Leveraging GIS to Explore the Healthcare Workforce

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Overview

- Introductions
- AAFP and HealthLandscape
- Workforce Data
- AMA Health Workforce Mapper
- Static Workforce Maps
About Me

▪ Masters in Professional Studies in GIS from University of Maryland

▪ Joined the HealthLandscape mapping division of AAFP in December 2015

▪ Responsible for data management, cartography, programming, web mapping development
About HealthLandscape

▪ HealthLandscape is part of the American Academy of Family Physicians (AAFP)

▪ Building online, geographic information systems since 2005

▪ Expertise in large datasets, data aggregation, application development, and analysis
HealthLandscape
Health Workforce Characteristics

- Dentists, primary care providers, optometrists, home health aides, nurses

- 274,000 Primary Care Physicians (AMA, 2018)

- 236,000 Nurse Practitioners (NPI, 2018)

- NPs alone have increased by 59% from 2013 to 2018

- PCPs have increased by 8% over the same period
Data Source 1: AMA Masterfile

- Quarterly released database of certified physicians (1.4 million physicians as of 2019)

- Includes mailing and office addresses, gender, DOB, practice type, and practice specialties
Data Source 2: NPPES National Provider Identifier File

- Contains all active health provider data from the NPPES system (around 6 million records as of 2019)

- Each provider has primary and subsequent taxonomy codes that determines what specialty(s) they practice under

- Mailing and practice addresses, provider names, gender fields
Processing Workforce Data for GIS

- Geocoded in Esri ArcMap using a mashup of available practice and office addresses

- Enriched with geographic identifiers down to block group level

- Provider locations are masked in the web service using a scale extent
AMA Health Workforce Mapper

- Built for the AMA for advocacy and resource allocation
- Created under the collaboration with AAFP and uses workforce data from 2018
- Aggregate data at the county and state levels, as well as, point locations of providers
- Maps practice locations of provider subspecialties, population per physician ratios, and designated shortage areas
Health Workforce Mapper

Workforce Explorer
Use the controls to select data for mapping

- Non Physician Specialties
  - [ ] Audiologist
  - [ ] Physician Assistant
  - [ ] APRN, Certified Nurse Practitioner
  - [ ] APRN, Certified Clinical Nurse Specialist
  - [ ] Certified Registered Nurse Anesthetist (CRNA)

- Gender
  - [ ] All
  - [ ] Male
  - [ ] Female

- Physician Age
  - [ ] 18
  - [ ] 100

- Physician Practice Type
  - [ ] Direct Patient Care
  - [ ] Resident
  - [ ] Administration
  - [ ] Medical Teaching

Population per Provider
- 601 - 799
- 799 - 1,072
- 1,072 - 1,435
- 1,435 - 1,810
- [ ] No Providers

Providers
- [ ] Physician Assistant
- [ ] APRN, Certified Nurse Practitioner

Jefferson
- Population 2010: 534,543
- Population Density (per sq mi): 690.4
- Percent Population over 65: 76.4%
- Percent Population under 18: 119,090
- Total Providers: 846
- Population per Provider Ratio:
Population Health Explorer

- Accompanying module within the Health Workforce Mapper

- Can be used with Health Workforce Mapper to pinpoint provider specialty locations in areas of need or areas that need resources

- Ability to turn multiple indicators on to visualize areas that are exceeding set benchmarks

- Population health metrics at county level drawing largely from Robert Wood Johnson’s County Health Rankings
Robert Wood Johnson County Rankings

- Annual ranking of counties to support claim that where you live determines your health and wellbeing

- Uses over 140 health, social, economic, and demographic indicators to calculate rankings

- Can link county IDs to boundary files to display in a GIS
Population Health Explorer

Rio Blanco - Colorado
Population: 6,571
Health Behaviors
Access to Exercise Opportunities: 66.8%
Clinical Care
Diabetes Monitoring: 75%
Request for Workforce Maps

- 30 specialty combinations of physician and non-physician provider types for all states using data from AMA and NPI

- 1,530 state-based workforce maps along with 30 national maps

- PDF deliverable with client-specified designs for map surrounds, symbols, logo, legend, and data
Room for Improvement

- 2014 – same contract, same deliverables, same data sources

- PDF maps were produced manually in ArcGIS for Desktop

- Logos, titles, footnotes, and legends on PDF templates were typed and placed by hand in Adobe Illustrator

- Delivered in batches to client over the course of one year
In Comes Python

- 2018 – new contract, same deliverables, new data years, and…Python!

- Python script to automate map production developed and tested over several months to get it right

- Once client and internal QA/QC team approved templates, all 1,560 PDF maps were completed in 3 days
The Python Script

- Assigns local variable name to all provider specialty combination layers in the MXD
- Calls an external library of state names to use for iterating
- Zooms to selected feature and initiates a definition query to turn on that map’s provider data for that state
- Updates title, subtitle, footnote, and legend based on the layer from the definition query
- Prints to PDF and moves to the next state
State Map Example
National Map Example
Limitations and Future Considerations

- ArcMap can only work with a single layout at a time, so states in portrait versus landscape layout needed to be run in separate batches

- Migrate Python 2.7 code to Python 3.3 and run the project using ArcGIS Pro

- Clean up redundancy and caching issues

- Geoprocessing tool
Interested in Python?

- [https://www.python.org/](https://www.python.org/)

- Numerous resources to learn from and consult with
  - GIS StackExchange
  - GeoNet
  - Esri
Thank you!

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