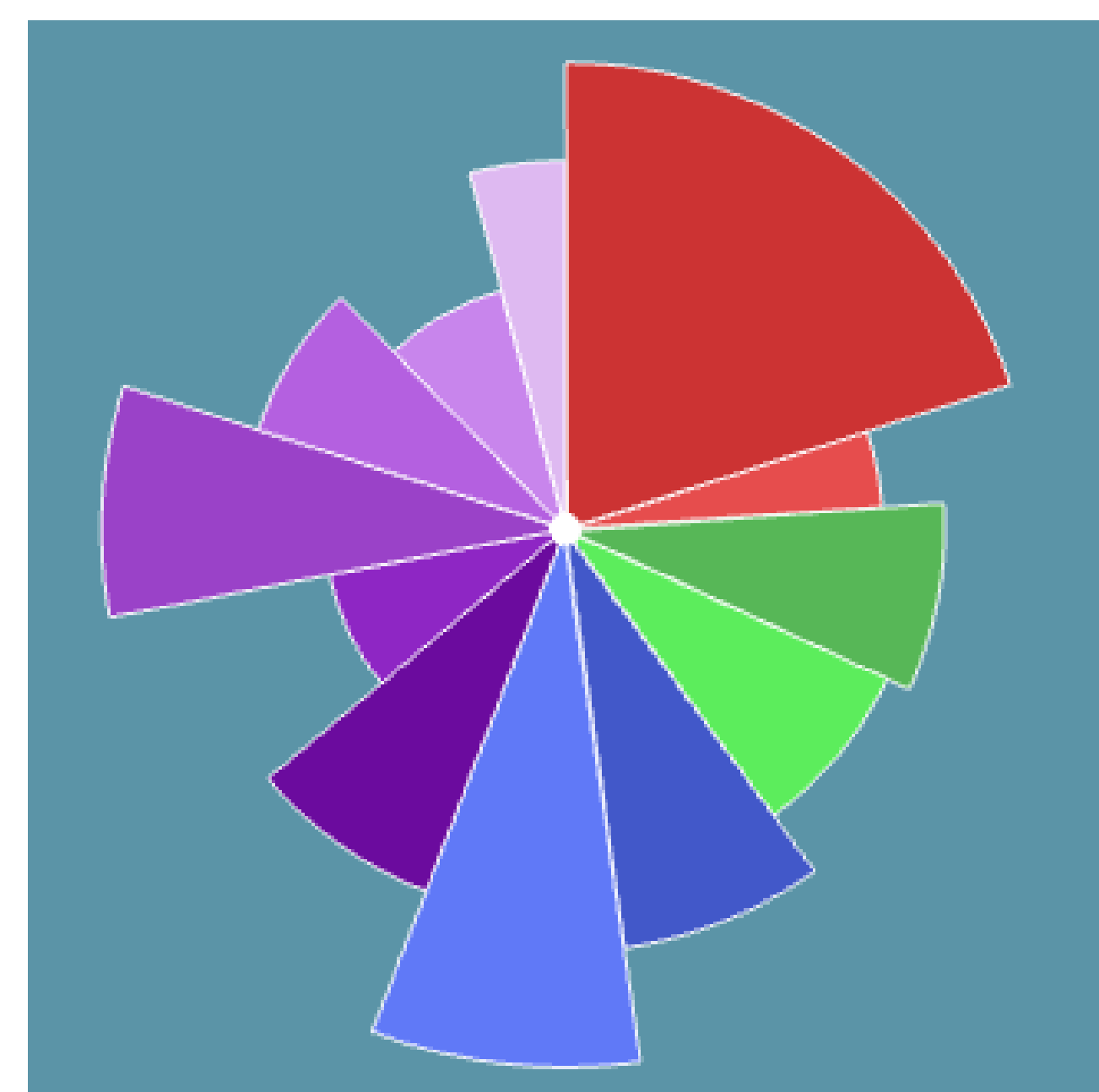


ToxPi*GIS

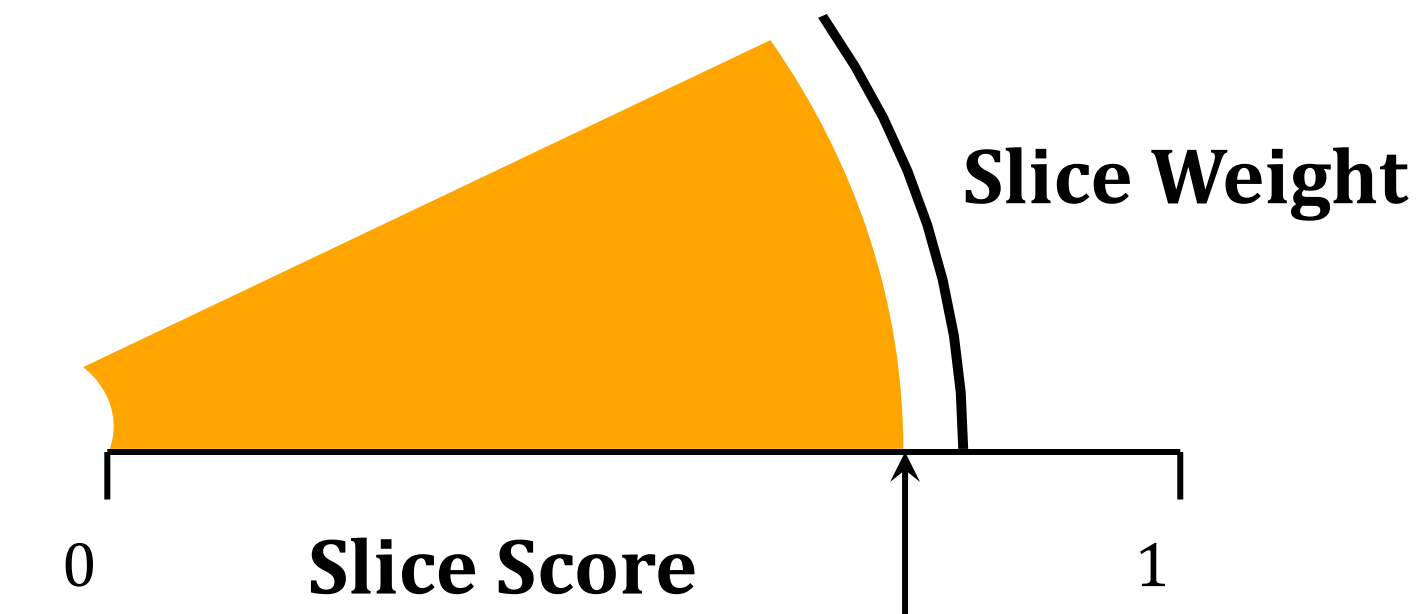
Abstract

Painting a comprehensive picture of place-based, geographic data comprised of multiple factors is an inherently integrative undertaking. Furthermore, the visualization of this data in an interactive form is essential for public sharing and geographic analysis. This integration is made available via the ToxPi model, which determines slice scores for different factors affecting the geographic data, and interactive geographic mapping is possible through ArcGIS; however, production of ToxPi figures in ArcGIS maps is not available. We propose a method for drawing these interactive ToxPi figures in ArcGIS, as well as a pipeline for map sharing consisting of the ToxPi GUI for data integration, a custom python script for automated map layer production, and ArcGIS for map sharing. Although this method will require ArcGIS for map production, it does not require the user to have previous knowledge of ArcGIS software, as the usual manual steps for map production have been automated by the python script. This widens the user-base to anyone with access to ArcGIS Pro licensing. Furthermore, map viewing and interaction is easily accessible to the general public via a web url. We illustrate this process with an example using current Covid-19 data to determine risk factors of counties across the United States. The script and its use instructions are available at <https://github.com/Jonathon-Fleming/ToxPi-GIS>, and the ToxPi GUI is available at <https://toxpi.org/>.

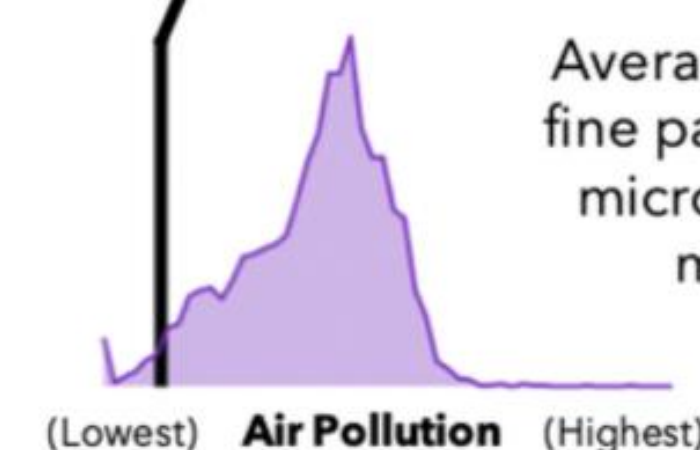
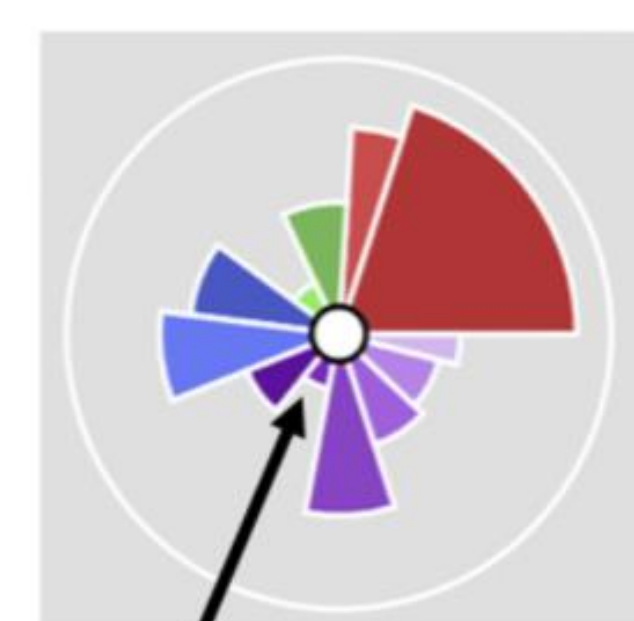
Toxicological Priority Index (ToxPi)



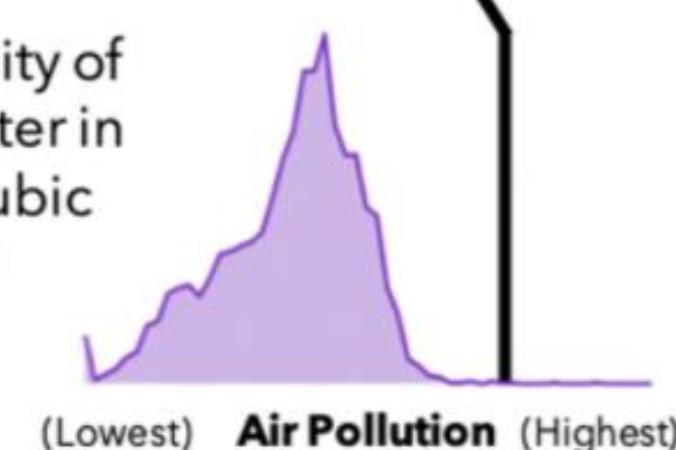
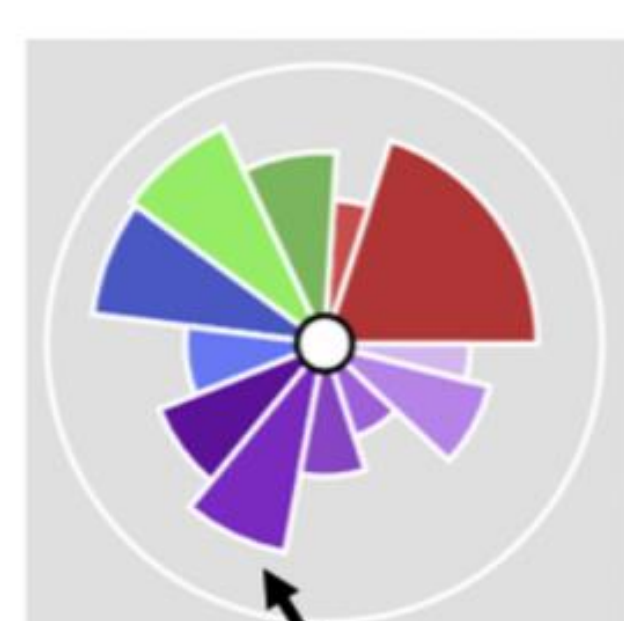
General Slice Information



Air Pollution is a relatively **low** risk for "County X"



Air Pollution is a relatively **high** risk for "County Y"

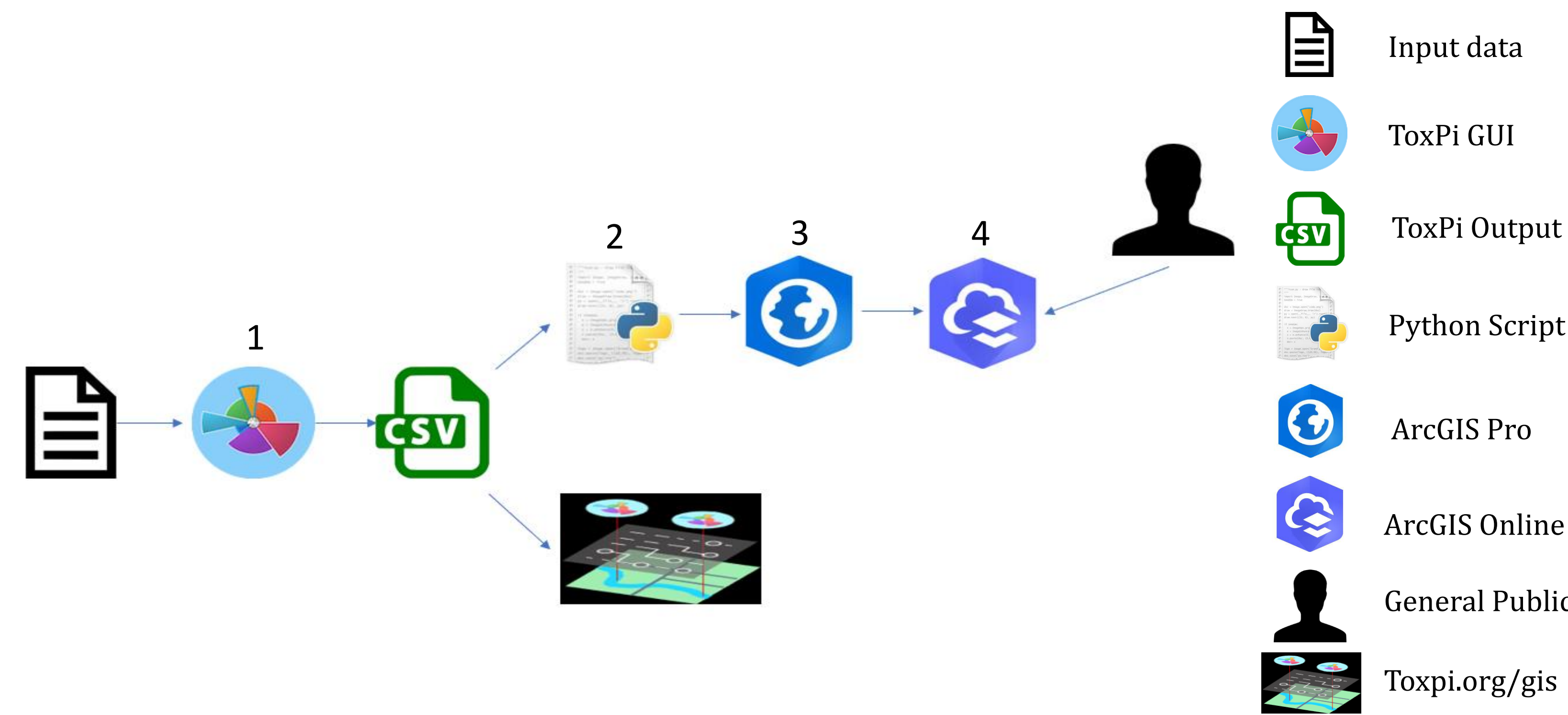


Production of ToxPi Geospatial Feature Layers for an Interactive Visual Analytic

Jonathon Fleming¹, Skylar Marvel¹, David Reif¹

¹North Carolina State University, Raleigh, NC

Geospatial Integration Pipeline



1. Download and use ToxPi GUI from toxpi.org
2. Download and run python script from github.com/Jonathon-Fleming/ToxPi-GIS

Input:

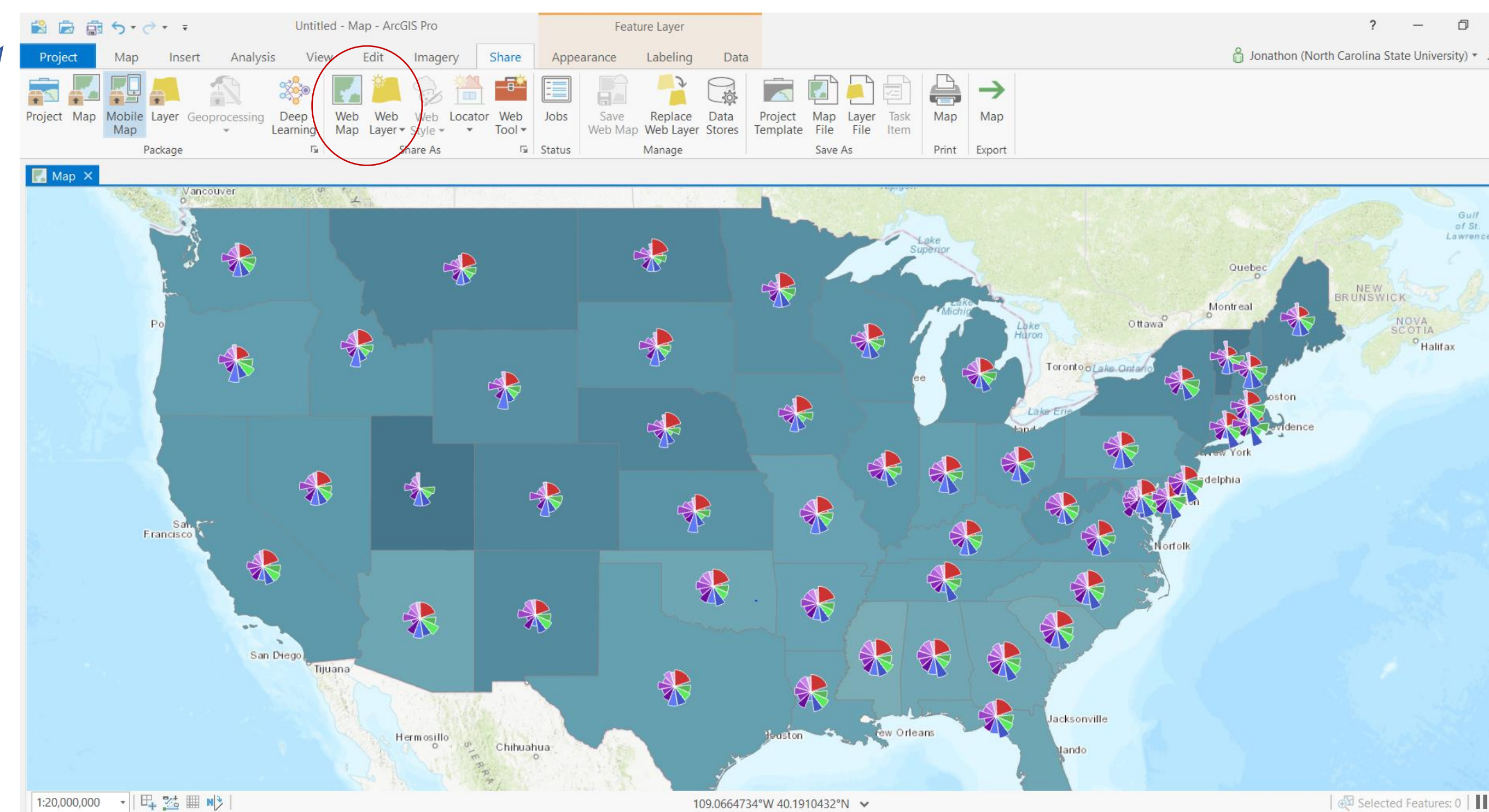
```
Microsoft Windows [Version 10.0.18363.1379]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\Jonathon>"%PROGRAMFILES%\ArcGIS\Pro\bin\Python\Scripts\proenv"
(arcgispro-py3) C:\Users\Jonathon>python ToxPi_Model.py location\inputdata.csv location\outputdata.lyrx
```

Output:

Name	Date modified	Type	Size
ToxPiAuto.gdb	3/3/2021 3:49 PM	File folder	
CountyCovid.lyrx	3/2/2021 2:54 PM	ArcGIS Pro Layer File	237 KB

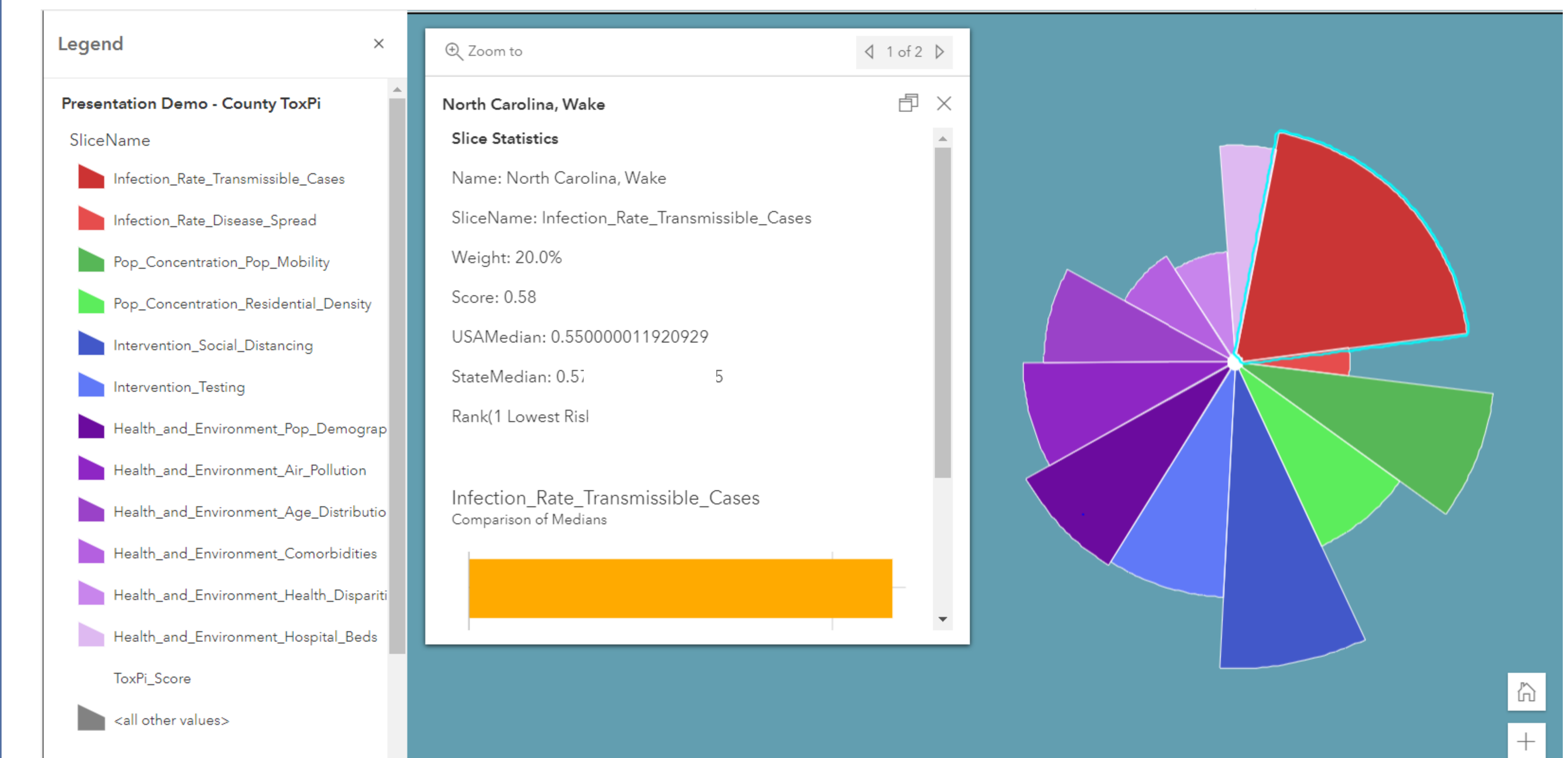
3. Open lyrx file in ArcGIS Pro and share to ArcGIS Online



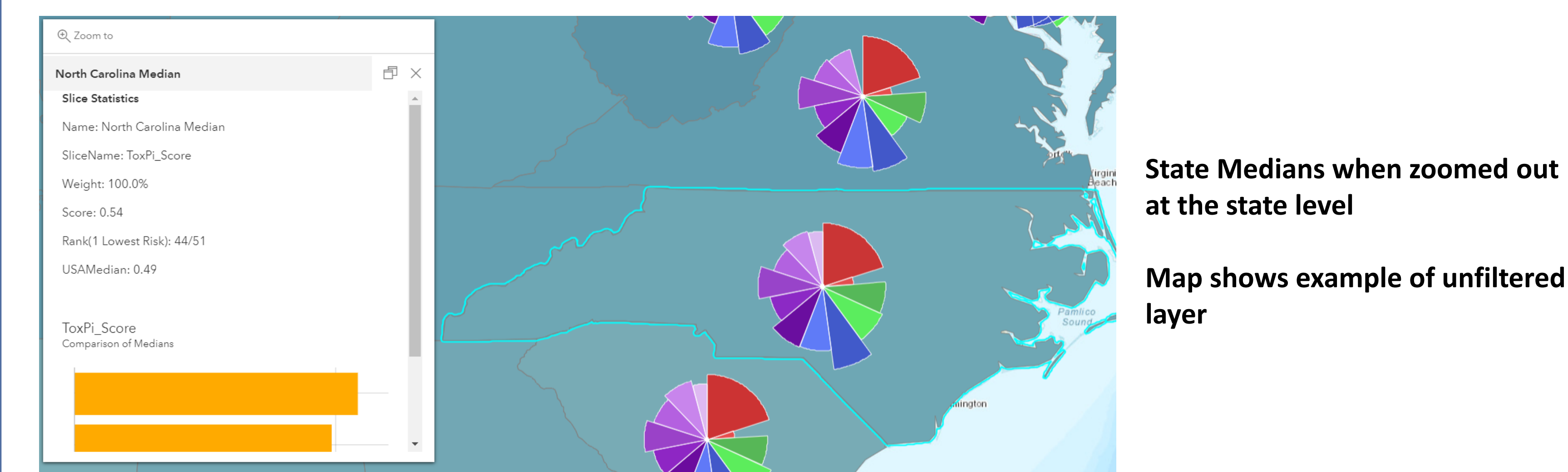
4. Retrieve shareable web url from Arcgis Online

Basic Map Visualization for Lay User

Specific ToxPi Slice Information on Select



Multi-Layer Visualization Based on Zoom Extent

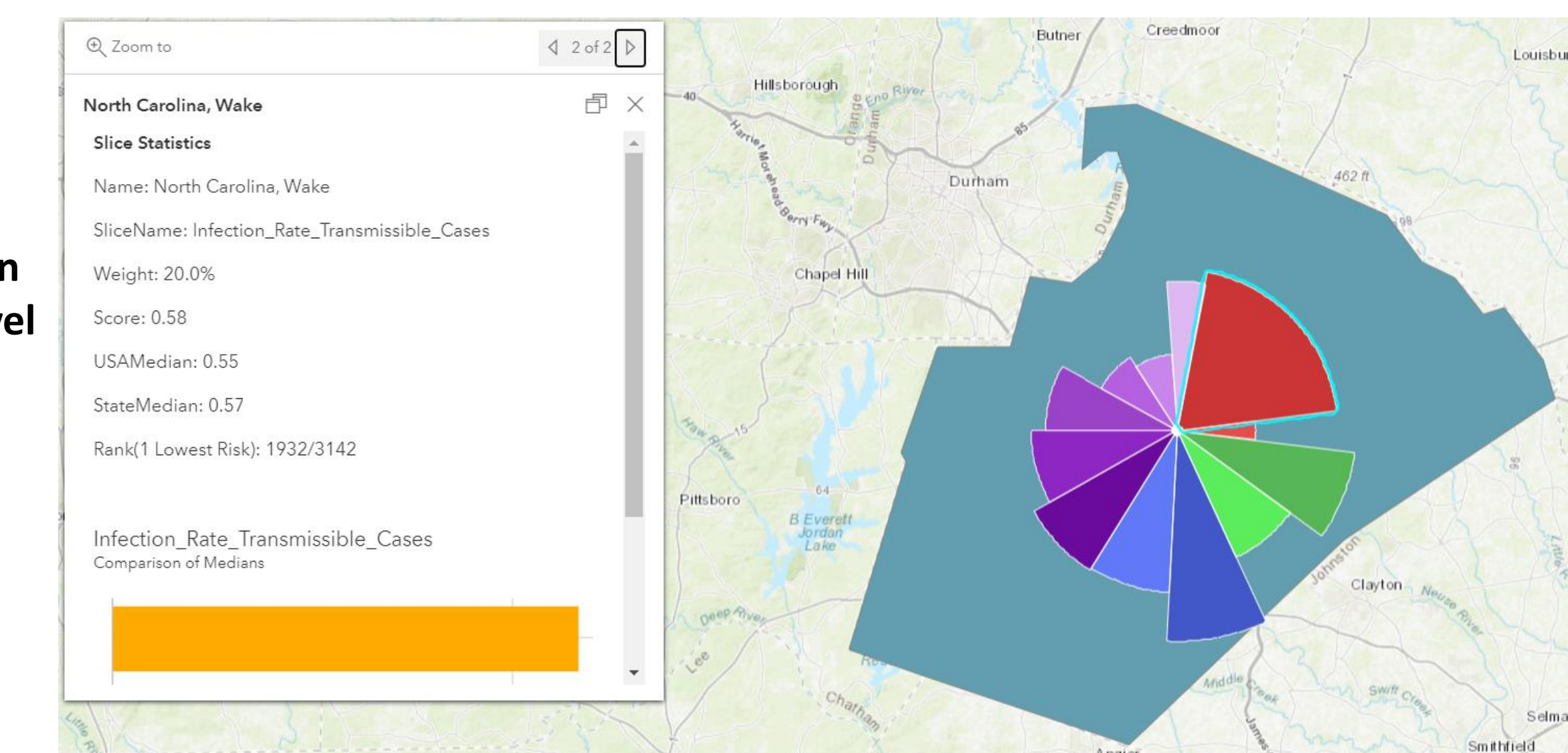


State Medians when zoomed out at the state level

Map shows example of unfiltered layer

County or census information when zoomed into the corresponding level

Map shows example of filtering capabilities by isolating Wake County



More to Come

- Web App Development for easier use and more visualizations
- Demos containing shareable dashboard capabilities with filtering on data selection

References

Marvel SW, et. al. ToxPi Graphical User Interface 2.0: Dynamic exploration, visualization, and sharing of integrated data models. *BMC Bioinformatics* **2018** Mar 5;19(1):80.
Marvel SW, et. al. The COVID-19 Pandemic Vulnerability Index (PVI) Dashboard: Monitoring County-Level Vulnerability Using Visualization, Statistical Modeling, and Machine Learning. *Environmental Health Perspectives* **2021** Jan 5; Vol 129 No 1.

NC STATE
UNIVERSITY