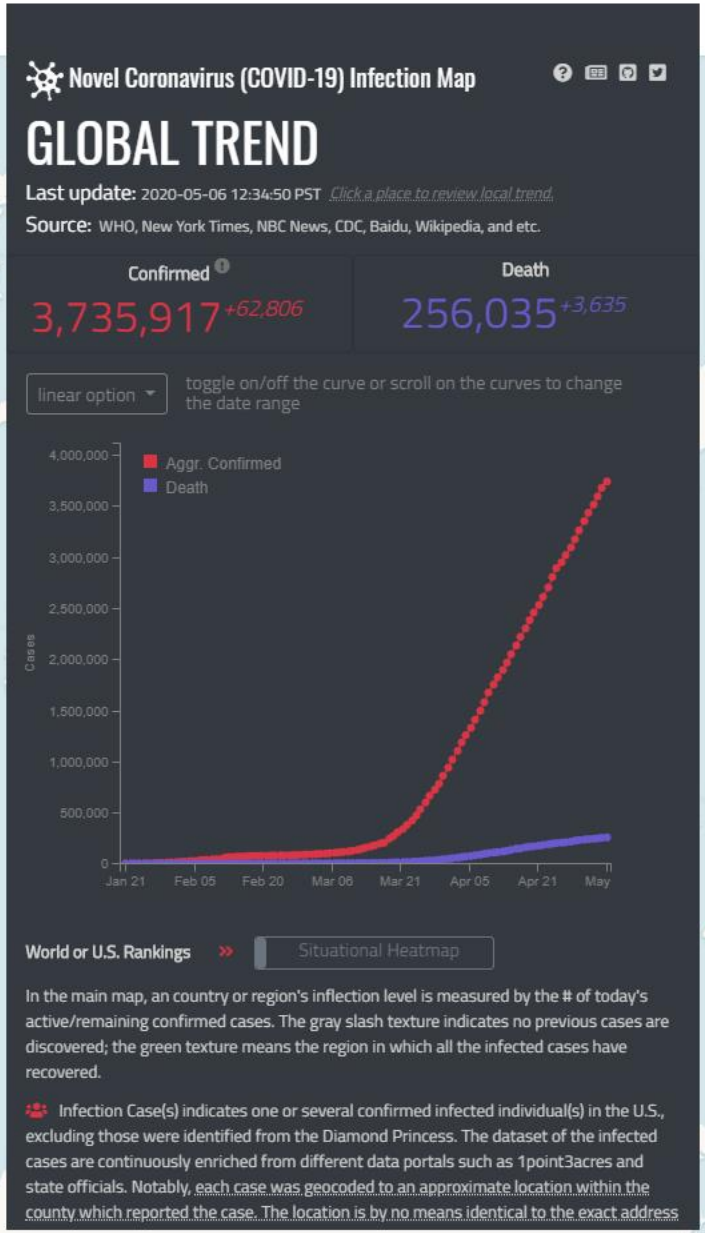
Coronavirus (COVID-19) map

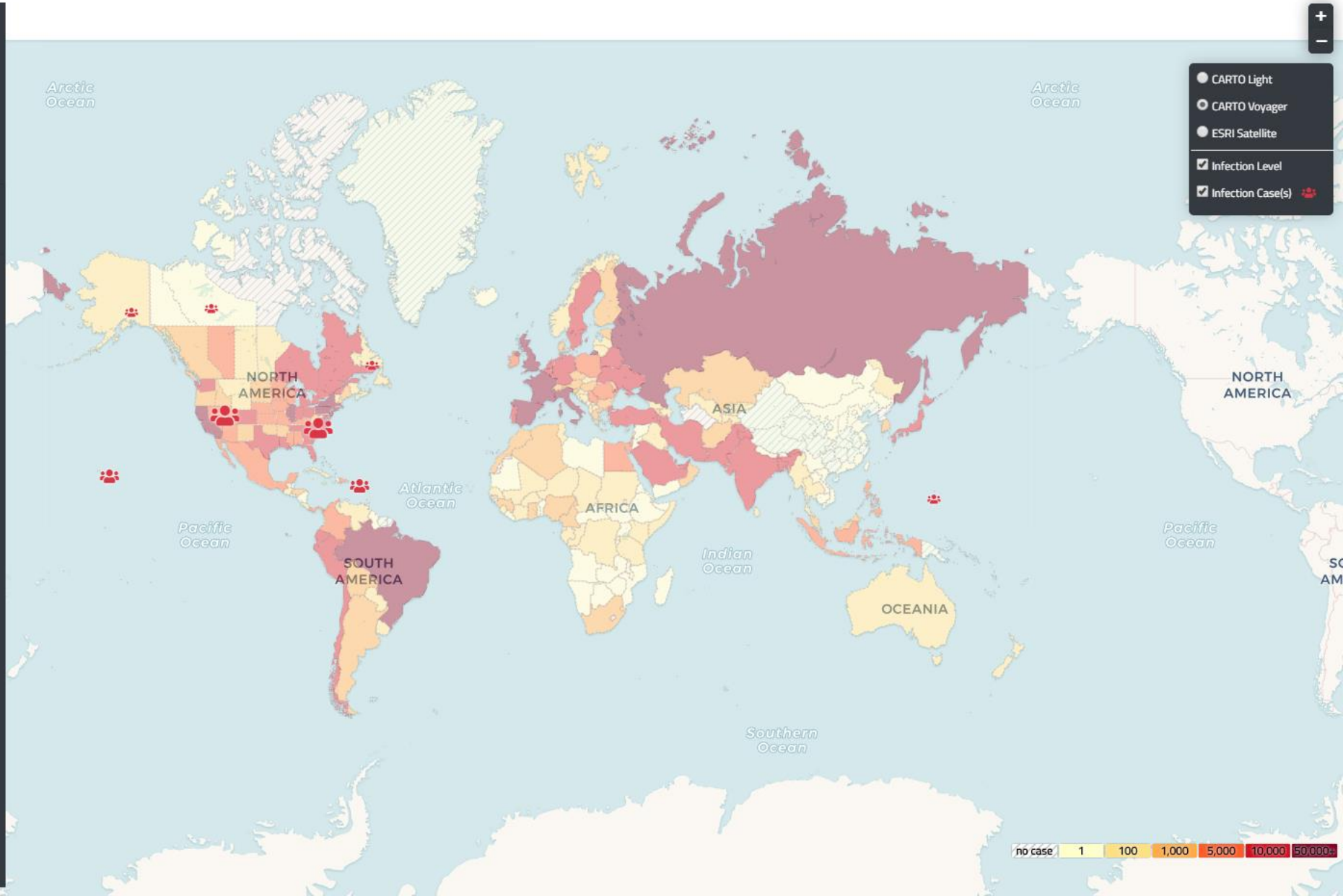
The Online Map by John Hopkins University



https://coronavirus.jhu.edu/map.html

The Online Map by the University of Washington





https://hgis.uw.edu/virus/

The Online Map by Global Change Data Lab

Coronavirus Pandemic (COVID-19) – the data

Tests, cases, and deaths

Cases and deaths

Confirmed deaths

Testing

Testing over time – relative to the time of the outbreak

Confirmed cases

Case Fatality Rate

Comparing data sources

Healthcare capacity

Age Structure

Risk Factors and Comorbidites

By GDP per capita

Relative to the size of the population

Licence

Add a country to all charts...

Select countries to show on all charts

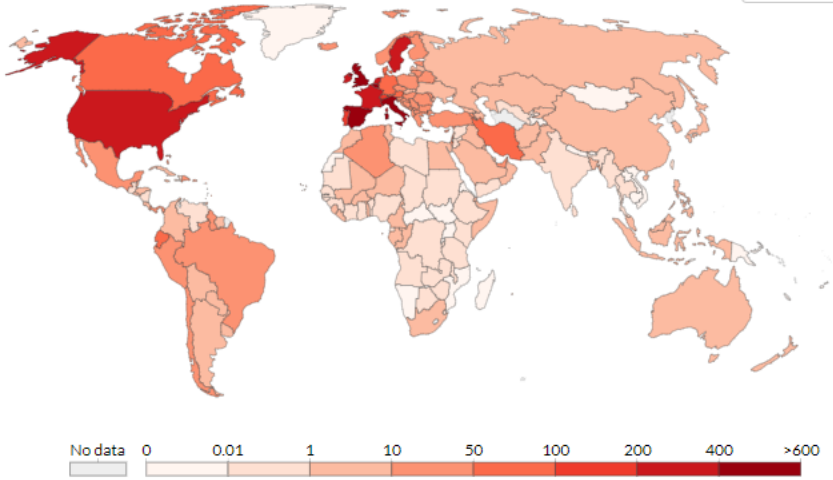
Per capita deaths

Total confirmed COVID-19 deaths per million people, May 3, 2020

Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true total number of deaths from COVID-19.

Our World in Data

World



Source: European CDC – Situation Update Worldwide – Last updated 6th May, 11:15 (London time)

CC BY

Dec 31, 2019 — May 6, 2020

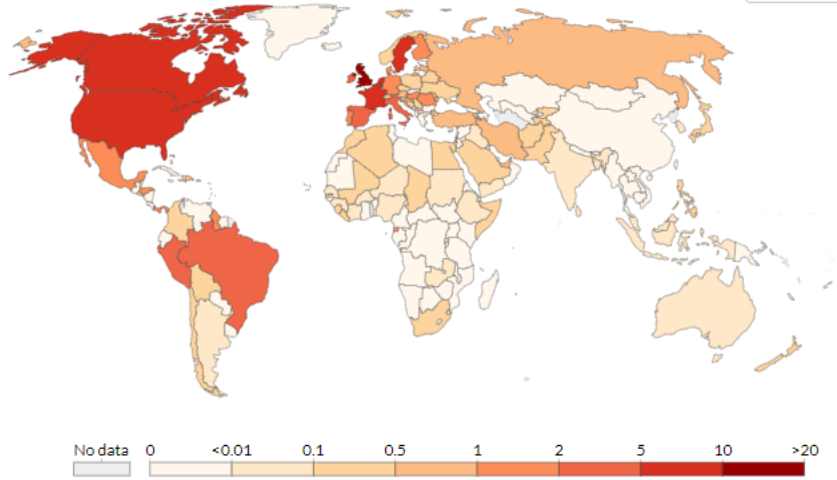
CHART | MAP | DATA | SOURCES

Daily confirmed COVID-19 deaths per million people, May 6, 2020

Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

Our World in Data

World



Source: European CDC – Situation Update Worldwide – Last updated 6th May, 11:15 (London time)

CC BY

Dec 31, 2019 — May 6, 2020

CHART | MAP | DATA | SOURCES

Related chart:

How do daily *per capita* death figures look when we average over several days?

Daily confirmed deaths per capita (rolling 3-day average) →

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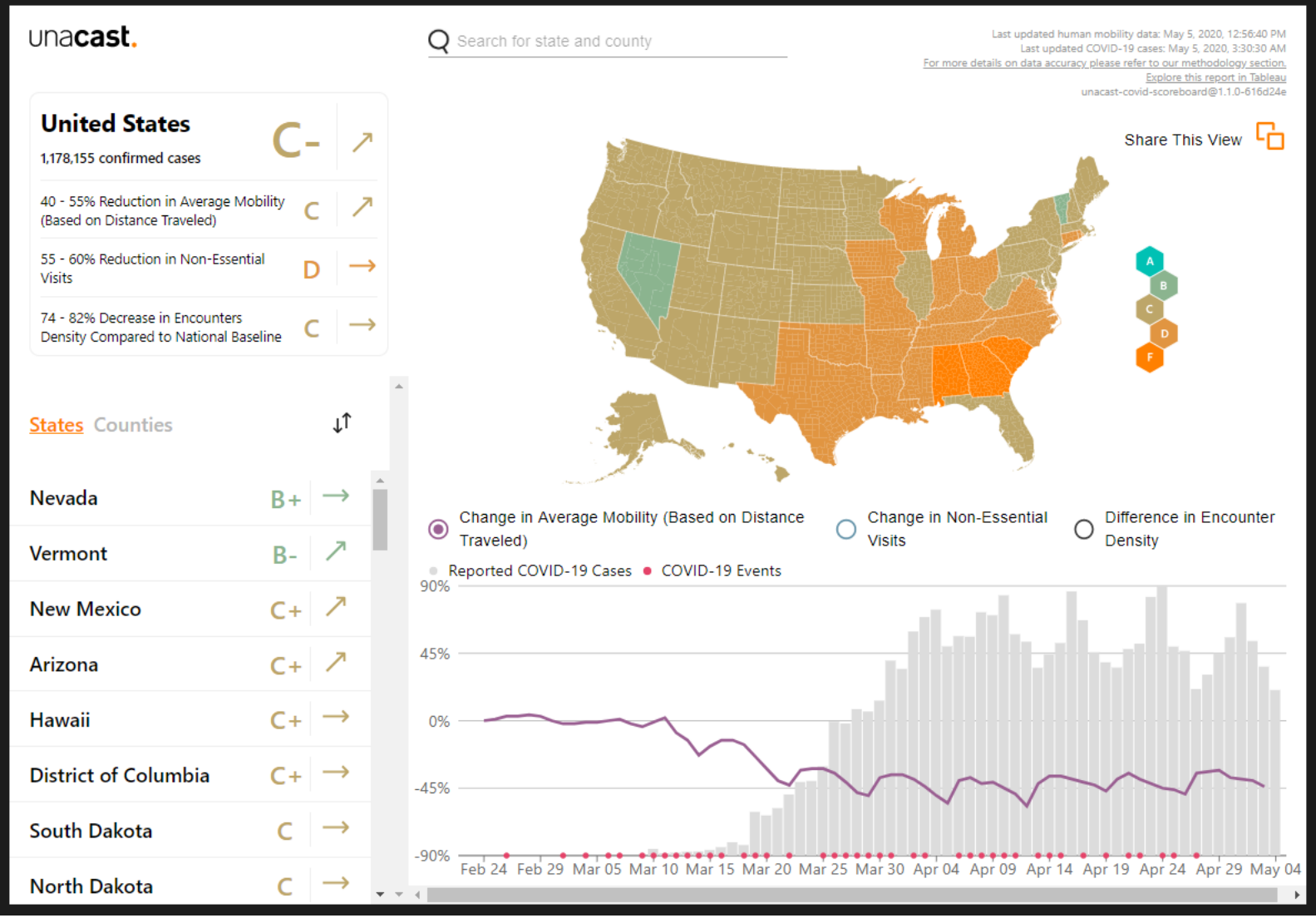
Read the privacy policy

✓ I agree

https://ourworldindata.org/coronavirus-data

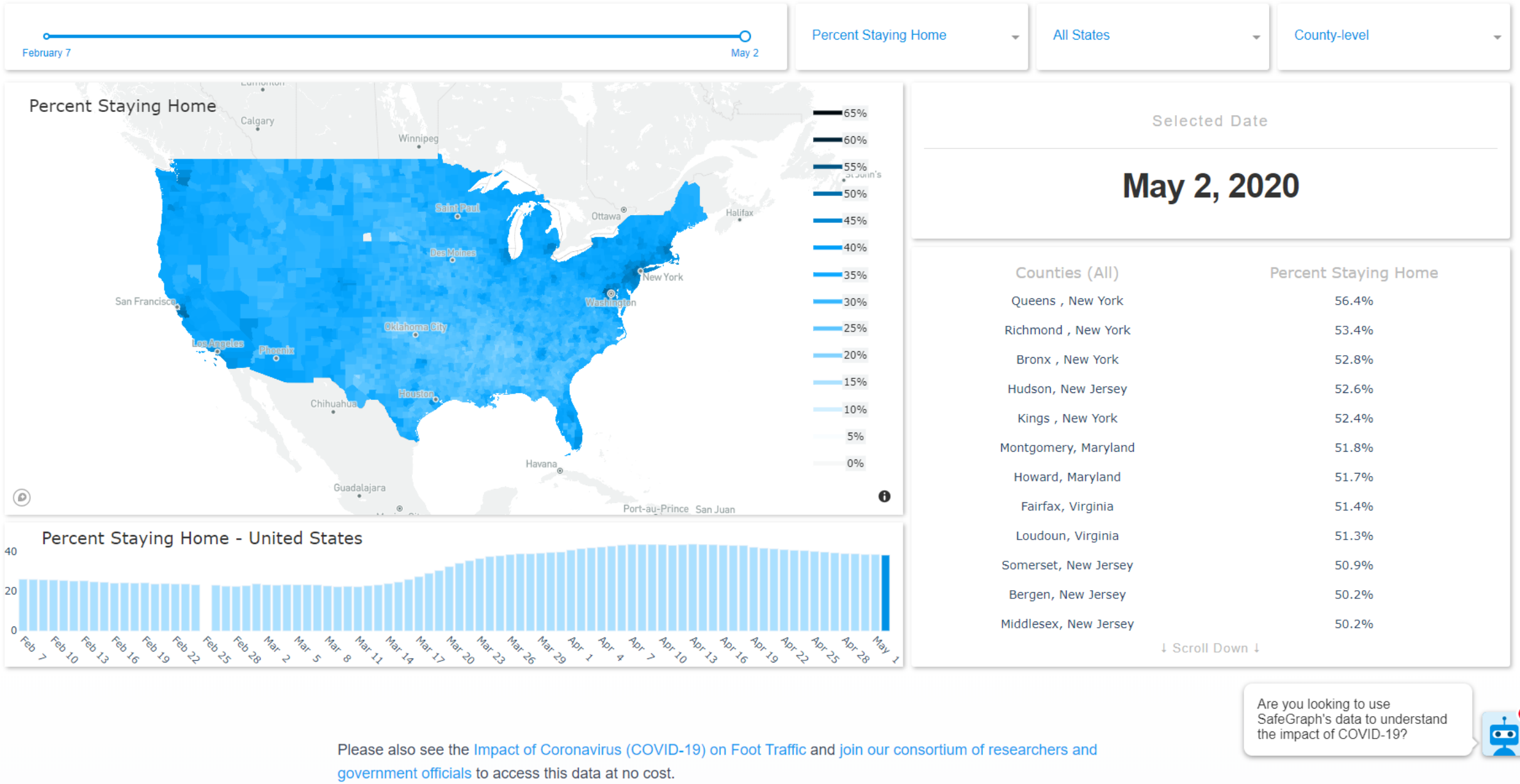
The Online Map by UNACAST

Compare your community's social distancing activity to its activity prior to COVID-19



https://www.unacast.com/covid19/social-distancing-scoreboard

The Online Map by SafeGraph



https://www.safegraph.com/dashboard/covid19-shelter-in-place?s=US&d=05-02-2020&t=counties&m=percent

The Online Map by Volunteering Experts (CovidActNow)

Covid ActNow

Map | About | Resources | Blog | Contact Us

Is COVID in retreat?

Are COVID cases and deaths decreasing?

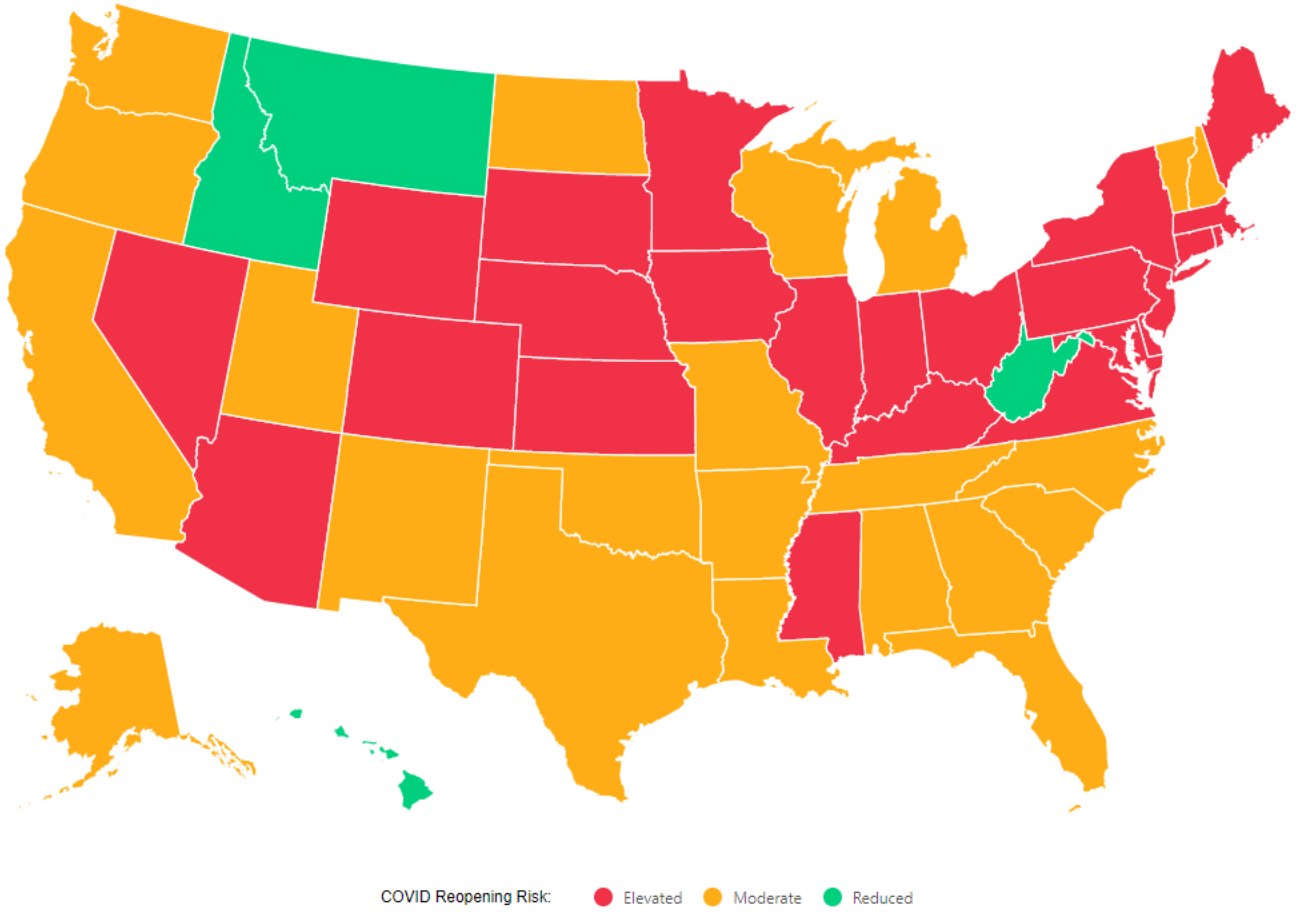
Are we testing enough?

Is COVID testing widespread enough to identify new cases?

Are our hospitals ready?

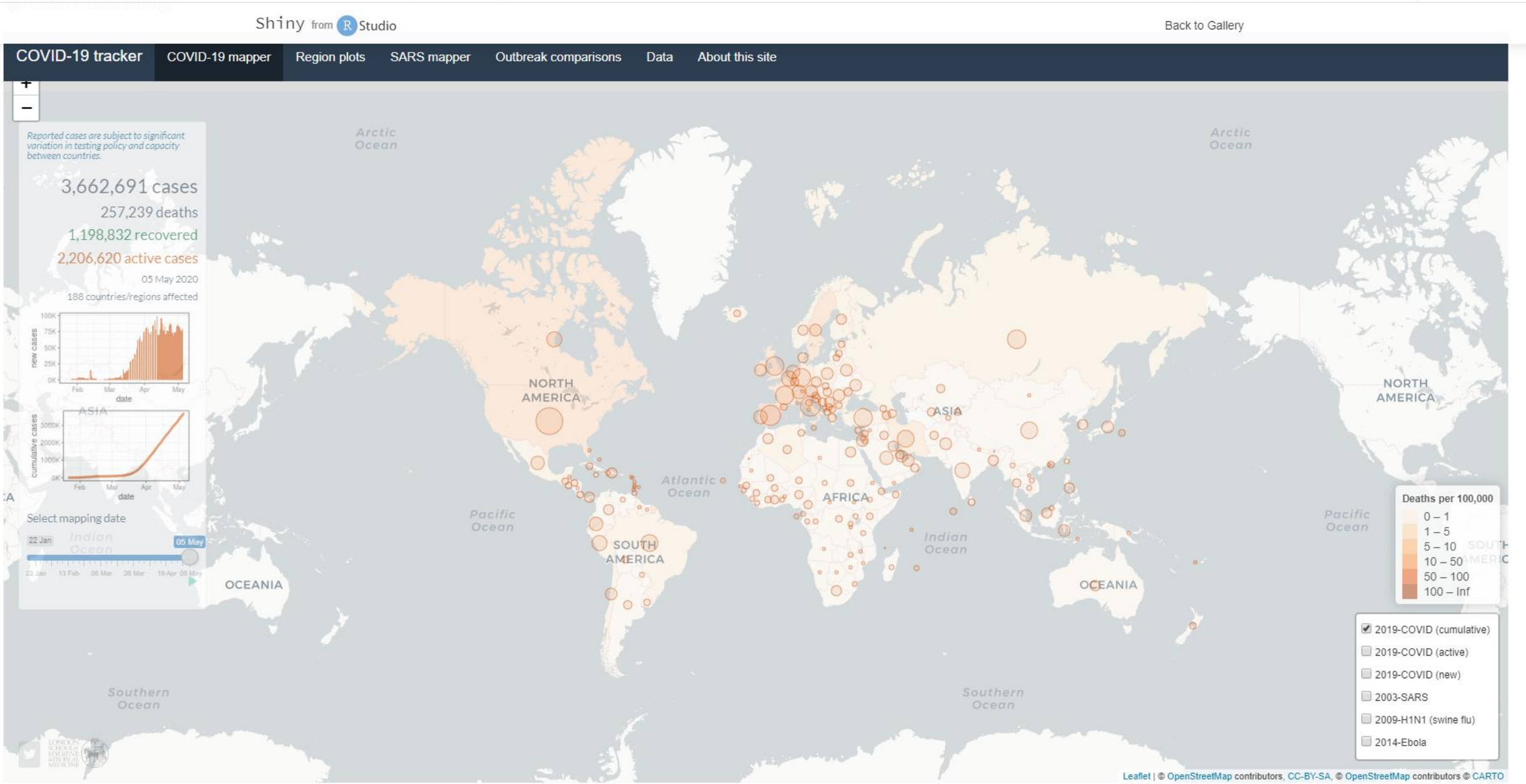
Do hospitals have capacity to treat a surge of COVID hospitalizations?

Click a state to view reopening risk details and county projections.



https://covidactnow.org/

The Online Map by Edward Parker on Shiny Gallery



https://shiny.rstudio.com/gallery/covid19-tracker.html

The Online Map by Esri's StoryMaps team

Mapping the novel coronavirus pandemic

Wuhan is a major transit hub for the region, with direct connections to dozens of other cities in China. The coronavirus outbreak coincided with the lunar new year, the most popular time of the year for domestic travel.

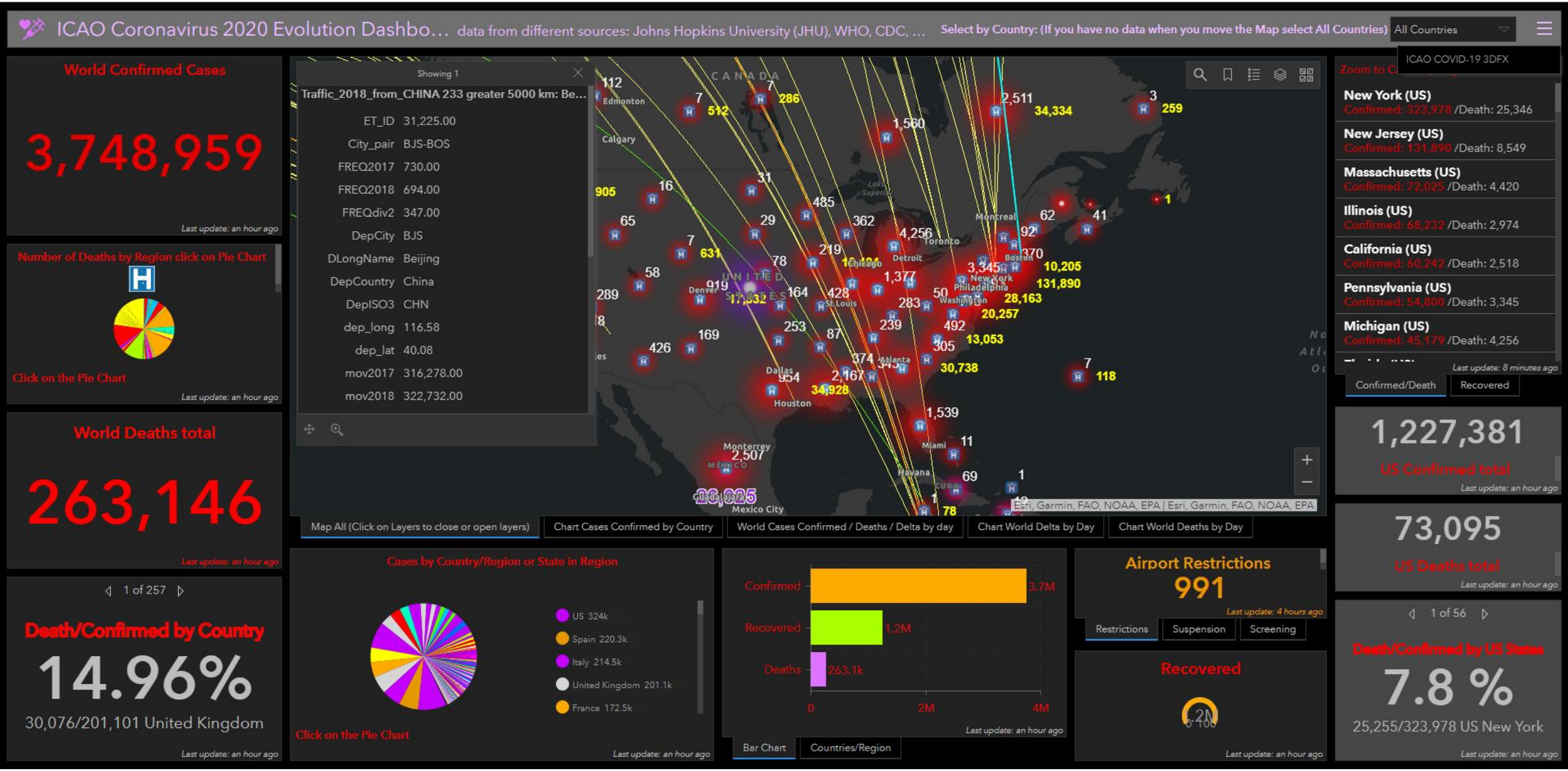
By the time the quarantine had been implemented there, an estimated 5 million people who were potentially exposed to the virus had already left Wuhan, complicating efforts to contain the virus.

Show international flights

***This map:** High-speed rail (2016) and domestic flights into and out of Wuhan (2018).*

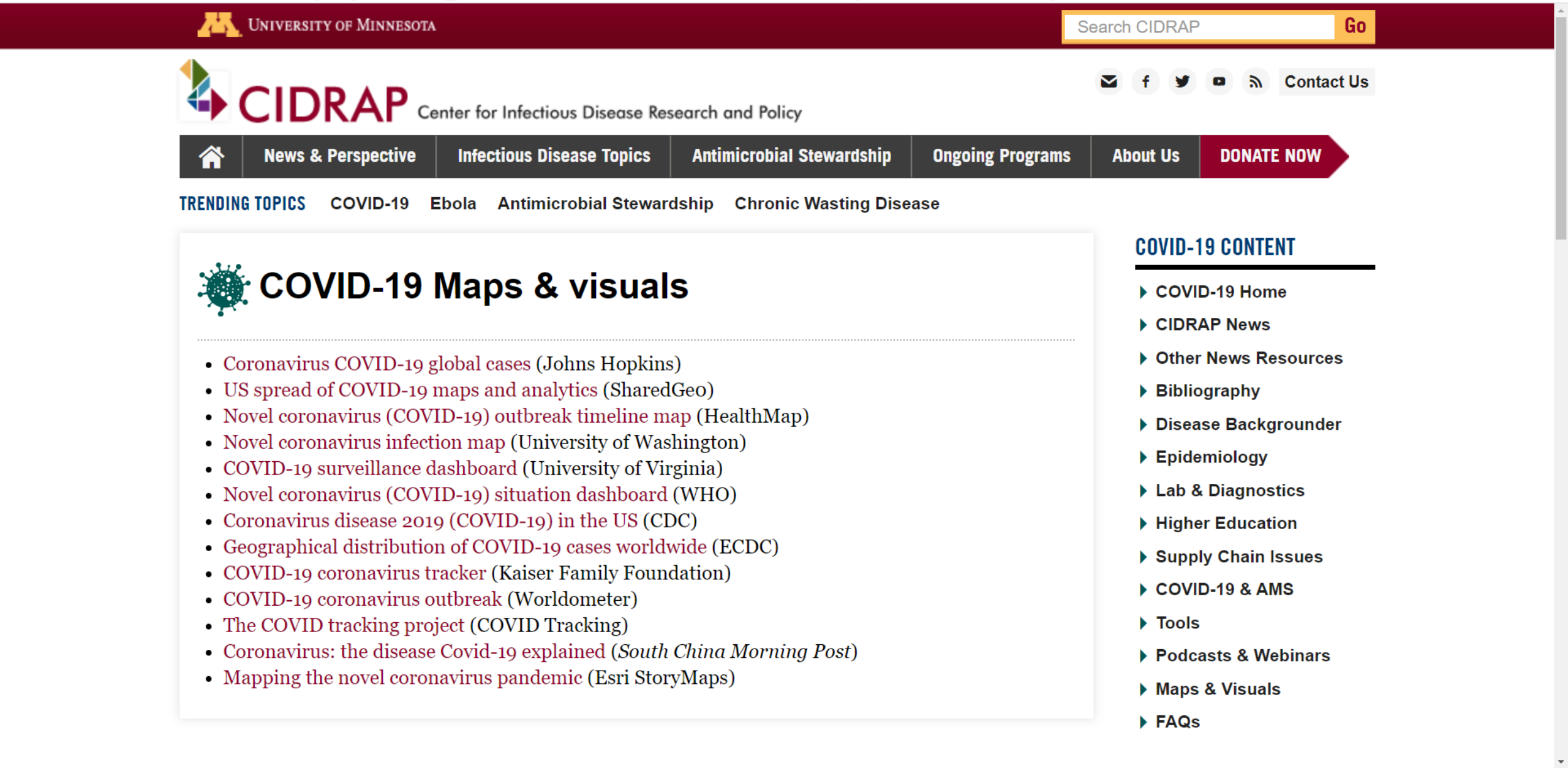
https://storymaps.arcgis.com/stories/4fdc0d03d3a34aa485de1fb0d2650ee0

The Online Map by ICAO



http://icao.maps.arcgis.com/apps/opsdashboard/index.html#/977dde48256b489fb48fa98e724721e8

Online Mapping Sources Compiled by CIDRAP



https://www.cidrap.umn.edu/covid-19/maps-visuals

✓ MAPS ABOUT 2019-NCOV ON ARCGIS ONLINE

February 5, 2020

- The JHU CSSE dashboard (link) – This is the most popular and was the first out, so it has 87M of the views. It has been featured on CNN, PBS, Fox News and Nature, among others. There is also a mobile version (link).
- Oklahoma Early Alert Dashboard (link) – includes airport suspensions, options to sort by country
- Distribution of pneumonia - New CoronaVirus Infections - JavaScript app (link) - Source: Esri China, Linked In post (link)
- Hong Kong Government (link) – includes buildings and quarantine, also confirmed + cases
- Web AppBuilder from the UN showing a 3D visualization of the spread of Wuhan Virus (link)
- Mapping the Novel Coronavirus Outbreak story map! populated in real time. The visualizations reflect the best known information about coronavirus from a variety of data sources. Readers get a solid snapshot of the outbreak on first visit and see virus updates when they return. (link) (Tweet)
- World Health Organization published a public facing dashboard on the current status of the Corona Virus (link).
- Map of an unknown source, appears to be in Lithuanian (link). It's got over 500k views.

Source: Recommended by Estella Geraghty of Esri. See the Tech Republic article where she was quoted in (link).

Latest News

Resources for Novel Coronavirus Global Research

April 24, 2020

As part of a larger NSF IUCRC Spatiotemporal Innovation Center's project to develop a Spatial Data Lab platform, the CGA has been collaborating with China Data Institute, a sponsoring member of the IUCRC based in Michigan,to build a resource collection for COVID-19 research since January. The effort is called... Read more ▸

Coronavirus Visualization Team

April 22, 2020

A Harvard led multi-University team of students has been recently formed with an aim of visualizing various aspects of the Coronavirus pandemic. Specifically, the group's focus is on showing objective statistics from reliable sources on what has been and what will be

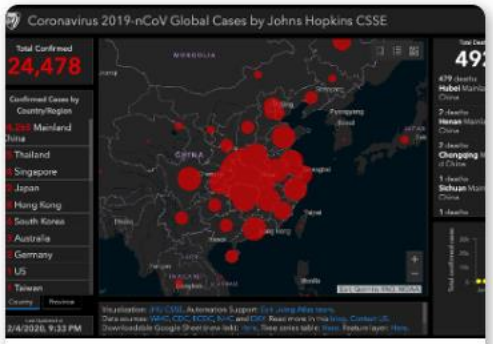
https://gis.harvard.edu/news/maps-about-2019-ncov-arcgis-online

ESRI's COVID-19 GIS Hub

esri COVID-19 Overview Resources

New: Develop Coronavirus (COVID-19) Testing Site Plans

Understand, prepare for, and respond to COVID-19 in your community or organization.



Coronavirus COVID-19 (2019-nCoV)

This dashboard created by Operations Dashboard contains the most up-to-date coronavirus COVID-19 (2019-nCoV) cases and latest trend plot.

Explore

Index of Global Applications related to COVID-19

Index of apps related to COVID-19 created by GIS users across the world and curated by Esri Disaster Response Program. Examples include dashboard...

Explore

Index of USA Applications related to COVID-19

Index of apps related to COVID-19 created by GIS users across the USA and curated by Esri Disaster Response Program. Examples include dashboard...

Explore

https://coronavirus-disasterresponse.hub.arcgis.com/

Section 1 Summary and Discussion

- Who created the web maps?
  - University researchers
  - News media
  - Commercial companies
  - Non-profit organizations
  - Government agencies
  - Private citizens
- What are the maps built with?
  - Proprietary systems (e.g. ArcGIS, Tableau, SafeGraph)
  - Open source tools (e.g. Carto, Leaflet, D3, Bootstrap)
- What are the themes of the maps?
  - Confirmed cases, Death
  - Social distancing enforcement
  - Readiness for re-opening
  - Travel and transmission
- What are the interface formats?
  - Dash board (linked to charts, graphs, tables, etc.)
  - Story map (with narratives)
- How are the maps' appearance?
  - Polygon shadings
  - Circular markers
- Geographers' concerns
  - Modifiable areal unit problem (MAUP)
  - Projection distortion

Section 2. How to animate COVID-19 spatial temporal data using ArcGIS Online

疫情数据时空动态显示

Pinde Fu

Esri Geospatial Cloud

ArcGIS Online
https://www.arcgis.com
https://www.arcgisonline.cn

ArcGIS Online

Esri managed

Customer managed

ArcGIS Enterprise

ArcGIS Enterprise

Online

Hybrid

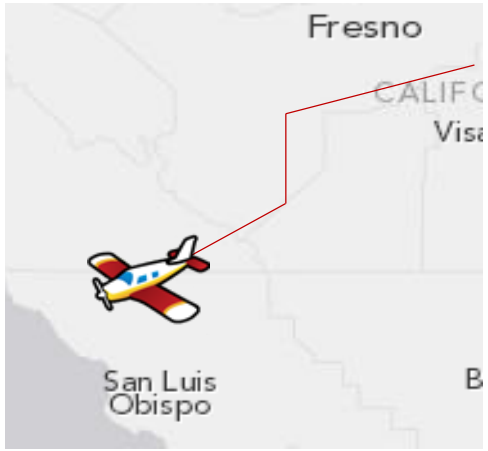
On-premises
or in cloud

注：

- Arcgisonline.cn基于ArcGIS Enterprise
- ArcGIS Online提供免费试用账号

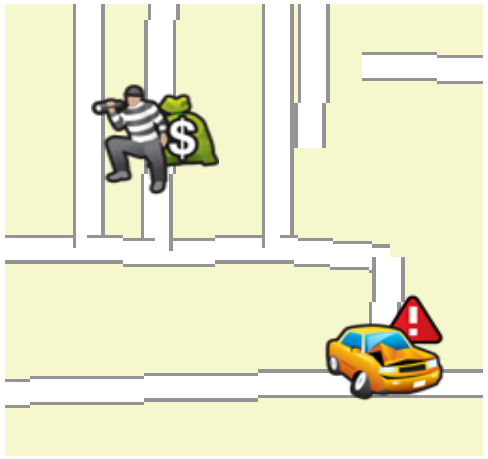
时空数据的常见类型

连续移动



例如一个感染者的行程轨迹

分散发生
(非连续)



固定位置，属性变化

例如一个行区的确诊人数

范围的扩张或退缩

时空数据的常见格式

常见时空序列数据格式：横向增长

location name	x	y	1/22/2020	1/23/2020	1/24/2020	…
xxx	…	…	1	4	12	

不符合数据库设计的基本原则：

- **Schema不具有扩展性**：表的字段可能太多（太宽），取决于时间跨度和时间间隔
  - 一年的跨度x每一小时一个读数：字段数=365*24=8760个！
- **Schema不具有固定性**：例如，每天要改表结构，要增加一列

Esri推荐的时空序列数据格式：竖向增长

location name	Shape	timestamp	value
xxx	…	1/22/2020	1
xxx	…	1/23/2020	4
xxx	…	1/24/2020	12
		…	

注：每行也可以有两个时间字段：开始时间、结束时间

符合数据库设计的基本原则：

- Schema具有固定性：
  - 时间跨度和间隔只影响行数，不影响列数
- Schema具有扩展性：
- **可以描述每一个时间点位置的变化**
  - 满足前述的各类时空数据：连续移动、分散发生、固定位置…

时空数据的常见转换

保存这些字段

这些字段从列转换成行

location name	x	y	1/22/2020	1/23/2020	1/24/2020	…
xxx	…	…	1	4	12	

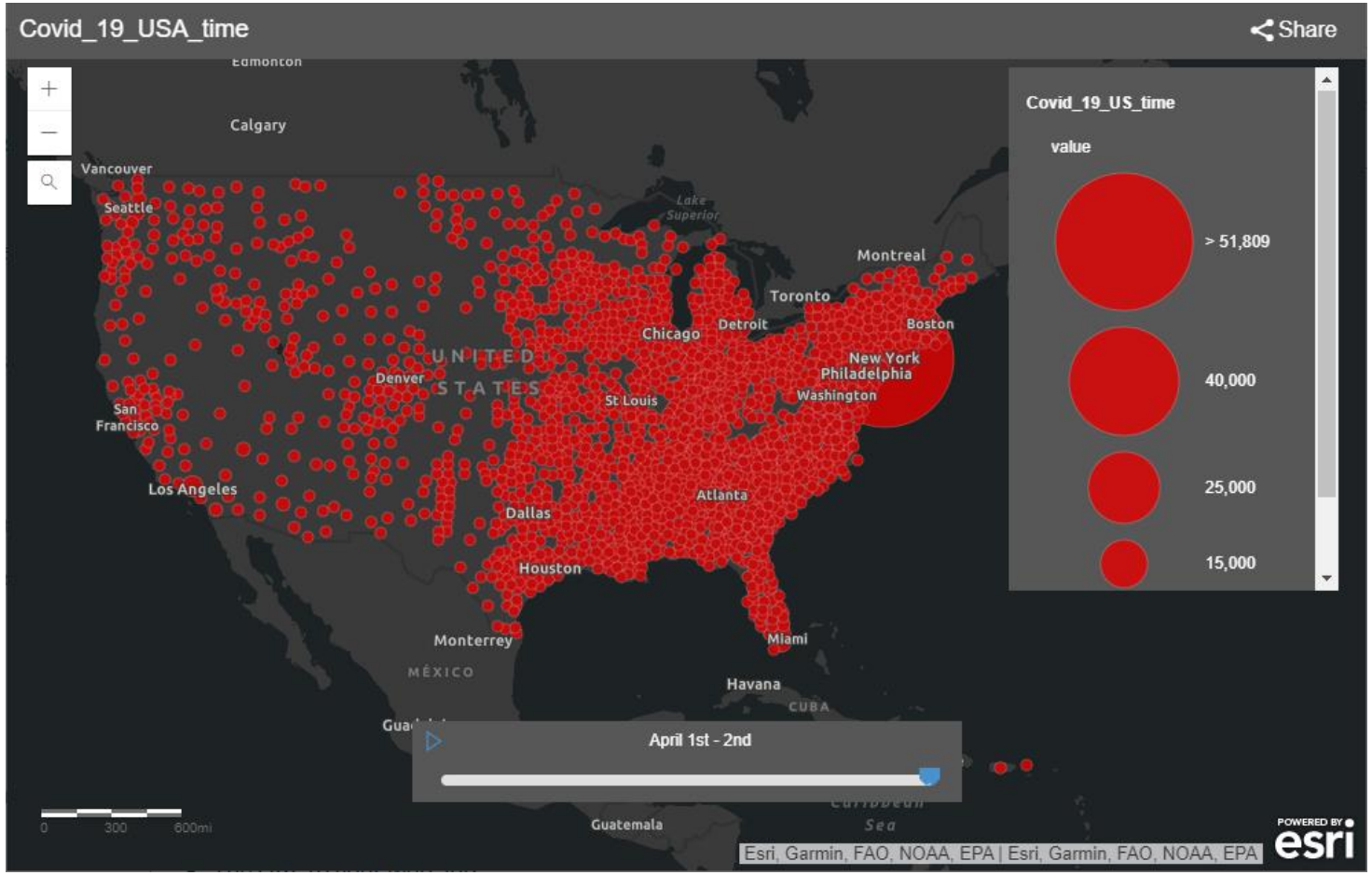
location name	x	y	timestamp	value
xxx	…	…	1/22/2020	1
xxx	…	…	1/23/2020	4
xxx	…	…	1/24/2020	12
			…	

演示

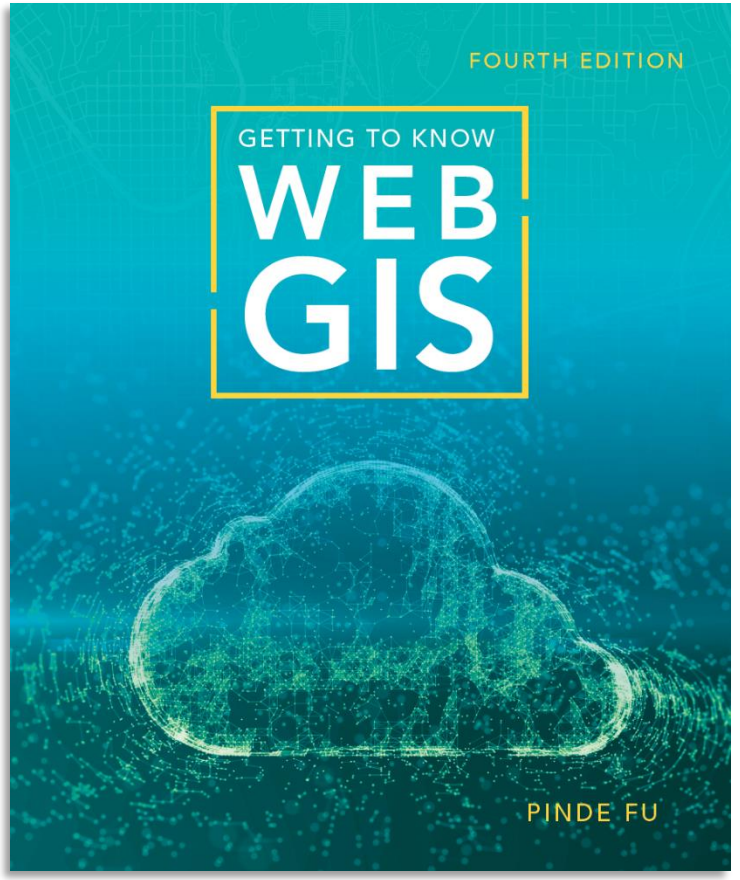
- 下载Covid-19时间序列数据（https://github.com/CSSEGISandData/COVID-19）
- 格式转换工具 （https://bit.ly/2zNuYao）

动态展示Covid-19时空数据

哈佛学生Web GIS作业截屏



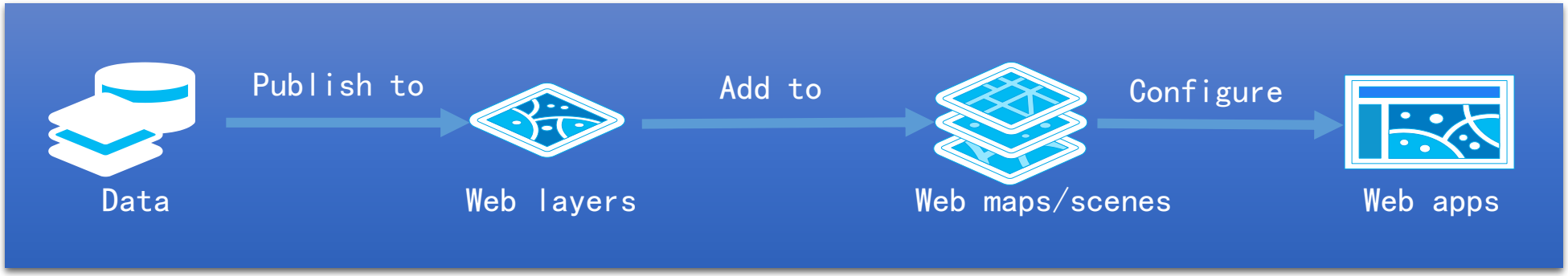
我的新书：
《Getting to Know Web GIS》第四版



Available at Amazon.com

Covid-19时空数据动态演示

这个演示也将展示 ArcGIS Online的基本工作流程



- 数据下载（https://github.com/CSSEGISandData/COVID-19）
- 格式转换（https://bit.ly/2zNuYao）

发布要素图层
- 启用时间

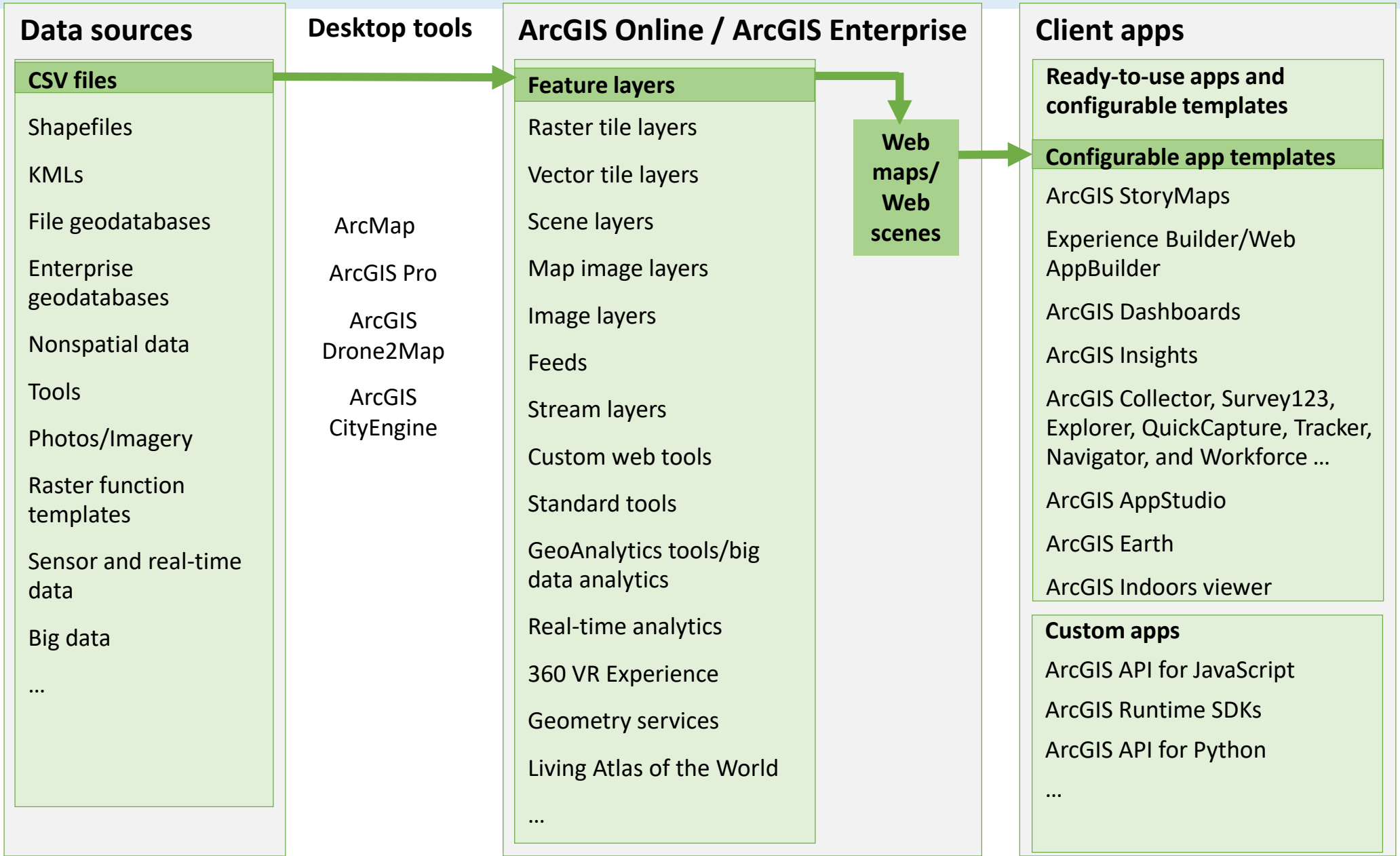
配置要素图层
- 符号
- 动态播放

选择app模板

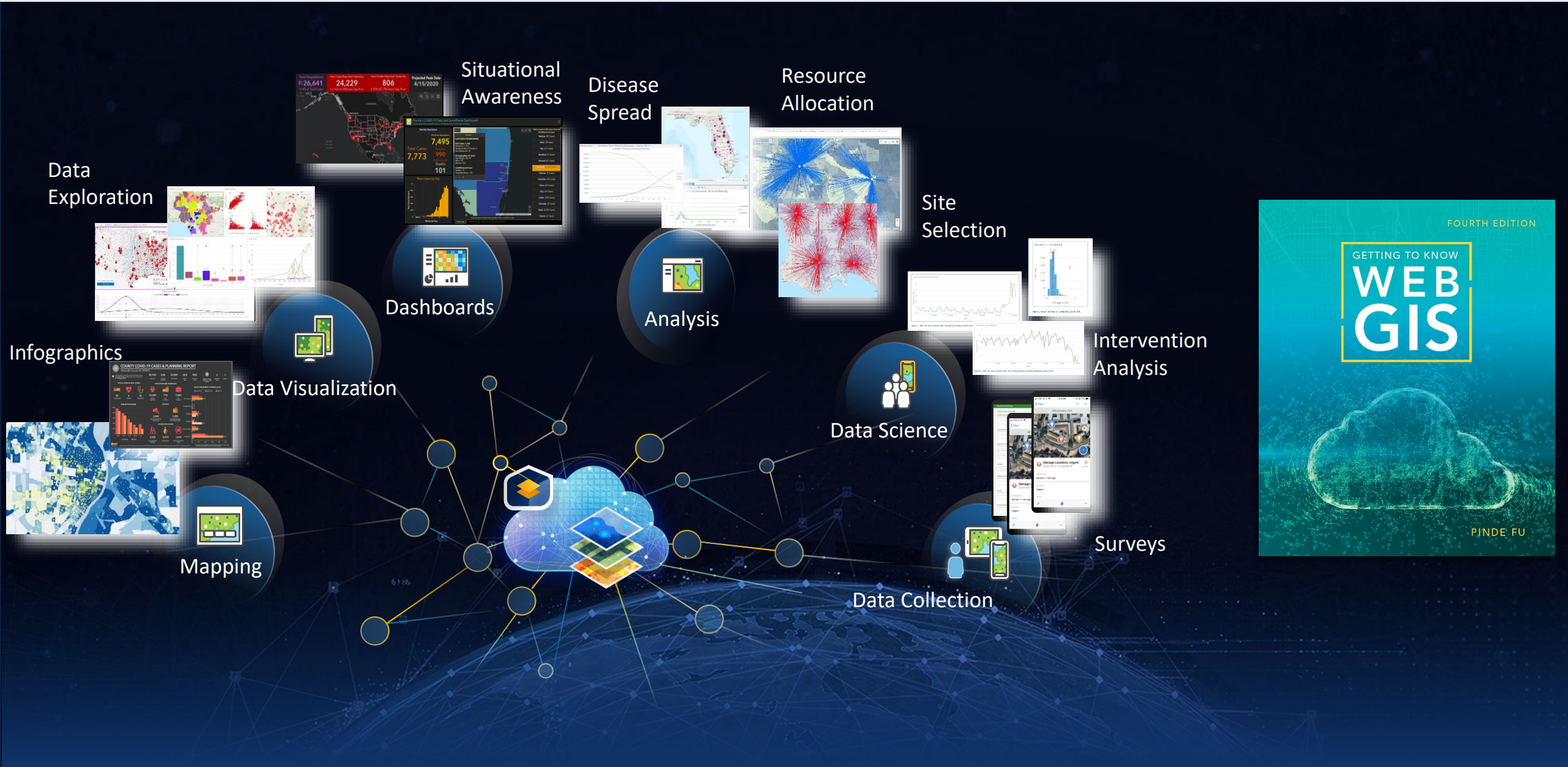
演示

动态播放能更直观的展示Covid-19在全球的传播过程（和测试量有关）

本演示在Esri Web GIS技术体系中的位置



You can do much more …



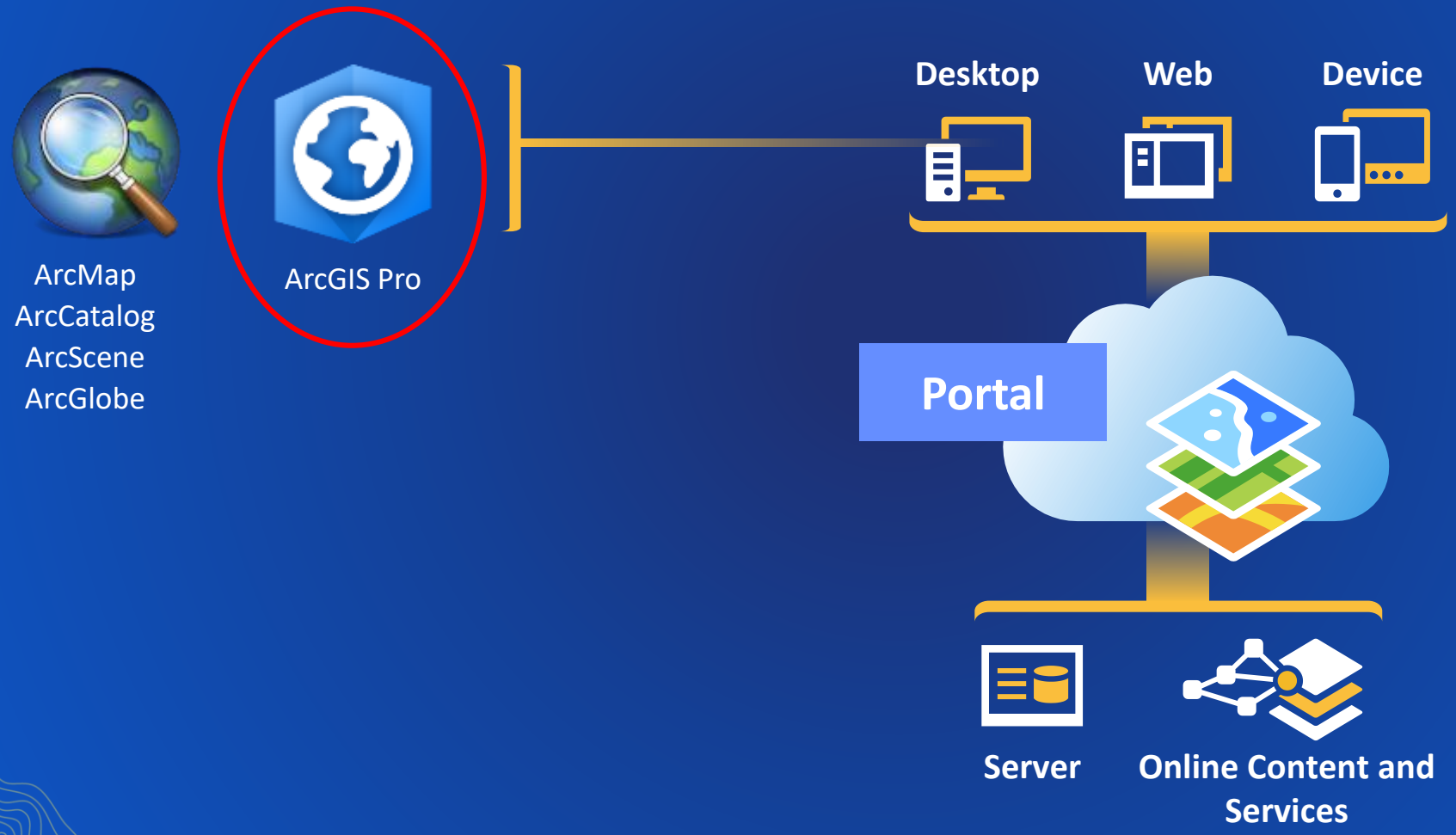
Section 3. How to map COVID-19 data with space and time in ArcGIS Pro

疫情数据时空地图制作

Wendy Guan

https://www.esri.com/about/newsroom/arcuser/**why-you-should-move-to-arcgis-pro/**
https://www.esri.com/arcgis-blog/products/3d-gis/3d-gis/**what-makes-arcgis-pro-so-pro/**

ArcGIS Desktop



COVID-19 Data Sources: Massachusetts State

COVID-19 cases in Massachusetts

COVID-19 cases in Massachusetts as of May 9, 2020	
Confirmed cases of COVID-19	76,743

COVID-19 case overview data

Updated each day by 4 p.m.

- COVID-19 Dashboard - May 9, 2020

he COVID-19 Dashboard includes daily and cumulative confirmed cases; cases by hospital, county, and age/sex/ethnicity; testing by date; deaths; hospital capacity and census; nursing home data; and PPE distribution.

Raw data used to create the dashboard is available here: COVID-19 Raw Data - May 9, 2020

Previous daily charts are available here: Archive of COVID-19 cases in Massachusetts

COVID-19 cases by city/town

Reported weekly. Updated each Wednesday by 4 p.m.

Information about COVID-19 testing in Massachusetts

CDC: Case Counts in the United States

Feedback

https://www.mass.gov/info-details/covid-19-response-reporting#covid-19-cases-in-massachusetts-

COVID-19 Data Format (County & Town)

H6

	A	B	C	D
1	Date	County	Count	Deaths
1061	5/8/2020	Hampden	4522	441
1062	5/8/2020	Hampshire	654	48
1063	5/8/2020	Middlesex	17014	1132
1064	5/8/2020	Nantucket	11	
1065	5/8/2020	Norfolk	6801	623
1066	5/8/2020	Plymouth	6194	375
1067	5/8/2020	Suffolk	14944	683
1068	5/8/2020	Worcester	7410	404
1069	5/8/2020	Unknown	297	3
1070	5/8/2020	Dukes and Nantucket		1
1071	5/9/2020	Barnstable	1056	66
1072	5/9/2020	Berkshire	472	37
1073	5/9/2020	Bristol	4847	260
1074	5/9/2020	Dukes	23	
1075	5/9/2020	Essex	11211	625
1076	5/9/2020	Franklin	294	42
1077	5/9/2020	Hampden	4647	445
1078	5/9/2020	Hampshire	659	50
1079	5/9/2020	Middlesex	17307	1169
1080	5/9/2020	Nantucket	11	
1081	5/9/2020	Norfolk	6887	635
1082	5/9/2020	Plymouth	6311	384

County

Ready 100%

Massachusetts DPH Town-By-Town Coronavirus Data Cumulative

File Edit View Insert Format Data Tools Add-ons Help

Share

100% View only

Town

	A	B	C	D
1	Town	State	Confirmed Cases	Rate per 100,000 residents
2	Abington	MA	177	985.47
3	Acton	MA	95	400.3
4	Acushnet	MA	47	449.61
5	Adams	MA	32	386.44
6	Agawam	MA	333	1164.16
7	Alford	MA	0	0
8	Amesbury	MA	156	937.2
9	Amherst	MA	60	148.16
10	Andover	MA	210	583.09
11	Aquinnah	MA	0	0
12	Arlington	MA	248	541.38
13	Ashburnham	MA	17	270.7
14	Ashby	MA	8	231.38
15	Ashfield	MA	<5	*
16	Ashland	MA	145	743.86
17	Athol	MA	41	342.66
18	Attleboro	MA	480	1037.44
19	Auburn	MA	152	921.64
20	Avon	MA	56	1278.34
21	Ayer	MA	45	556.93
22	Barnstable	MA	238	530.71
23	Barre	MA	42	755.7
24	Becket	MA	11	610.96
25	Bedford	MA	190	1275.48
26	Belchertown	MA	69	433.34
27	Bellingham	MA	96	537.02
28	Belmont	MA	182	666.52
29	Berkley	MA	41	604.7
30	Berlin	MA	14	438.43
31	Bernardston	MA	6	286.94
32	Beverly	MA	440	1068.83
33	Billerica	MA		

Running Total | May 6 | April 29 | April 22 | April 15 | Explore

https://docs.google.com/spreadsheets/d/12x3bbOzjNY2roOggAA8JjapNwp8y_J4bj4xpK4IL4EA/edit#gid=132557649

GIS Data Sources: Massachusetts State

EMERGENCY ALERTS | Coronavirus Update HIDE ALERTS

Stay informed about coronavirus - COVID-19. Learn more. *May. 11th, 2020, 9:00 am* Read more

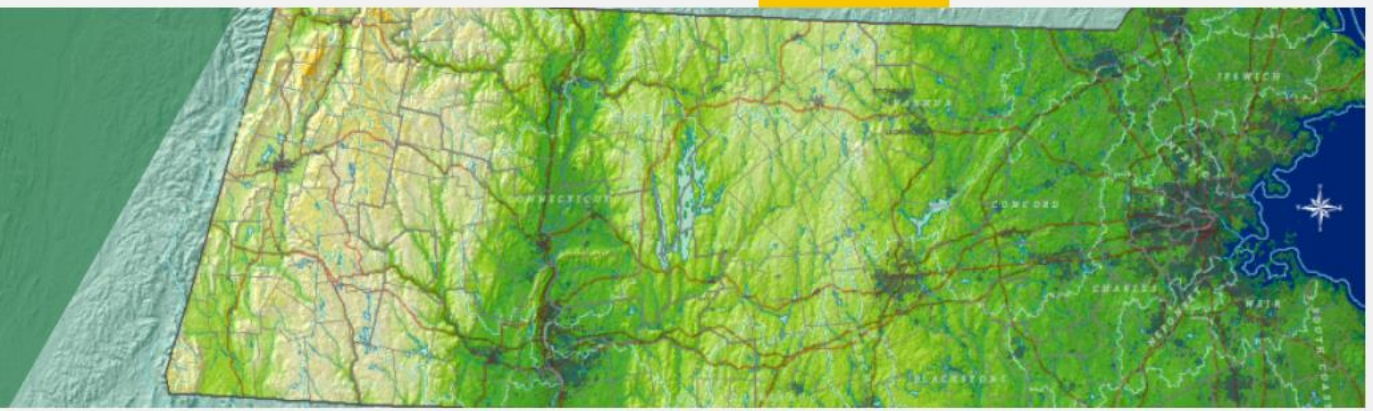
Select Language | State Organizations | Log In to...

Mass.gov

Search Mass.gov SEARCH

LIVING | WORKING | LEARNING | VISITING & EXPLORING | YOUR GOVERNMENT | COVID-19

MassGIS (Bureau of Geographic Information) (MASSGIS)



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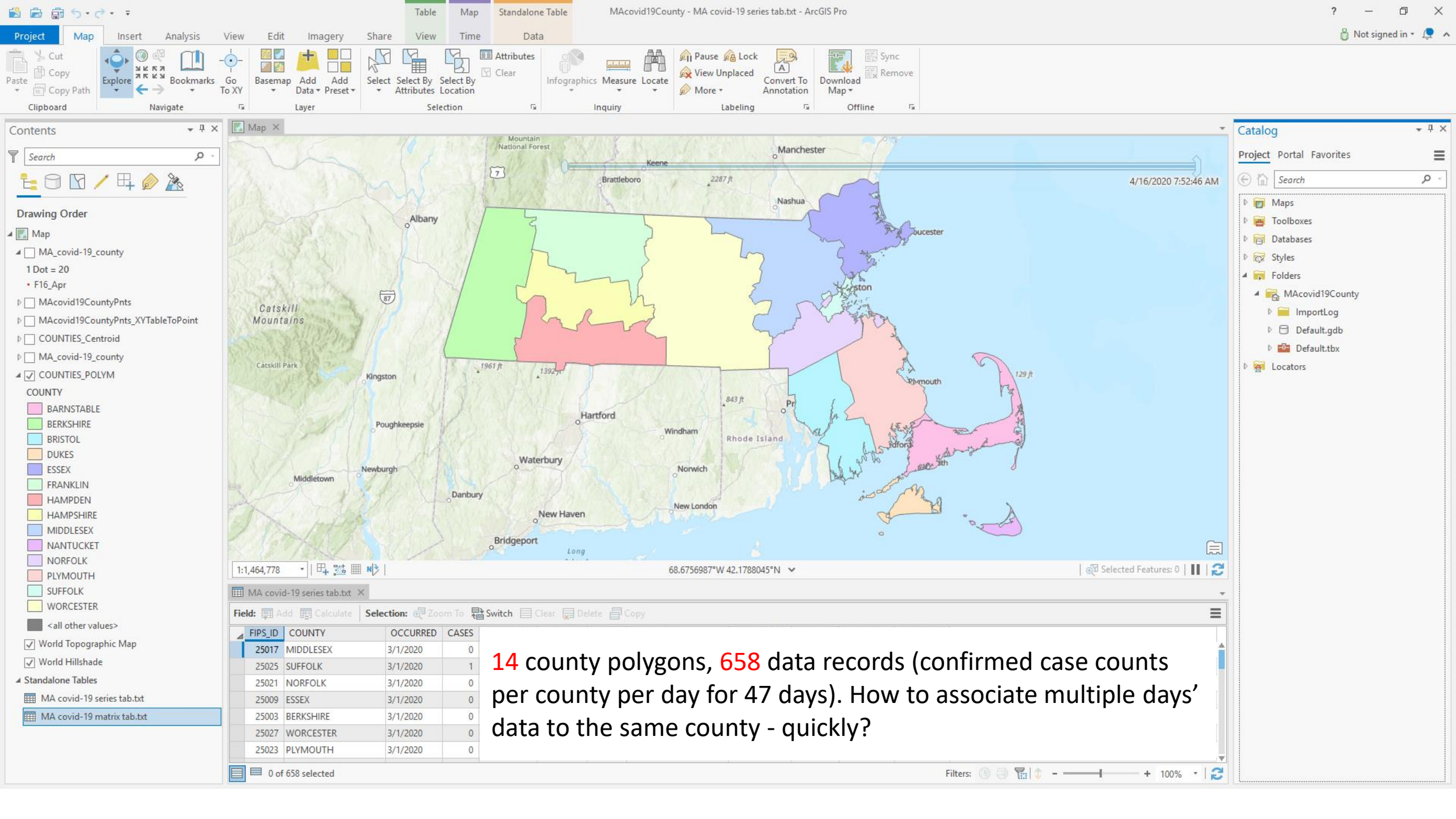
MassGIS is the state's one-stop-shop for interactive maps and associated descriptive information. You can view and explore our extensive library of map information using our on-line mapping viewer, OLIVER and other web maps. GIS users can access data and web services for their software and applications. MassGIS also coordinates GIS activities in state and local government and sets GIS data standards.

Feedback

https://www.mass.gov/orgs/massgis-bureau-of-geographic-information


MAcovid19County - MA covid-19 series tab.txt - ArcGIS Pro
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COUNTIES_Centroid
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World Topographic Map
World Hillshade
Standalone Tables
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Brattleboro
2287 ft
4/16/2020 7:52:46 AM
Nashua
Albany
Catskill Mountains
Catskill Park
Kingston
1961 ft
1392 ft
Poughkeepsie
Hartford
Windham
843 ft
Rhode Island
Waterbury
Newburgh
Middletown
Norwich
Danbury
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New London
Bridgeport
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68.6756987°W 42.1788045°N
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Selection: Zoom To Switch Clear Delete Copy
FIPS_ID COUNTY OCCURRED CASES
25017 MIDDLESEX 3/1/2020 0
25025 SUFFOLK 3/1/2020 1
25021 NORFOLK 3/1/2020 0
25009 ESSEX 3/1/2020 0
25003 BERKSHIRE 3/1/2020 0
25027 WORCESTER 3/1/2020 0
25023 PLYMOUTH 3/1/2020 0
14 county polygons, 658 data records (confirmed case counts per county per day for 47 days). How to associate multiple days' data to the same county - quickly?
0 of 658 selected
Filters:
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Catalog
Project Portal Favorites
Search
Maps
Toolboxes
Databases
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Folders
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ImportLog
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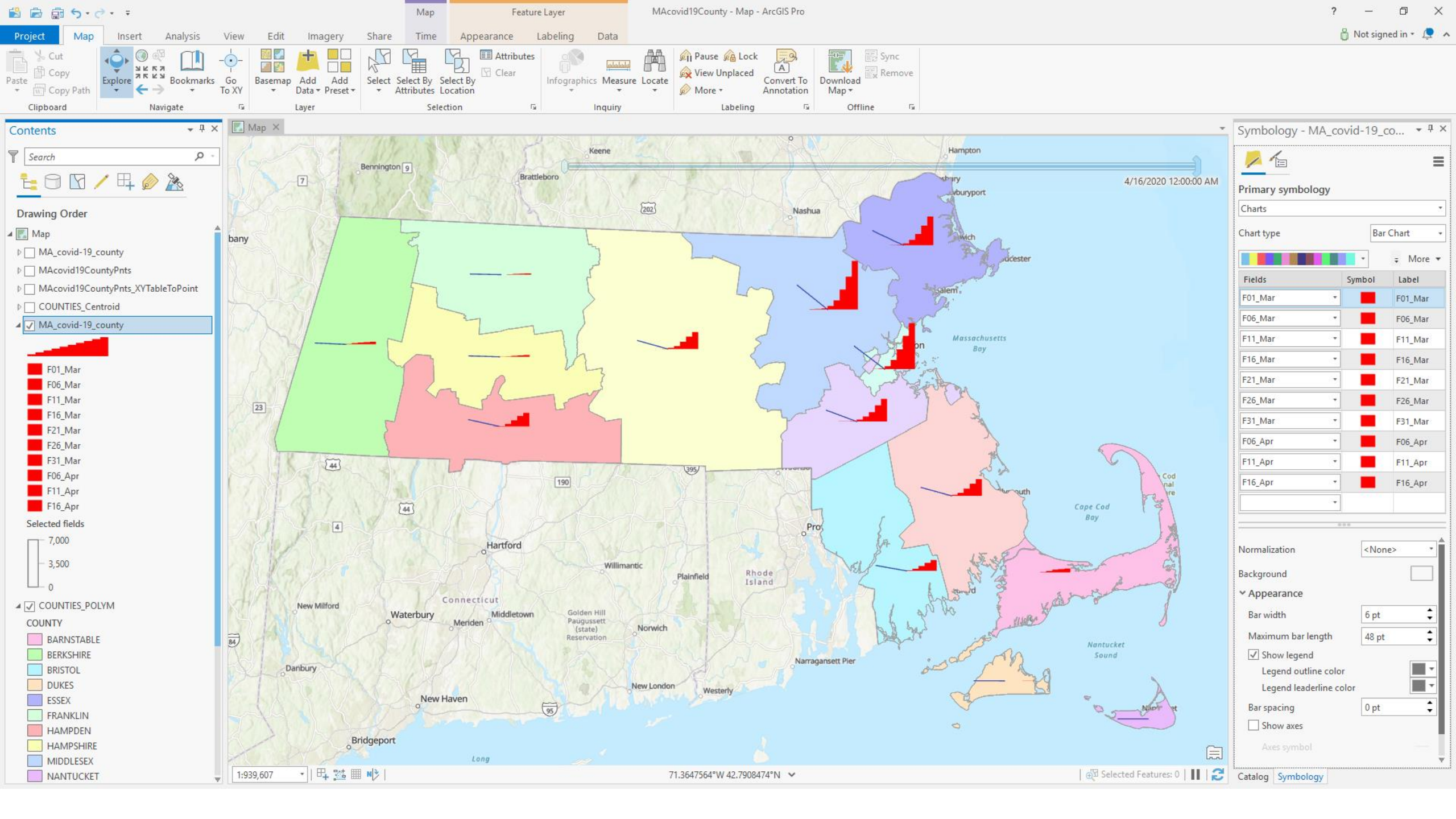
Default.tbx
Locators


MAcovid19County - Map - ArcGIS Pro
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MAcovid19CountyPnts
MAcovid19CountyPnts_XYTableToPoint
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F06_Mar
F11_Mar
F16_Mar
F21_Mar
F26_Mar
F31_Mar
F06_Apr
F11_Apr
F16_Apr
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DUKES
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FRANKLIN
HAMPDEN
HAMPSHIRE
MIDDLESEX
NANTUCKET
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Bennington
Brattleboro
Nashua
Massachusetts Bay
Cape Cod Bay
Nantucket Sound
Hartford
Willimantic
Plainfield
Rhode Island
Connecticut
New Milford
Waterbury
Meriden
Middletown
Golden Hill Paugussett (state) Reservation
Norwich
Narragansett Pier
Danbury
New London
Westerly
New Haven
Bridgeport
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Primary symbology
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Bar Chart
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F06_Mar
F11_Mar
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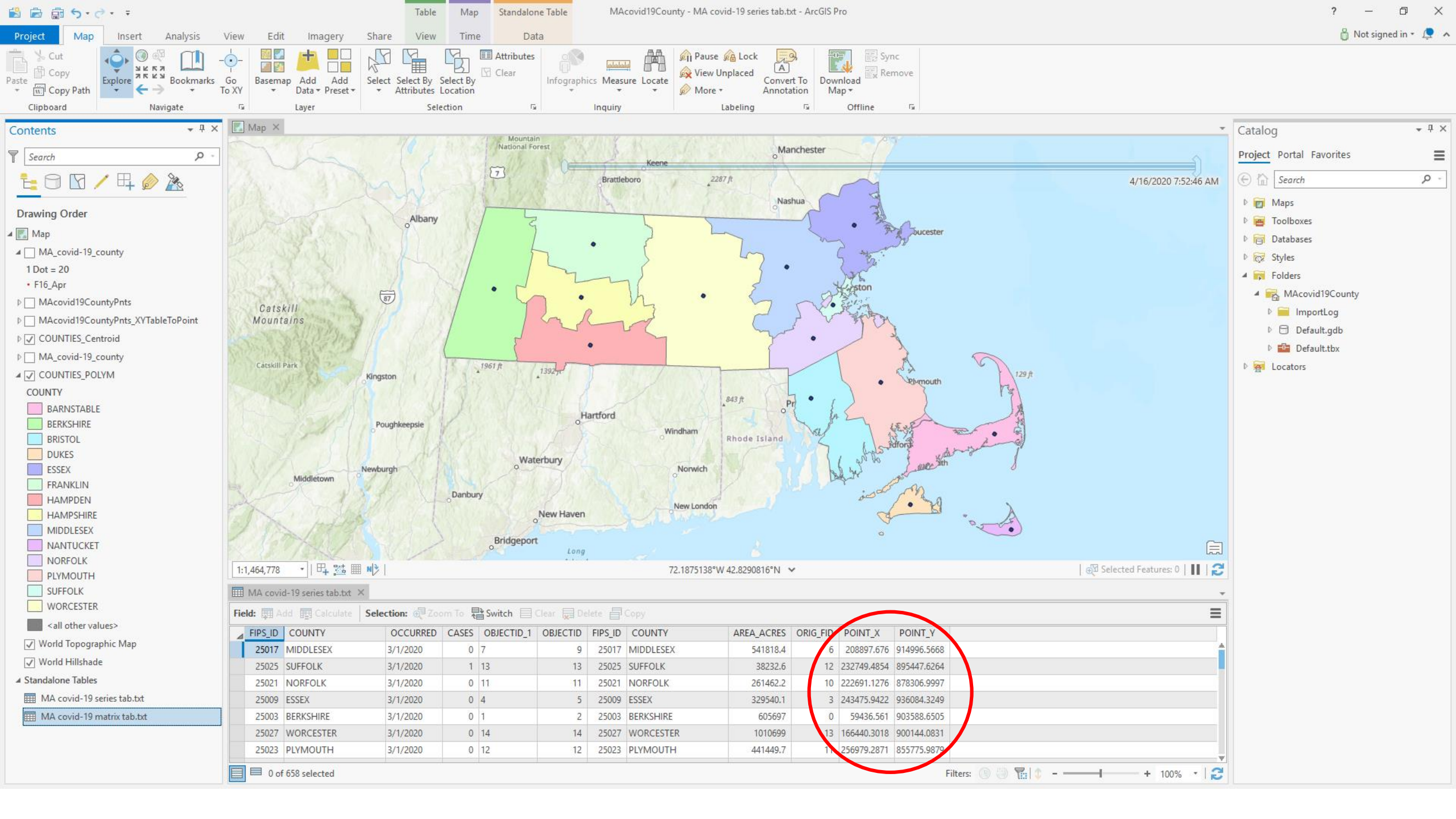
Axes symbol
Catalog
Symbology


MAcovid19County - MA covid-19 series tab.txt - ArcGIS Pro
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1 Dot = 20
F16_Apr
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MAcovid19CountyPnts_XYTableToPoint
COUNTIES_Centroid
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DUKES
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HAMPSHIRE
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SUFFOLK
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World Hillshade
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MA covid-19 matrix tab.txt
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Brattleboro
2287 ft
4/16/2020 7:52:46 AM
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Albany
Catskill Mountains
Catskill Park
Kingston
1961 ft
1392 ft
Poughkeepsie
Hartford
Windham
843 ft
Rhode Island
Waterbury
Newburgh
Middletown
Norwich
Danbury
New London
New Haven
Bridgeport
129 ft
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MA covid-19 series tab.txt
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25017 MIDDLESEX 3/1/2020 0 7 9 25017 MIDDLESEX 541818.4 6 208897.676 914996.5668
25025 SUFFOLK 3/1/2020 1 13 13 25025 SUFFOLK 38232.6 12 232749.4854 895447.6264
25021 NORFOLK 3/1/2020 0 11 11 25021 NORFOLK 261462.2 10 222691.1276 878306.9997
25009 ESSEX 3/1/2020 0 4 5 25009 ESSEX 329540.1 3 243475.9422 936084.3249
25003 BERKSHIRE 3/1/2020 0 1 2 25003 BERKSHIRE 605697 0 59436.561 903588.6505
25027 WORCESTER 3/1/2020 0 14 14 25027 WORCESTER 1010699 13 166440.3018 900144.0831
25023 PLYMOUTH 3/1/2020 0 12 12 25023 PLYMOUTH 441449.7 1 256979.2871 855775.9879
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Filters:
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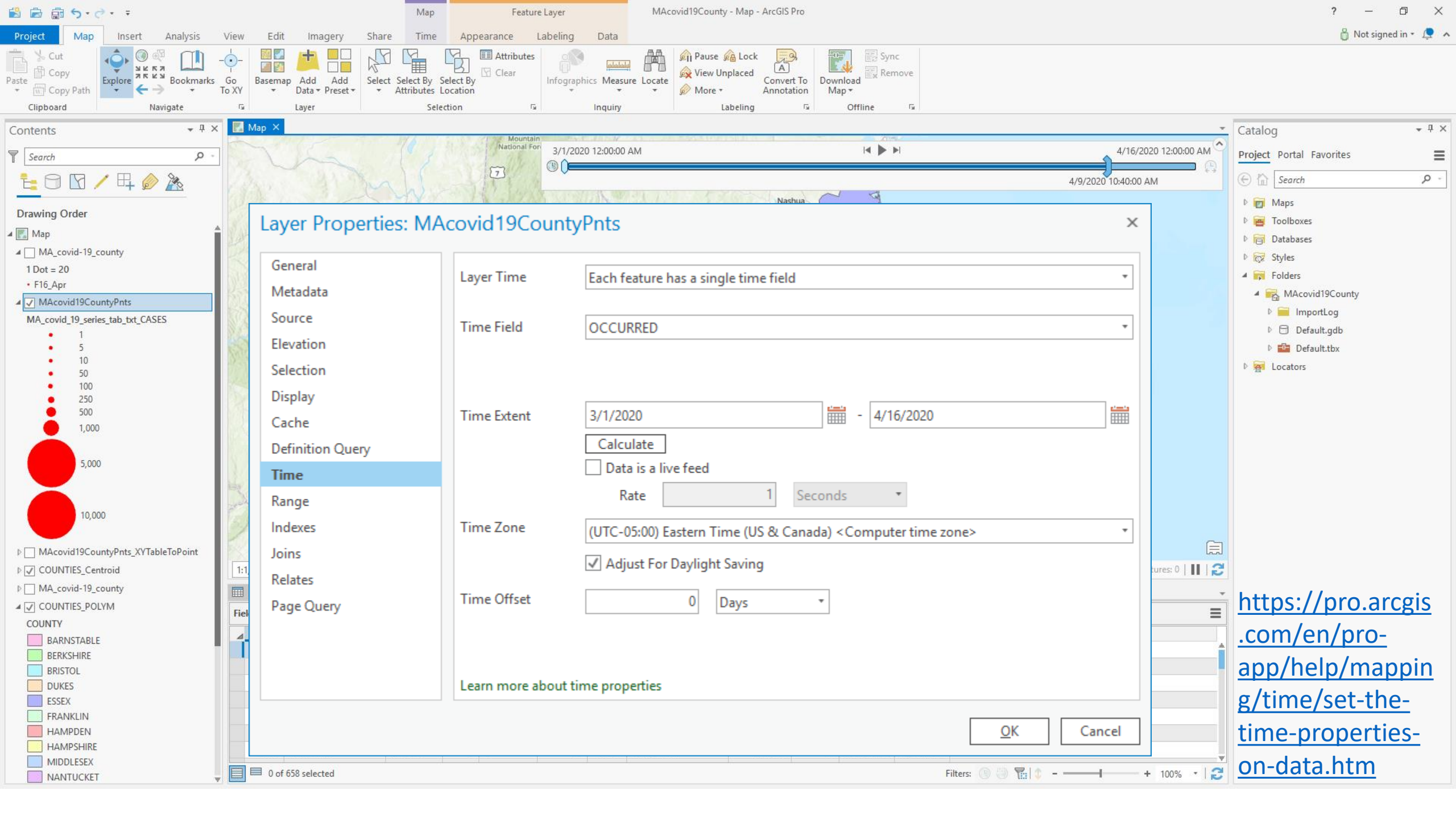
Folders
MAcovid19County
ImportLog
Default.gdb
Default.tbx
Locators



https://pro.arcgis.com/en/pro-app/help/mapping/time/set-the-time-properties-on-data.htm

MAcovid19County - Map - ArcGIS Pro

Not signed in

Project | Map | Insert | Analysis | View | Edit | Imagery | Share | Map Time | Feature Layer: Appearance | Labeling | Data

Clipboard: Paste, Cut, Copy, Copy Path
Navigate: Explore, Bookmarks, Go To XY
Layer: Basemap, Add Data, Add Preset
Selection: Select, Select By Attributes, Select By Location, Attributes, Clear
Inquiry: Infographics, Measure, Locate
Labeling: Pause, Lock, View Unplaced, More, Convert To Annotation
Offline: Download Map, Sync, Remove

Contents

Search

Drawing Order

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    - 1 Dot = 20
    - F16_Apr
  - MAcovid19CountyPnts
    - MA_covid_19_series_tab_txt_CASES
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      - 10
      - 50
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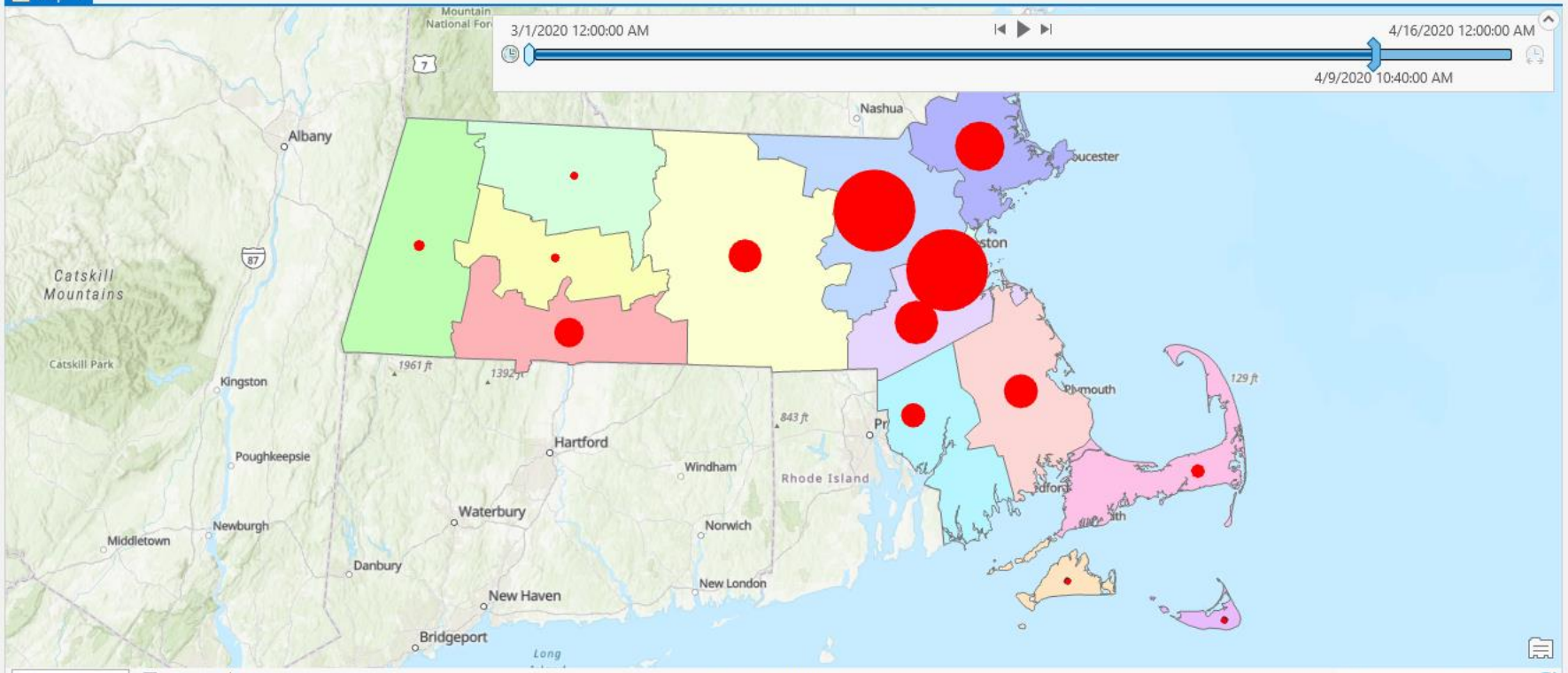
      - 10,000
  - MAcovid19CountyPnts_XYTableToPoint
  - COUNTIES_Centroid
  - MA_covid-19_county
  - COUNTIES_POLYM
    - COUNTY
      - BARNSTABLE
      - BERKSHIRE
      - BRISTOL
      - DUKES
      - ESSEX
      - FRANKLIN
      - HAMPDEN
      - HAMPSHIRE
      - MIDDLESEX
      - NANTUCKET

Map



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MA covid-19 series tab.txt

Field: Add, Calculate | Selection: Zoom To, Switch, Clear, Delete, Copy

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25025	SUFFOLK	3/1/2020	1	13	13	25025	SUFFOLK	38232.6	12	232749.4854	895447.6264
25021	NORFOLK	3/1/2020	0	11	11	25021	NORFOLK	261462.2	10	222691.1276	878306.9997
25009	ESSEX	3/1/2020	0	4	5	25009	ESSEX	329540.1	3	243475.9422	936084.3249
25003	BERKSHIRE	3/1/2020	0	1	2	25003	BERKSHIRE	605697	0	59436.561	903588.6505
25027	WORCESTER	3/1/2020	0	14	14	25027	WORCESTER	1010699	13	166440.3018	900144.0831
25023	PLYMOUTH	3/1/2020	0	12	12	25023	PLYMOUTH	441449.7	11	256979.2871	855775.9879

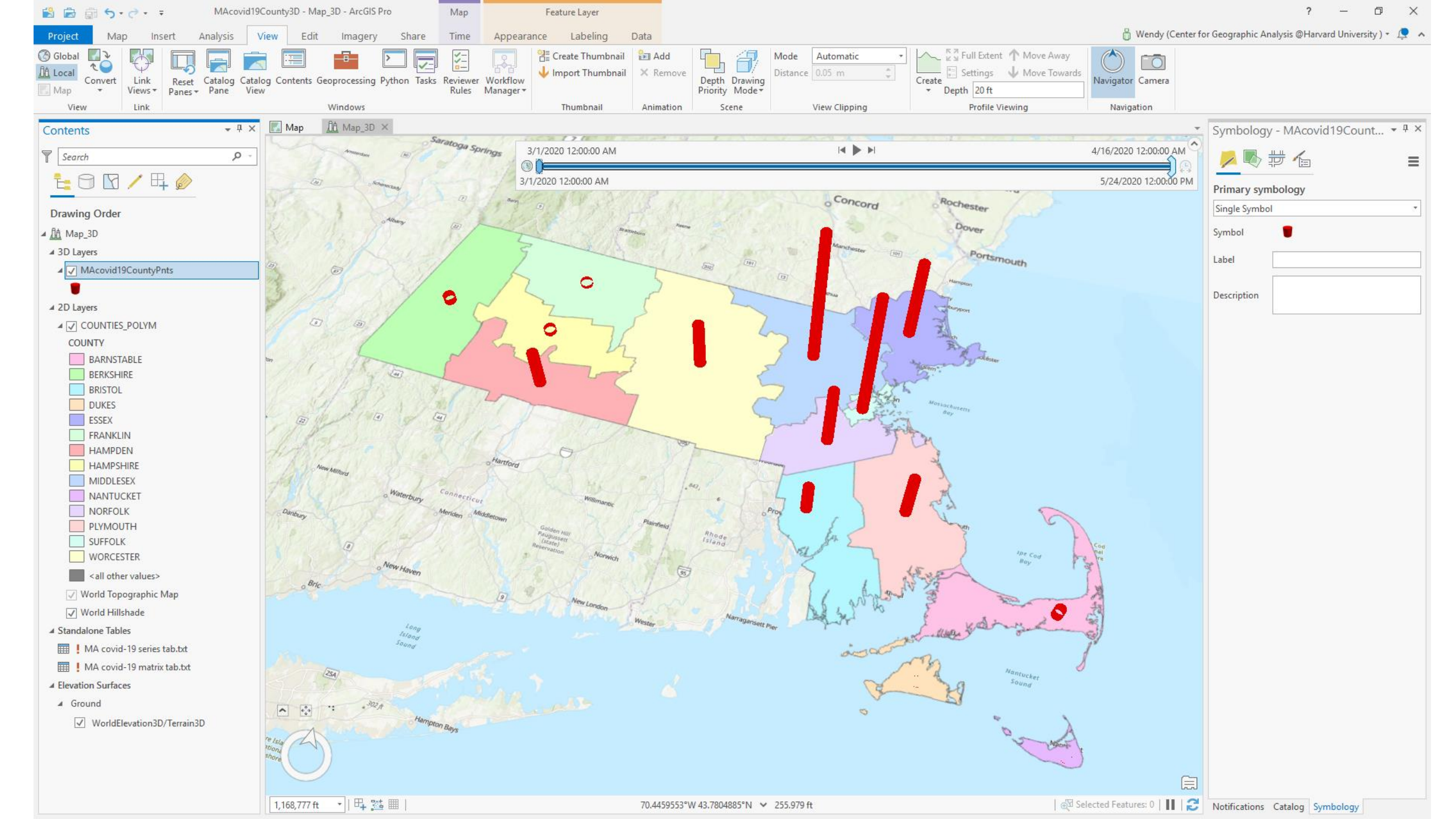
0 of 658 selected | Filters: | 100%

Catalog

Project | Portal | Favorites

Search

- Maps
- Toolboxes
- Databases
- Styles
- Folders
  - MAcovid19County
    - ImportLog
    - Default.gdb
    - Default.tbx
- Locators


MAcovid19County3D - Map_3D - ArcGIS Pro
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Imagery
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Wendy (Center for Geographic Analysis @Harvard University)
Global
Local
Map
Convert
Link Views
Reset Panes
Catalog Pane
Catalog View
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Geoprocessing
Python
Tasks
Reviewer Rules
Workflow Manager
Create Thumbnail
Import Thumbnail
Add
Remove
Depth Priority
Drawing Mode
Mode
Automatic
Distance
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Settings
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Move Towards
Depth
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Profile Viewing
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2D Layers
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BRISTOL
DUKES
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HAMPSHIRE
MIDDLESEX
NANTUCKET
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World Hillshade
Standalone Tables
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MA covid-19 matrix tab.txt
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Ground
WorldElevation3D/Terrain3D
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Map_3D
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4/16/2020 12:00:00 AM
3/1/2020 12:00:00 AM
5/24/2020 12:00:00 PM
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Concord
Rochester
Dover
Portsmouth
Hartford
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New Haven
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Nantucket Sound
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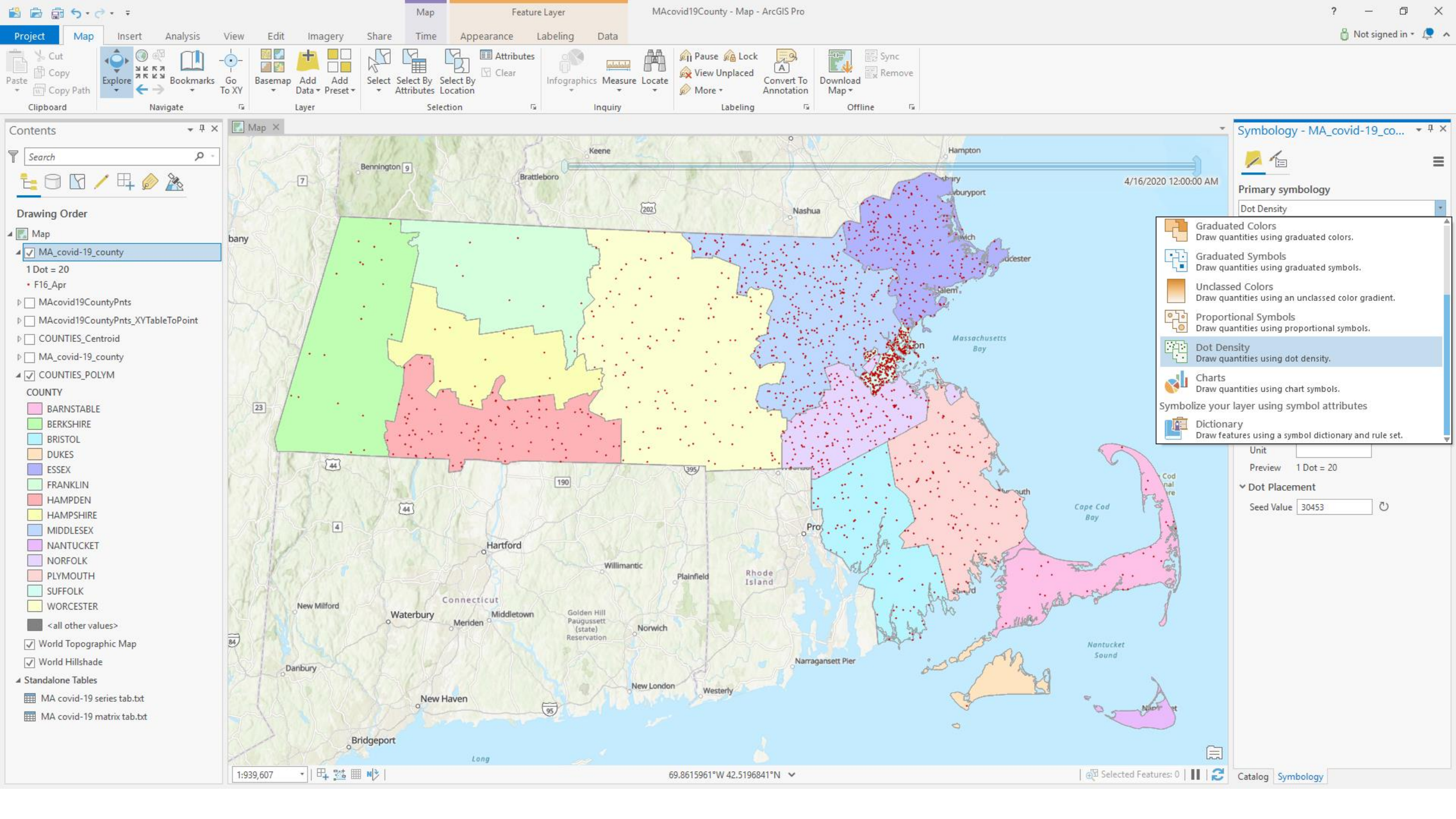
Notifications
Catalog
Symbology


MAcovid19County - Map - ArcGIS Pro
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Convert To Annotation
Labeling
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Search
Drawing Order
Map
MA_covid-19_county
1 Dot = 20
F16_Apr
MAcovid19CountyPnts
MAcovid19CountyPnts_XYTableToPoint
COUNTIES_Centroid
MA_covid-19_county
COUNTIES_POLYM
COUNTY
BARNSTABLE
BERKSHIRE
BRISTOL
DUKES
ESSEX
FRANKLIN
HAMPDEN
HAMPSHIRE
MIDDLESEX
NANTUCKET
NORFOLK
PLYMOUTH
SUFFOLK
WORCESTER
<all other values>
World Topographic Map
World Hillshade
Standalone Tables
MA covid-19 series tab.txt
MA covid-19 matrix tab.txt
Map
4/16/2020 12:00:00 AM
Keene
Hampton
Bennington
Brattleboro
Nashua
Hartford
Willimantic
Plainfield
Rhode Island
Connecticut
New Milford
Waterbury
Meriden
Middletown
Golden Hill Paugussett (state) Reservation
Norwich
Danbury
New Haven
New London
Westerly
Narragansett Pier
Bridgeport
Massachusetts Bay
Cape Cod Bay
Nantucket Sound
Long
1:939,607
69.8615961°W 42.5196841°N
Selected Features: 0
Symbology - MA_covid-19_co...
Primary symbology
Dot Density
Graduated Colors
Draw quantities using graduated colors.
Graduated Symbols
Draw quantities using graduated symbols.
Unclassed Colors
Draw quantities using an unclassed color gradient.
Proportional Symbols
Draw quantities using proportional symbols.
Dot Density
Draw quantities using dot density.
Charts
Draw quantities using chart symbols.
Symbolize your layer using symbol attributes
Dictionary
Draw features using a symbol dictionary and rule set.
Unit
Preview
1 Dot = 20
Dot Placement
Seed Value
30453
Catalog
Symbology

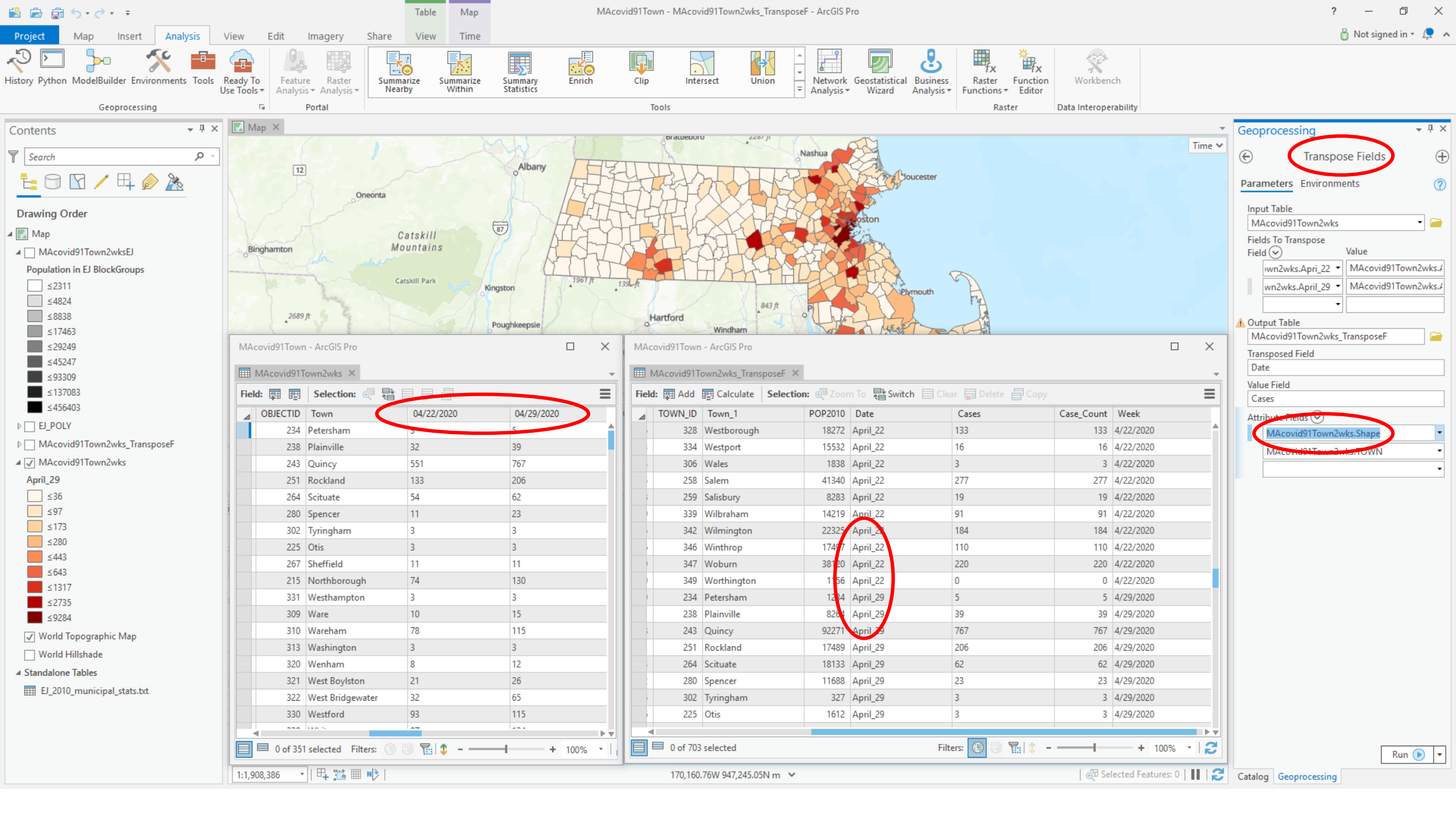
MAcovid91Town - MAcovid91Town2wks_TransposeF - ArcGIS Pro
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Table View
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History
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ModelBuilder
Environments
Tools
Ready To Use Tools
Geoprocessing
Feature Analysis
Raster Analysis
Portal
Summarize Nearby
Summarize Within
Summary Statistics
Enrich
Clip
Intersect
Union
Tools
Network Analysis
Geostatistical Wizard
Business Analysis
Raster Functions
Function Editor
Raster
Workbench
Data Interoperability
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Drawing Order
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Population in EJ BlockGroups
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≤8838
≤17463
≤29249
≤45247
≤93309
≤137083
≤456403
EJ_POLY
MAcovid91Town2wks_TransposeF
MAcovid91Town2wks
April_29
≤36
≤97
≤173
≤280
≤443
≤643
≤1317
≤2735
≤9284
World Topographic Map
World Hillshade
Standalone Tables
EJ_2010_municipal_stats.txt
Map
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Albany
Nashua
Oneonta
Catskill Mountains
Binghamton
Catskill Park
Kingston
Poughkeepsie
Hartford
Windham
Plymouth
MAcovid91Town - ArcGIS Pro
MAcovid91Town2wks
Field: Selection:
OBJECTID Town 04/22/2020 04/29/2020
234 Petersham 5 5
238 Plainville 32 39
243 Quincy 551 767
251 Rockland 133 206
264 Scituate 54 62
280 Spencer 11 23
302 Tyringham 3 3
225 Otis 3 3
267 Sheffield 11 11
215 Northborough 74 130
331 Westhampton 3 3
309 Ware 10 15
310 Wareham 78 115
313 Washington 3 3
320 Wenham 8 12
321 West Boylston 21 26
322 West Bridgewater 32 65
330 Westford 93 115
0 of 351 selected
Filters:
100%
MAcovid91Town - ArcGIS Pro
MAcovid91Town2wks_TransposeF
Field: Add Calculate Selection: Zoom To Switch Clear Delete Copy
TOWN_ID Town_1 POP2010 Date Cases Case_Count Week
328 Westborough 18272 April_22 133 133 4/22/2020
334 Westport 15532 April_22 16 16 4/22/2020
306 Wales 1838 April_22 3 3 4/22/2020
258 Salem 41340 April_22 277 277 4/22/2020
259 Salisbury 8283 April_22 19 19 4/22/2020
339 Wilbraham 14219 April_22 91 91 4/22/2020
342 Wilmington 22325 April_22 184 184 4/22/2020
346 Winthrop 17427 April_22 110 110 4/22/2020
347 Woburn 38120 April_22 220 220 4/22/2020
349 Worthington 1156 April_22 0 0 4/22/2020
234 Petersham 1234 April_29 5 5 4/29/2020
238 Plainville 8264 April_29 39 39 4/29/2020
243 Quincy 92271 April_29 767 767 4/29/2020
251 Rockland 17489 April_29 206 206 4/29/2020
264 Scituate 18133 April_29 62 62 4/29/2020
280 Spencer 11688 April_29 23 23 4/29/2020
302 Tyringham 327 April_29 3 3 4/29/2020
225 Otis 1612 April_29 3 3 4/29/2020
0 of 703 selected
Filters:
100%
Geoprocessing
Transpose Fields
Parameters
Environments
Input Table
MAcovid91Town2wks
Fields To Transpose
Field
Value
MAcovid91Town2wks.Apri_22
MAcovid91Town2wks.April_29
Output Table
MAcovid91Town2wks_TransposeF
Transposed Field
Date
Value Field
Cases
Attribute Fields
MAcovid91Town2wks.Shape
Run
1:1,908,386
170,160.76W 947,245.05N m
Selected Features: 0
Catalog
Geoprocessing

Section 3 Summary and Discussion

- There are many ways to visualize data in space and time
  - Choropleth vs. other types of symbology
  - 2D vs 3D
  - Time animation on map
  - Time chart as feature symbols

  Select the most appropriate way by the purpose of communication
- How time is managed in spatial data
  - Each time step as an attribute field (column)
  - Each time step as a value in the Time field (row)
  - Each time step as a separate layer (raster)
- Tips and tricks when working with time
  - Data type definitions
  - Directions of table join
  - Including Shape when Transpose

Section 4. Beyond visualization: understanding COVID-19 with spatial analysis

空间疫情数据解读

Wendy Guan

HEALTH

The other COVID-19 risk factors: How race, income, ZIP code can influence life and death

Liz Szabo and Hannah Recht Kaiser Health News

Published 4:43 p.m. ET Apr. 22, 2020 | **Updated 2:29 p.m. ET Apr. 25, 2020**

USA TODAY

Apr 4, 2020 - Health

Coronavirus hits poor, minority communities harder

Sam Baker, Alison Snyder

AXIOS

HEALTH • COVID-19

TIME

These Graphs Show How COVID-19 Is Ravaging New York City's Low-Income Neighborhoods

COVID-19 is hitting black and poor communities the hardest, underscoring fault lines in access and care for those on margins

April 9, 2020 8.10am EDT

THE CONVERSATION

Academic rigor, journalistic flair

Census Data Sources: Massachusetts State

Environmental Justice Communities in Massachusetts

Environmental Justice (EJ) Population Data from 2010 Census based upon demographic criteria developed by the Massachusetts Executive Office of Energy and Environmental Affairs.

TABLE OF CONTENTS

- What is an Environmental Justice Community?
- Interactive Map
- Downloadable Maps & Files
- ArcGIS Files & Spreadsheets
- Related

What is an Environmental Justice Community?

In Massachusetts a community is identified as an Environmental Justice community if any of the following are true:

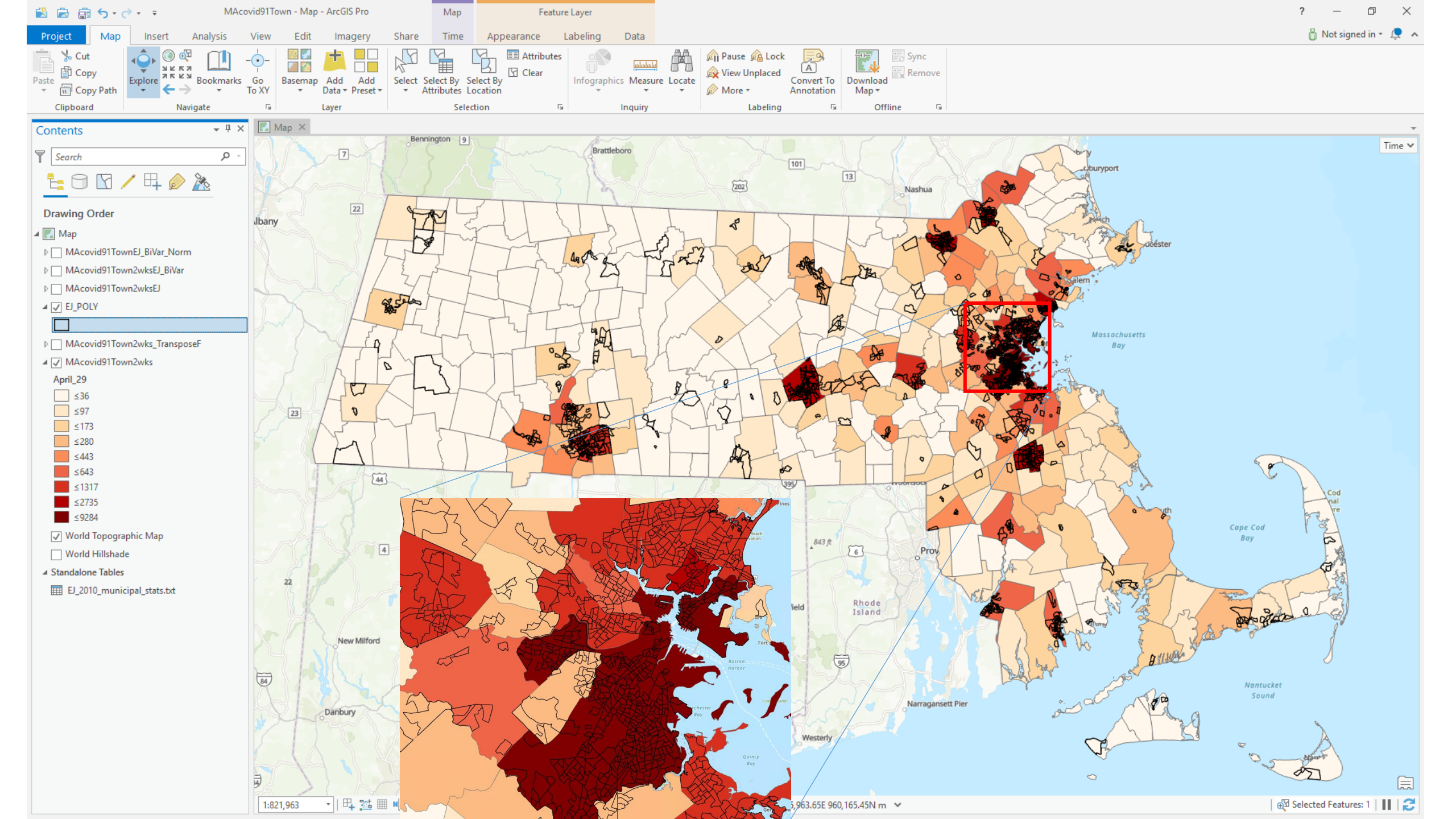
- Block group whose annual median household income is equal to or less than 65 percent of the statewide median ($62,072 in 2010); or
- 25% or more of the residents identify as a race other than white; or
- 25% or more of households have no one over the age of 14 who speaks English only or very well - English Isolation

RELATED

Environmental Justice Contacts →

Feedback

https://www.mass.gov/info-details/environmental-justice-communities-in-massachusetts


MAcovid91Town - Map - ArcGIS Pro
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Clipboard
Explore
Bookmarks
Go To XY
Navigate
Basemap
Add Data
Add Preset
Layer
Select
Select By Attributes
Select By Location
Attributes
Clear
Selection
Infographics
Measure
Locate
Inquiry
Pause
Lock
View Unplaced
More
Convert To Annotation
Labeling
Download Map
Sync
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MAcovid91Town2wksEJ
EJ_POLY
MAcovid91Town2wks_TransposeF
MAcovid91Town2wks
April_29
≤36
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≤2735
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World Topographic Map
World Hillshade
Standalone Tables
EJ_2010_municipal_stats.txt
Map
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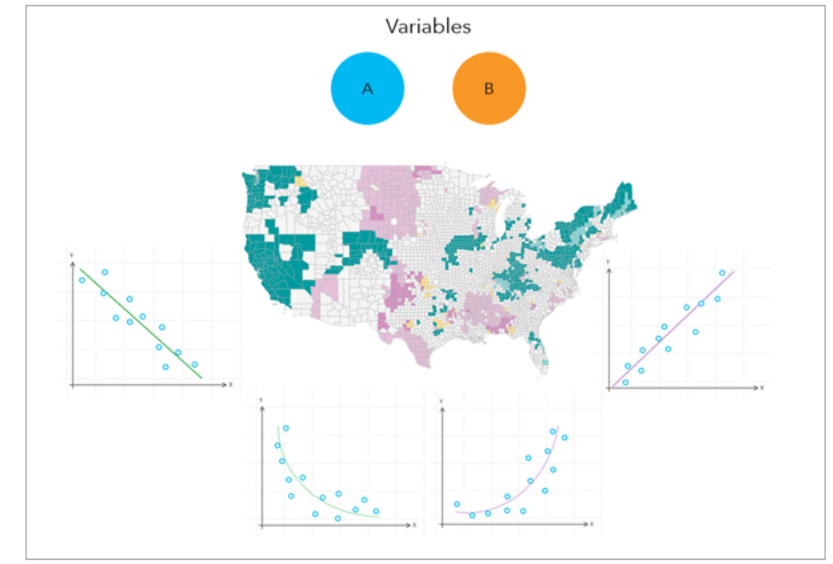
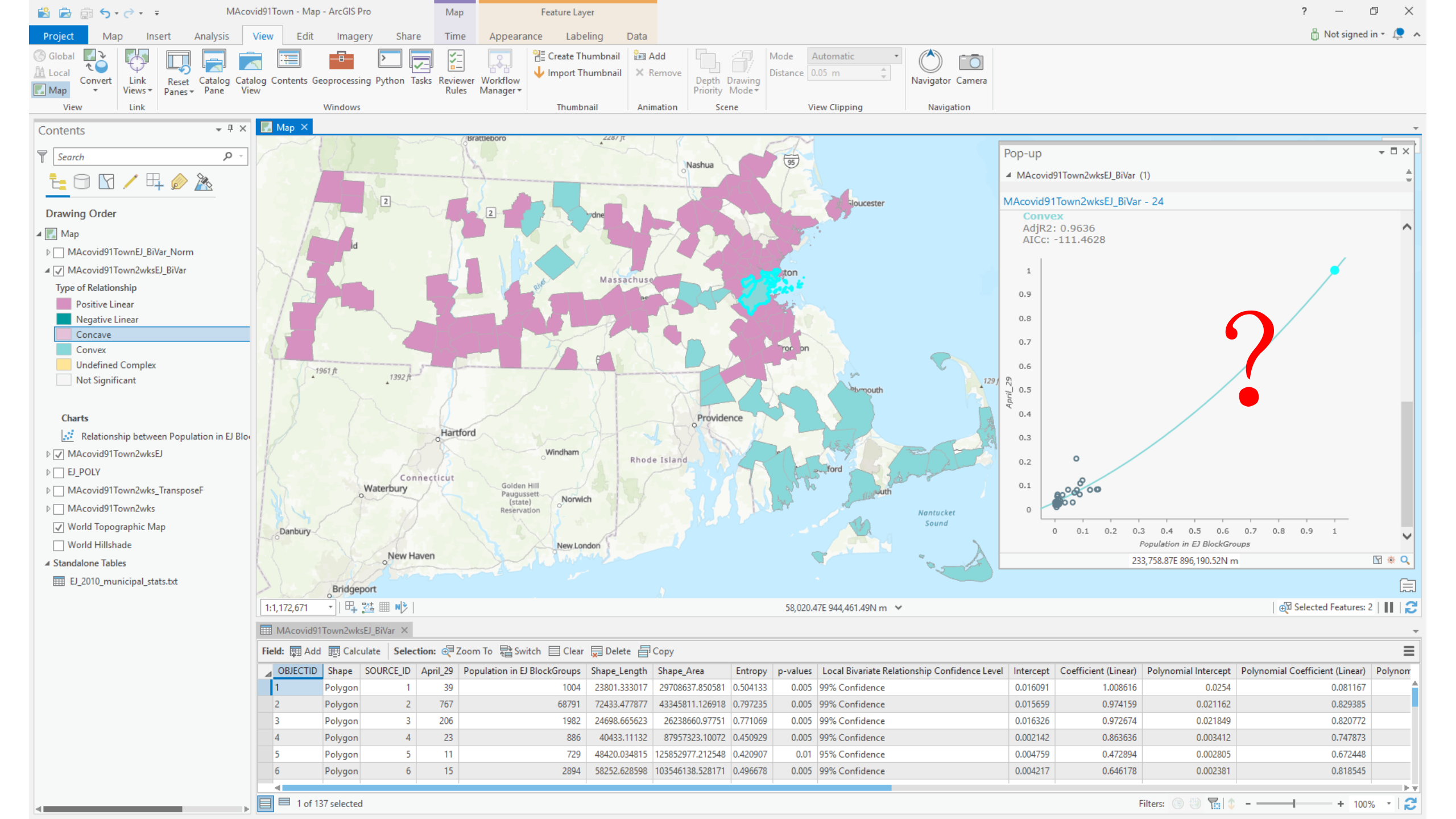
Bennington
Brattleboro
Nashua
Albany
Massachusetts Bay
Cape Cod Bay
Nantucket Sound
Rhode Island
Providence
New Milford
Danbury
Narragansett Pier
Westerly
Boston Harbor
Quincy Bay
1:821,963
Selected Features: 1

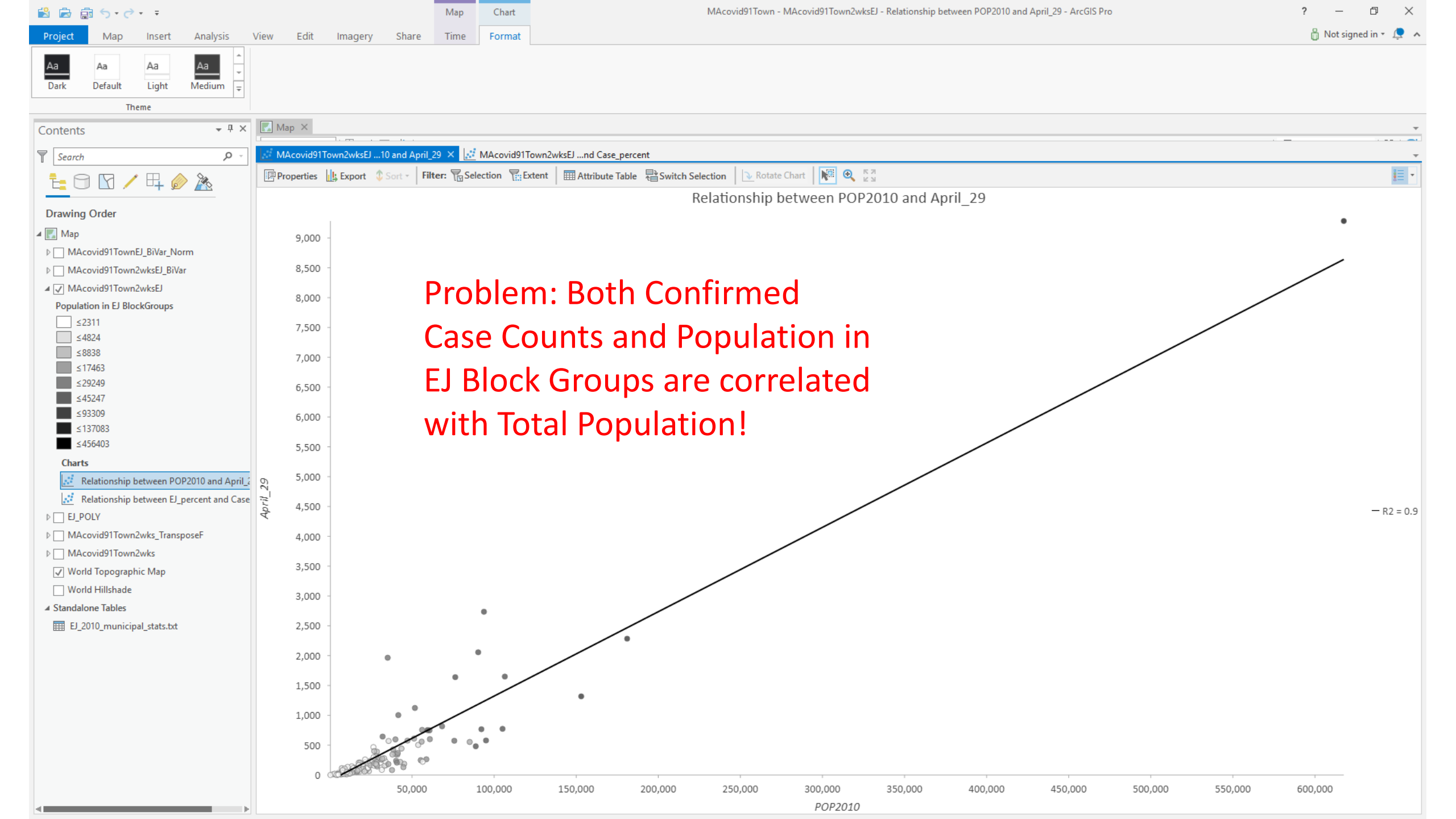
Local Bivariate Relationship between Confirmed Cases on April 29th and Population in EJ Block Groups



https://pro.arcgis.com/en/pro-app/tool-reference/spatial-statistics/learnmore-localbivariaterelationships.htm



OBJECTID	Shape	SOURCE_ID	April_29	Population in EJ BlockGroups	Shape_Length	Shape_Area	Entropy	p-values	Local Bivariate Relationship Confidence Level	Intercept	Coefficient (Linear)	Polynomial Intercept	Polynomial Coefficient (Linear)	Polynom
1	Polygon	1	39	1004	23801.333017	29708637.850581	0.504133	0.005	99% Confidence	0.016091	1.008616	0.0254	0.081167	
2	Polygon	2	767	68791	72433.477877	43345811.126918	0.797235	0.005	99% Confidence	0.015659	0.974159	0.021162	0.829385	
3	Polygon	3	206	1982	24698.665623	26238660.97751	0.771069	0.005	99% Confidence	0.016326	0.972674	0.021849	0.820772	
4	Polygon	4	23	886	40433.11132	87957323.10072	0.450929	0.005	99% Confidence	0.002142	0.863636	0.003412	0.747873	
5	Polygon	5	11	729	48420.034815	125852977.212548	0.420907	0.01	95% Confidence	0.004759	0.472894	0.002805	0.672448	
6	Polygon	6	15	2894	58252.628598	103546138.528171	0.496678	0.005	99% Confidence	0.004217	0.646178	0.002381	0.818545	


MAcovid91Town - MAcovid91Town2wksEJ - Relationship between POP2010 and April_29 - ArcGIS Pro
Project
Map
Insert
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Default
Light
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Contents
Search
Drawing Order
Map
MAcovid91TownEJ_BiVar_Norm
MAcovid91Town2wksEJ_BiVar
MAcovid91Town2wksEJ
Population in EJ BlockGroups
≤2311
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≤456403
Charts
Relationship between POP2010 and April_2
Relationship between EJ_percent and Case
EJ_POLY
MAcovid91Town2wks_TransposeF
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World Topographic Map
World Hillshade
Standalone Tables
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MAcovid91Town2wksEJ ...nd Case_percent
Properties
Export
Sort
Filter:
Selection
Extent
Attribute Table
Switch Selection
Rotate Chart
Relationship between POP2010 and April_29
Problem: Both Confirmed
Case Counts and Population in
EJ Block Groups are correlated
with Total Population!
April_29
POP2010
R2 = 0.9
9,000
8,500
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
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2,000
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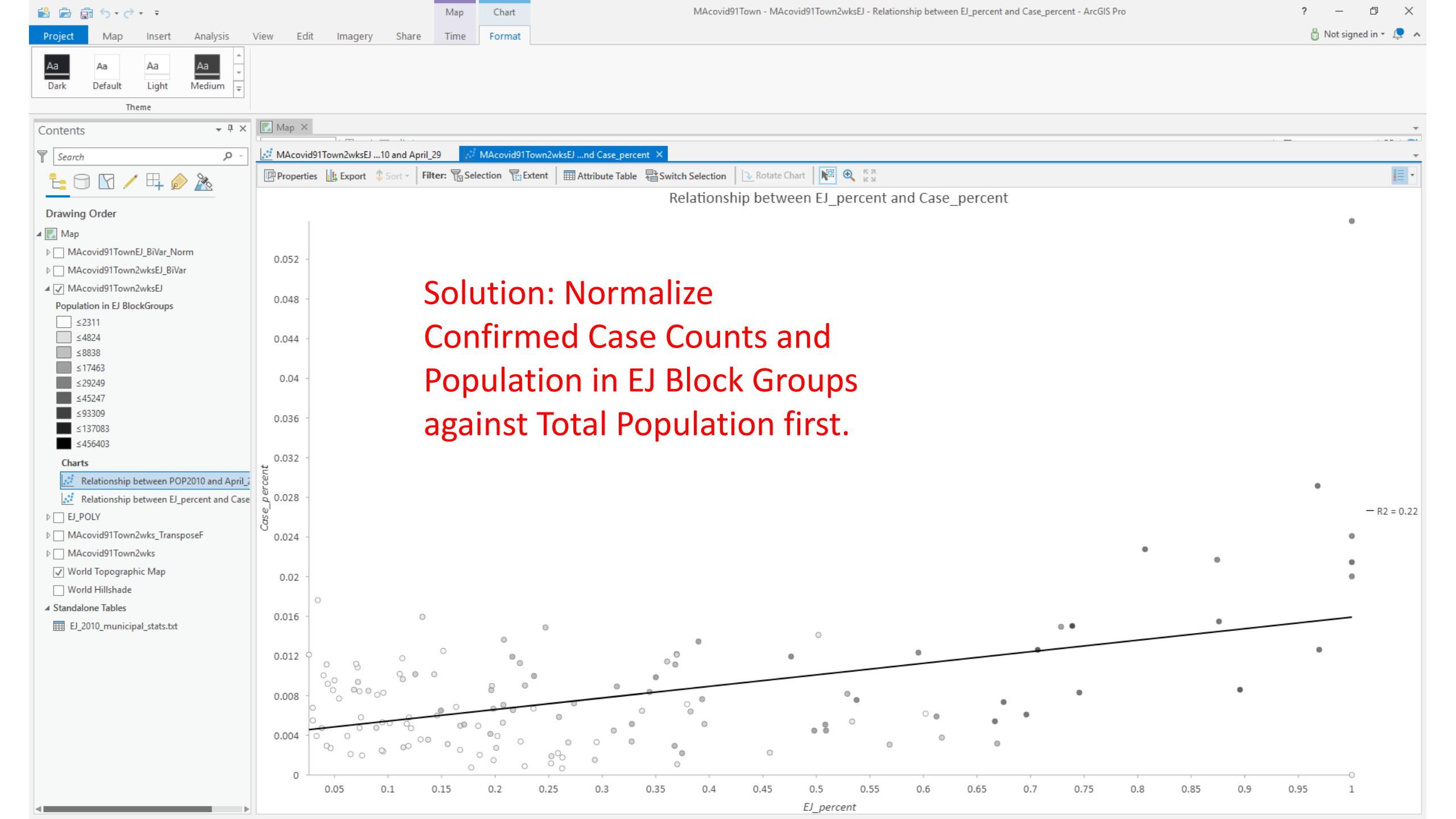
600,000


MAcovid91Town - MAcovid91Town2wksEJ - Relationship between EJ_percent and Case_percent - ArcGIS Pro
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Properties
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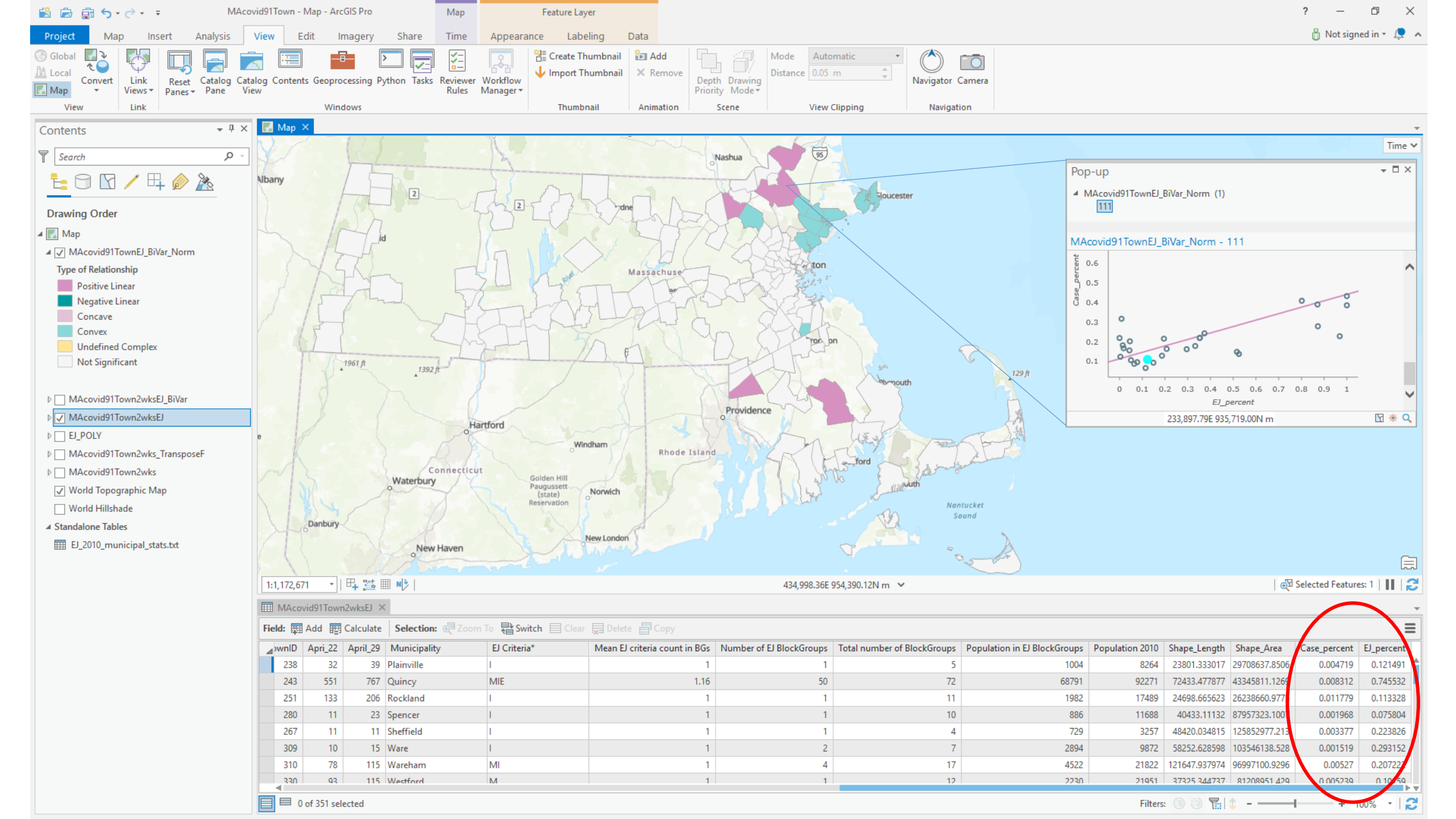
Rotate Chart
Relationship between EJ_percent and Case_percent
Solution: Normalize
Confirmed Case Counts and
Population in EJ Block Groups
against Total Population first.
Case_percent
0.052
0.048
0.044
0.04
0.036
0.032
0.028
0.024
0.02
0.016
0.012
0.008
0.004
0
R2 = 0.22
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
EJ_percent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Workflow Manager
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Navigation
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Type of Relationship
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Standalone Tables
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MAcovid91TownEJ_BiVar_Norm - 111
Case_percent
EJ_percent
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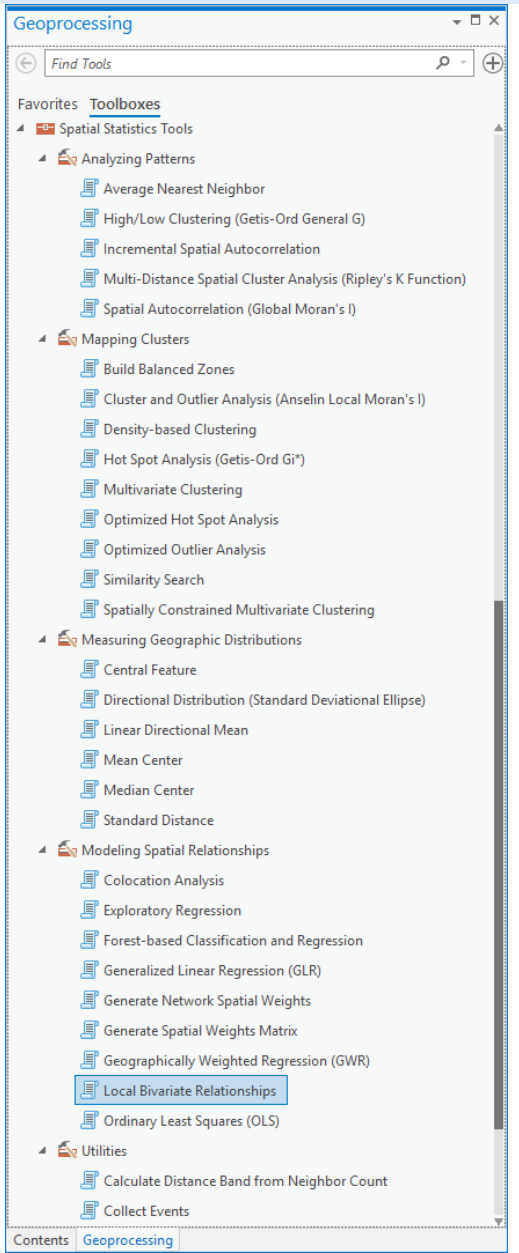
Albany
Massachusetts
Providence
Rhode Island
Hartford
Windham
Connecticut
Waterbury
Golden Hill Paugussett (state) Reservation
Norwich
Danbury
New Haven
New London
Nantucket Sound
1961 ft
1392 ft
129 ft
1:1,172,671
434,998.36E 954,390.12N m
Selected Features: 1
MAcovid91Town2wksEJ
Field: Add Calculate
Selection: Zoom To Switch Clear Delete Copy
townID | Apri_22 | April_29 | Municipality | EJ Criteria* | Mean EJ criteria count in BGs | Number of EJ BlockGroups | Total number of BlockGroups | Population in EJ BlockGroups | Population 2010 | Shape_Length | Shape_Area | Case_percent | EJ_percent
238 | 32 | 39 | Plainville | I | 1 | 1 | 5 | 1004 | 8264 | 23801.333017 | 29708637.8506 | 0.004719 | 0.121491
243 | 551 | 767 | Quincy | MIE | 1.16 | 50 | 72 | 68791 | 92271 | 72433.477877 | 43345811.1269 | 0.008312 | 0.745532
251 | 133 | 206 | Rockland | I | 1 | 1 | 11 | 1982 | 17489 | 24698.665623 | 26238660.977 | 0.011779 | 0.113328
280 | 11 | 23 | Spencer | I | 1 | 1 | 10 | 886 | 11688 | 40433.11132 | 87957323.1001 | 0.001968 | 0.075804
267 | 11 | 11 | Sheffield | I | 1 | 1 | 4 | 729 | 3257 | 48420.034815 | 125852977.213 | 0.003377 | 0.223826
309 | 10 | 15 | Ware | I | 1 | 2 | 7 | 2894 | 9872 | 58252.628598 | 103546138.528 | 0.001519 | 0.293152
310 | 78 | 115 | Wareham | MI | 1 | 4 | 17 | 4522 | 21822 | 121647.937974 | 96997100.9296 | 0.00527 | 0.207223
330 | 93 | 115 | Westford | M | 1 | 1 | 12 | 2230 | 21951 | 37325.344737 | 81208951.429 | 0.005239 | 0.10459
0 of 351 selected
Filters:

Understanding the Findings and Limitations

- Positive correlation between COVID-19 confirmed case count and Environmental Justice Community population in some towns in Massachusetts.
- Both variables are normalized against total population.
- The case count is up to April 29th, 2020.
- The correlation is only significant in some towns in eastern Massachusetts. These towns are outside of the Boston metropolitan but close to it, on the I-495 beltway.
- Further analysis is needed to understand why. One hypothesis is that it may depend on the stage in the outbreak, assuming the disease is transmitted from Boston outward.

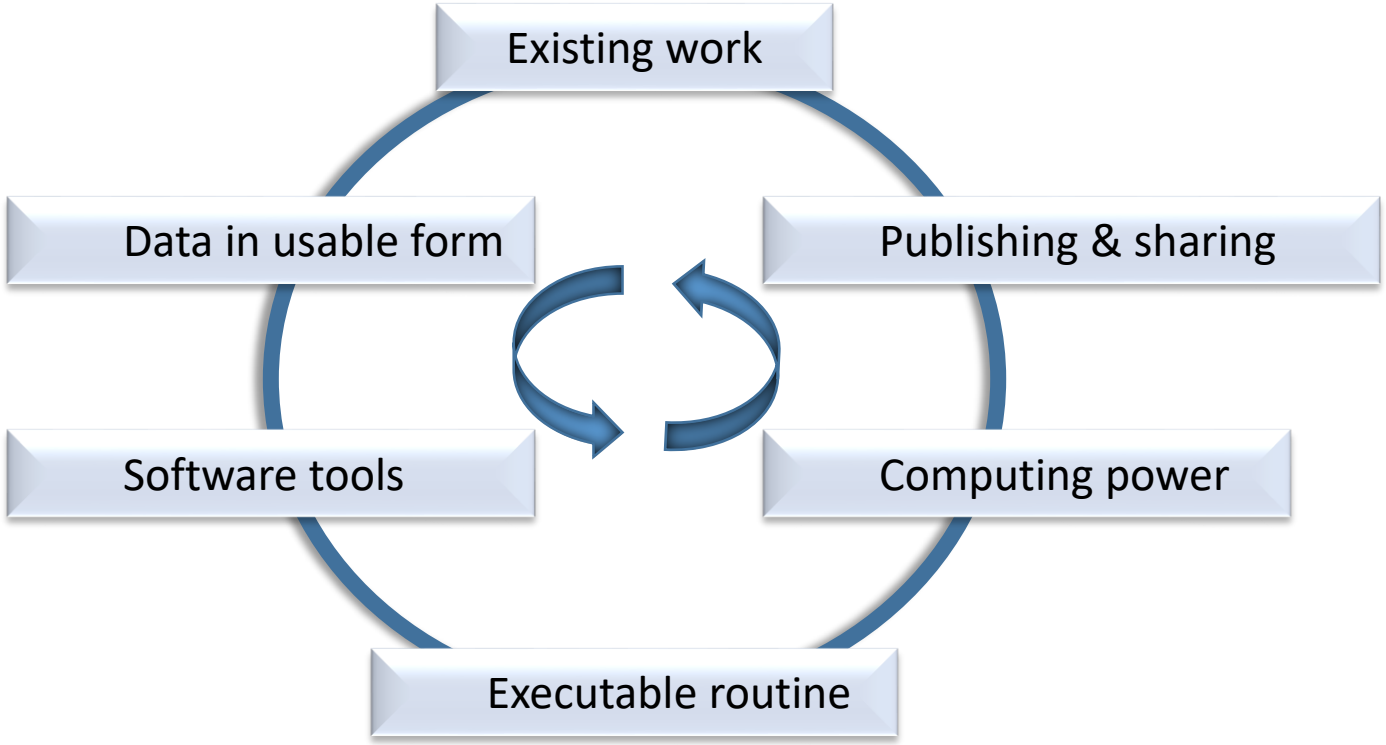
Common Issues in Spatial Statistical Analysis

- Dependency among variables
  - Normalization
  - Spatial autocorrelation
- Data exploration vs. prediction
  - Bi-variation vs. Regression
  - Correlation vs. Causation
- Missing variables, e.g.
  - Public transportation density
  - Building density
  - Multi-unit vs. single-unit residential condition
- The time factor
  - Space as proxy for time, e.g. distance to Boston International Airport
  - Modified start time, e.g. first day when a variable reaches a threshold



Section 4 Summary and Discussion

- Essential resources for spatial data visualization and analysis research



- The Spatial Data Lab (CDL) provides such resources in an integrated platform to speed up research (https://projects.iq.harvard.edu/chinadatalab/resources-covid-19)

Acknowledgement

This presentation included contributions from the Coronavirus Visualization Team – a global group of students producing visualizations and datasets on the COVID-19 Pandemic (https://scholar.harvard.edu/cvt/about).

In particular:

- **Akhil Kumar** contributed to the gathering and formatting of MA infection cases data for mapping in ArcGIS Pro;
- **Viraj Kacker** and **Scott Blender** contributed to the gathering and reviewing of online COVID-19 visualization websites;
- **Jerry Sun**, **Asad Yamin** and **Anurag Koyyada** contributed to the gathering and reviewing of published papers on COVID-19 related geospatial analysis;
- **Lucas Chu** contributed to the coordination of the collaboration.

致谢/Acknowledgement

Geocomputation Center for Social Sciences, Wuhan University
武汉大学社会地理计算中心

Center for Geographic Analysis, Harvard University
哈佛大学地理分析中心

RMDS Lab 研究方法与数据科学实验室

China Data Institute 中国数据研究所

Amazon.com, Inc 亚马逊

MicroSoft China 微软中国

Vesystem Inc.和信创天科技有限公司

Knowledge Sharing Inc.百智享科技有限公司

All China Marketing Research Inc. 华通人市场研究有限公司

联系方式/Contact

Resources for Coronavirus Study

http://chinadatalab.net

The Cloud for COVID-19 Study

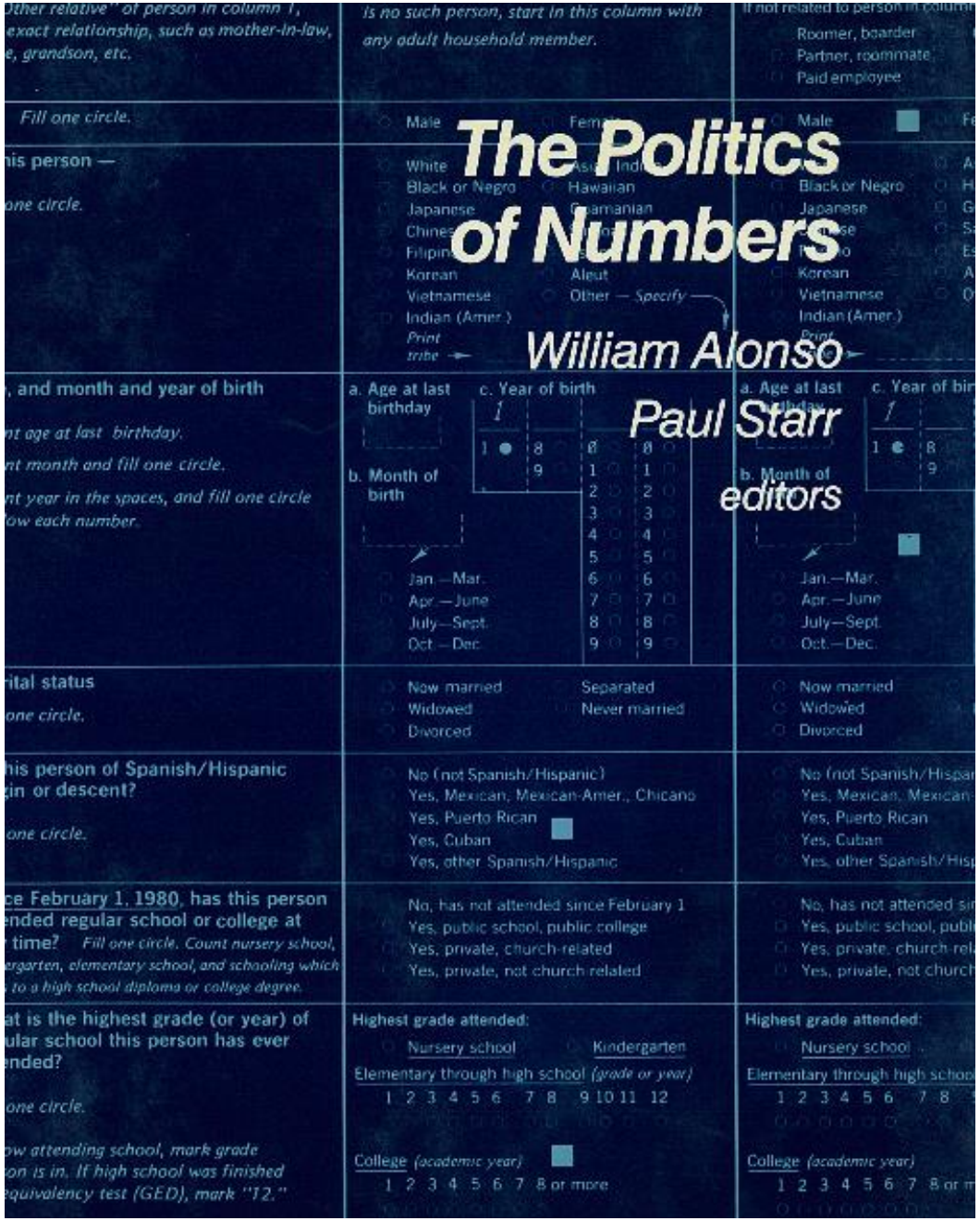
Http://chinadatalab.org

spatialdatalab@lists.fas.harvard.edu

点评人：隋殿志，阿肯色大学研究副校长、地理科学系杰出教授

Two questions for discussion

- Let’s pay more attention to data quality and validity;
- Let’s read and interpret all maps with a healthy level of skepticism



The Politics of Numbers

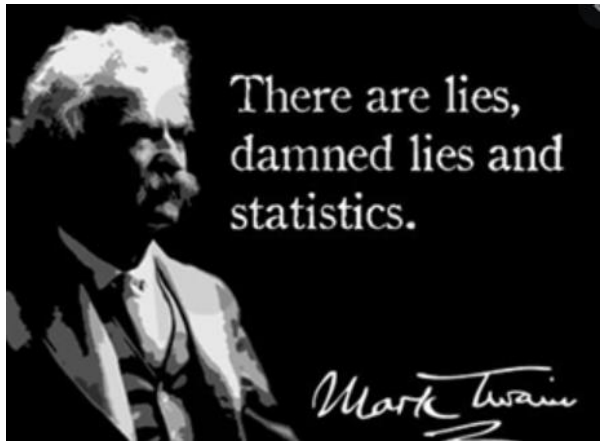
William Alonso

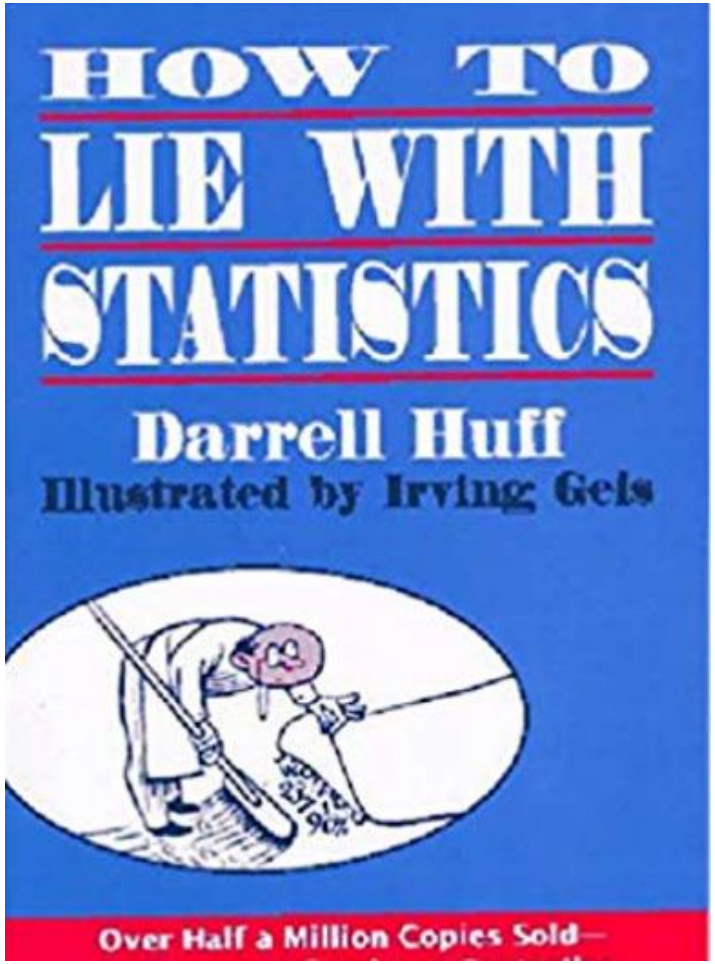
Paul Starr

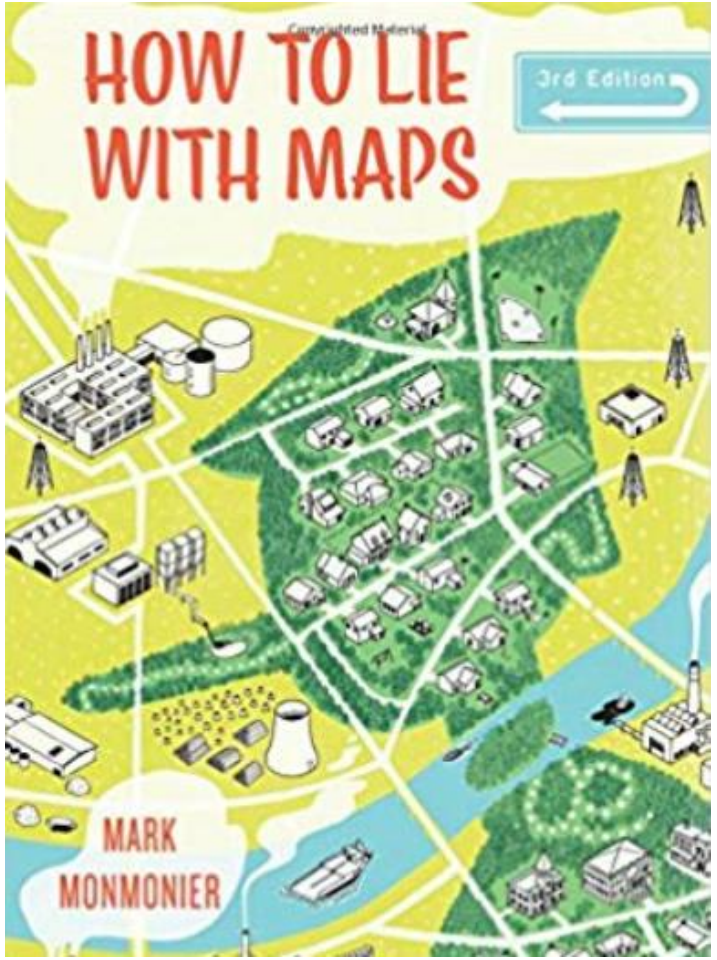
editors

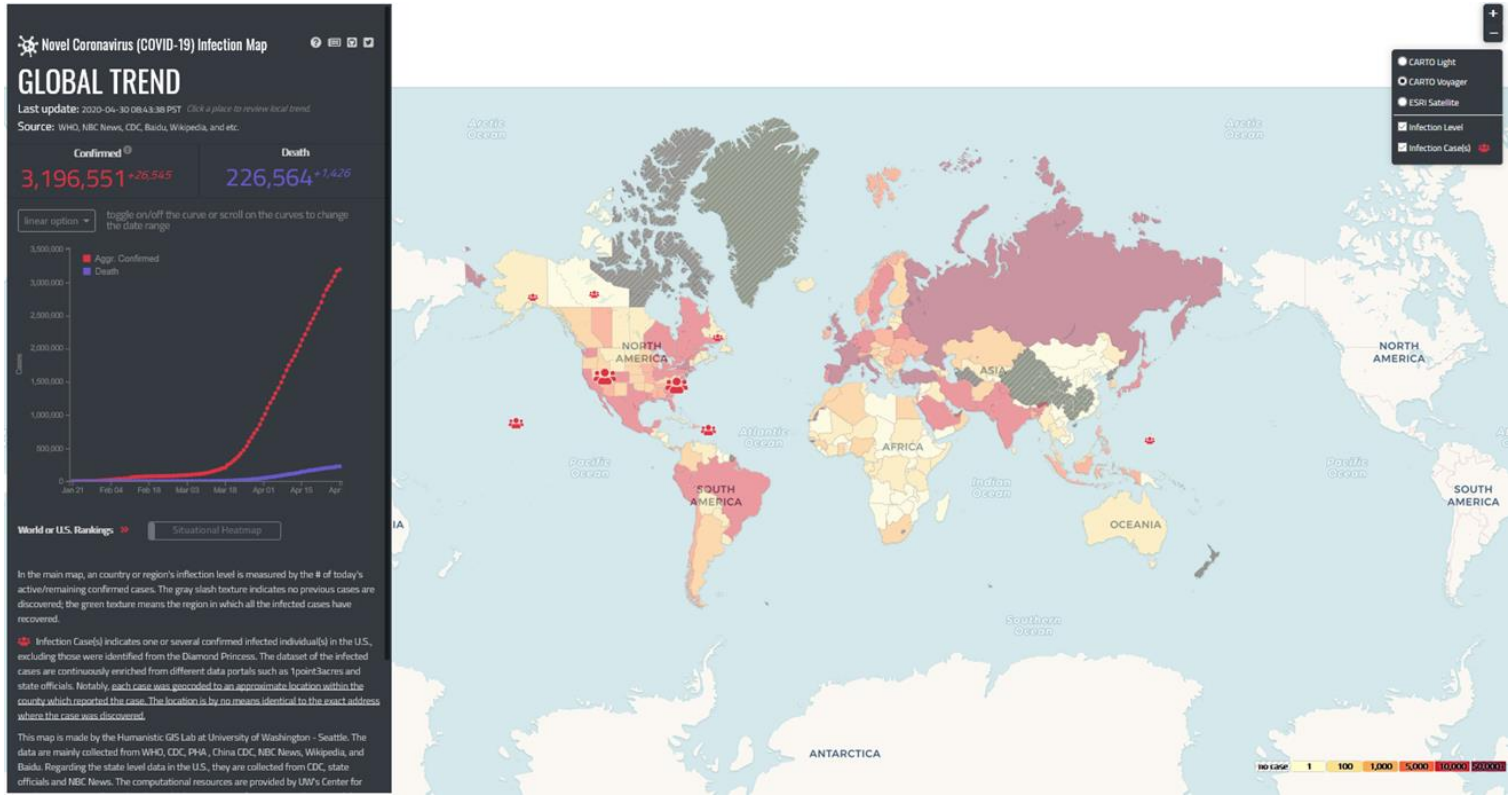
How Accurate Are COVID-19 Tests? Many Factors Can Affect Sensitivity, Specificity of Test Results

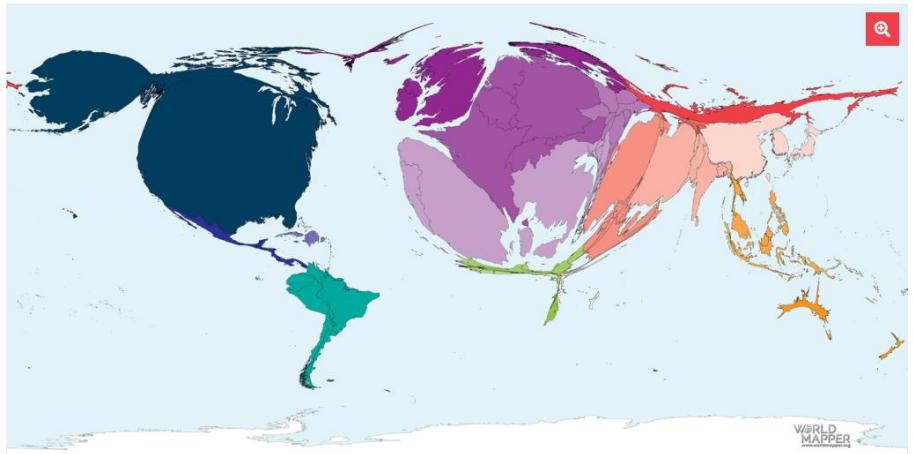
How to read/interpret maps?



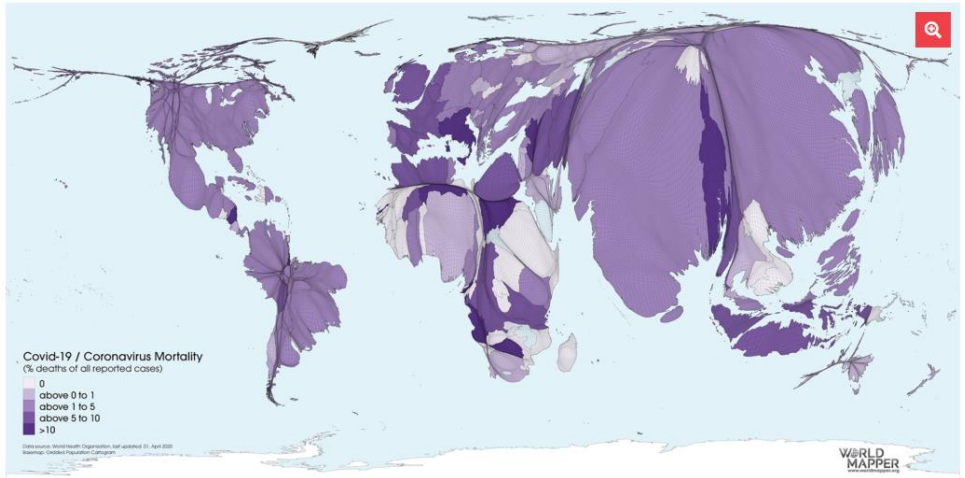








Accumulated Coronavirus cases as of 23 April 2020



Coronavirus mortality (% deaths per reported cases) as of 01.04.2020

WORLD MAPPER

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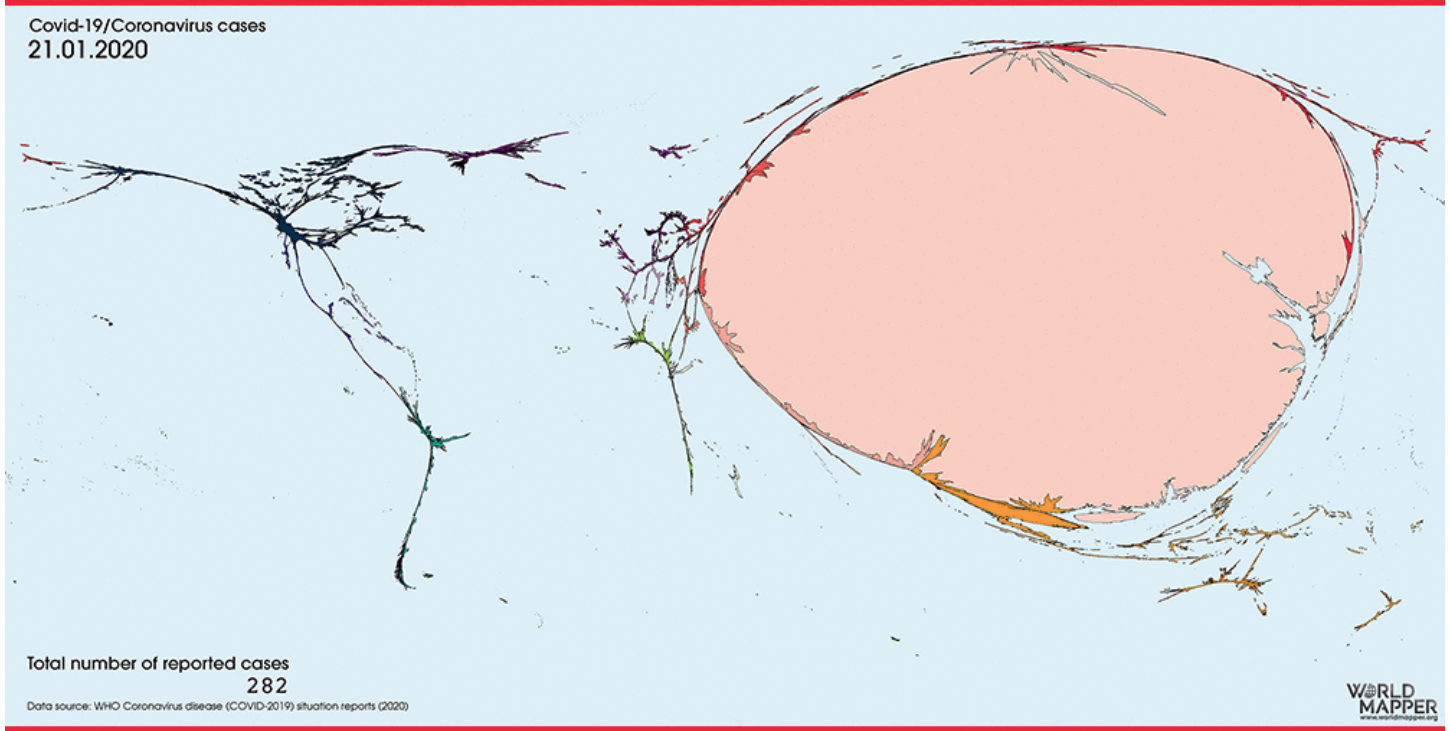

Covid-19/Coronavirus cases

Change over time

Find out more at http://wrld.at/covid19ani

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