Geographic Information Systems (GIS) and Spatial Methods Workshop Panel: Using GIS and Spatial Analysis to Advance Child Care and Early Education Policy Analysis and Research

1. Descriptive Information

Breakout Session B1: Geographic Information Systems (GIS) and Spatial Methods Workshop Panel: Using GIS and Spatial Analysis to Advance Child Care and Early Education Policy Analysis and Research	Facilitator
GIS/spatial analysis is a powerful policy analysis tool. This panel provides a space for discussion about how GIS/spatial analysis can be used to address high-priority questions related to the geographic reach and properties of early childhood programs/services, and the implications for policy. First, GIS scholars will discuss opportunities for using GIS/spatial methods to deepen analyses and to support the development of practical tools for use by decisionmakers. These interdisciplinary presentations highlight applications from other fields. The next presentation describes the use of GIS/spatial methods in the work of the Oregon Child Care Research Partnership, and will serve as a bridge to the "workshop" portion of the session where discussion will focus on developing a "smart" GIS/spatial analysis agenda that both advances our knowledge base and produces practical tools/products.	• Elizabeth Davis, University of Minnesota **Presenters** • Erin Hardy, Brandeis University • Jennifer Rankin, HealthLandscape • Roberta Weber, Oregon State University **Discussant** **Scribe** • Nadia Orfali, Child Trends

2. **Documents in Session Folder**

In addition to the speakers' PowerPoint slides, there is a handout titled Child Care Subsidy Map of the Worcester and Fitchburg Regions.

3. Brief Summary of Presentations

Summary of Presentation #1:
- What is this map? It is the most photographed places in the world.
- Agenda: Where we are, where might we go, discussion ideas
    - Where are we? Most of the big questions in child care have a geographic component at their base. The location of child care matters. Important to think about location when we analyze and implement policy
    - Sample projects are child care research partnership grants that are using mapping. Top 4 have been discussed here and have to do with supply/demand; the last 4 are more about risk and reach. The asterisks refer to interactive map tools. In the field of early childhood, there are pieces that are more active and less and there are opportunities in both areas.
- What is GIS? It's a Geographic Information System that captures and analyzes information about places. It is a foundation of everything else we want to do.
    - Menu of GIS applications that are applicable to early childhood.
- Where can we go?
    - Tober's first law of geography - this is what spatial analysis is all about.
    - In a way we are already using ESDA when we look at maps and write about patterns we use, but this is a more formal conclusion about what we are seeing descriptively in a map. The most important concept is called autocorrelation, which means a self-correlation. Correlation of an attribute over time during longitudinal analysis - but now it's with itself, in space.
    - The first step in ESDA is thinking about spatial arrangements. For example, clustering in the map of child care providers in MA. More formally, we can look at the nearest neighbor ratio to look at the clustering and tell if it is statistically significant.
- Example of spatial autocorrelation. Positive autocorrelation - like values are clustered together in space. Negative autocorrelation - like values are evening distributed.

- o Choropleth map shows the number of children in poverty. It seems that there is some clustering of the darker colors, and sometimes they are checker boarded. You can run a statistic across the whole state in that variable and see if it is significant. In this case, it is significantly clustered.
  - o The next step is what is driving this global statistic? What towns are driving the clustering? Hot spots. These are where high-high occur and there is concentrated need. This has policy implications because you might need to think about a larger area if there is a cluster.
- Spatial Regression. When you have spatial dependence, it could be because of spatially-correlated measurement error. Curb-stoning - all areas in a cluster will have the same systematic error (AKA they look correlated).
  - o If you try to use OLS you have bias because you don't satisfy the random error requirement.
  - o Spatial interactions - Amount of light is a function of the amount of trees on my property, but also the amount of trees on my neighbors property. You would want to know how many leaves are in my trees but also my neighbor's trees. Amount of light is the dependent variables, but the other two explain some part.
  - o Can look into questions like spillover in poor neighborhoods. For example, Cordes (2016) showed that public schools that had a high quality charter school nearby were also of higher quality - could replicate this using early childhood programs.
- Data collection opportunities
  - o Candace Odgers at Duke is using this tool where you drop a pin and takes you to google street view and virtually take a walk down a street like a socialist. In a study for IES, they are dropping a pin at a school and walking around and assessing the quality of the neighborhood, then trying to correlate this with other measures of school quality. This method could be applied to QRIS validation studies.
- Measure Development
  - o We can keep doing more of what we are doing. The National Survey has census tracts and county tracts, and there is a ton of potential to link that to other census data.
  - o Using maps as motivators - people see themselves in maps and it's not as easy to run away from the truth as it is with a graph. Helps people think of the potential - use an empty map.
- Cautions
  - o Not everything is spatial. GIS is costly. Self-teaching GIS is not really a "thing" (note: the next speaker DID self-teach GIS!). There is so much data and some not good maps and some great maps. GIS can do things more powerful than we can digest, so need to be careful.
  - o Units - Zip codes and counties aren't neighborhoods.
- Blue sky ideas
  - o Model a GIS training institute after a Harvard program
  - o Website for mapping/spatial products for states and decision makers to use. States don't know what maps/spatial data they need.

Summary of Presentation #2: Jennifer Rankin
- HealthLandscape began working in policy about 17 years ago. Created the Robert Graham center to do the policy work and early on realized that geography mattered. 11 years ago, started building online mapping tools to take what is happening in DC to how it applies to neighborhood physicians.
  - o Social determinants of health - applies to early childhood as well.
- Tools that exist already

  School Based Health Alliance Mapping Tool
  http://www.sbh4all.org/resources/mapping-tool/
  Arizona First Things First
  http://datacenter.azftf.gov/
  Halton, Canada Our Kids Network Data Portal
  http://www.ourkidsnetwork.ca/Public/DataPortal.html
  500 Cities Mapping Tool
  http://www.healthlandscape.org/map_Project500Cities.cfm

  For a more exhaustive list, visit www.healthlandscape.org
- These are live, free, and open to the public.

- UDS Mapper - Uniform Data System
  - Health Center Program - federally funded everyone who comes receives care no matter if they pay, and in return they have to report into the UDS.
  - Access is free once you create an account. The tool grows every year based on feedback and input.
  - A major update is happening right now and it will be new data in a couple of weeks.
  - This can only happen because the data exist! The data was collected to benchmark and to show Congress what the health centers were doing.
  - It is a bi-partisan supported program, in part because the data supports it so strongly. Funding keeps coming from all administrations, and the program continues to grow.
  - Now all records have to be electronic, and it reports back to UDS.
  - Why build a mapping tool?
    - Geography is important to the health center program because funding is awarded based on area. Then the area is "claimed".
    - The unit of geography is not uniform across these different requirements for a Health Center - you could be looking for all of these things and it may not align.
    - Community Oriented Primary Care means that you are responsible for the health of everyone in the area, regardless of if they come to you or not. At first, the service areas were forbidden to overlap, but now it is common. For example, if there is so much need or language barriers. Started to collect patient origin data (ZIP codes) and use desktop mapping to figure out the overlaps.
    - ZIP codes - are made for mailing and not good for data! They are not really an area, but a collection of post officer transportation routes. People sell different ZIP code layers and they don't always match up. Also, they can change zip codes at any time to divvy up work between post men.
    - Zip code tabulation areas are connected to the census, but it's not nested in the hierarchy. Other analyses use census tracts, counties, etc. which are in the nested structure.
    - Question - allow overlap or not? Use the UDS mapper to guide this question.
- DC Map for a case of use
  - The dots on the map are where health services are provided in DC. The darker green means higher amount of people are going to Health Centers. You can clearly see where there is need for services, dark green areas with few dots.
- Now to get funding you have to use the UDS mapper to write your grant and show high need in your area, so the use is constantly evolving. Can identify target populations to grow services/programs, identify other indicators, and who is accessing the data?
- Evolves use case: new indicators overlaid on DC map. Orange areas show higher low income populations than the state average of MD. Brown areas are higher rates of adults that did not go to the dentist in the last year than the state average, and the mixed color is high for both. Crosshatching shows where the patients from a specific provider came from, and see if it overlays from where these indicators occur. These data show that maybe there needs to be more dental services in Anacostia, for example.
- Finding your area of need is harder when you have to use a bad/different/large measure of geography, like zip code. It is not ideal. ZCTAs don't nest into larger measures and users do not understand them.
- There are lots of mapping programs out there. Build the right tool, using the right measures, for the right people.

Summary of Presentation #3:

- I am not a mapper - but we had the need and partnered to create maps about Early Learning in Oregon. The Early Learning Council was charged with integrating and created a set of hubs which are designed to bring people together using a collective impact model, focusing on K readiness.
  - Equity lens - make sure that you are thinking about everyone equally and deal with structural barriers to equity.

- o Not much money to make this happen, but needed to work together. It was critical to identify high need areas and came up with the idea to make maps.
- Used the Early Learning data that we already had and found a partner in state government to create the map for us using GIS software, integrating multiple data sources.
  - o The hubs started using the maps, and we learned that interacted maps were cool and interesting but they are not powerful analytic tools.
- Tables of data sources - used elementary school catchment areas.
- Using maps to identify areas of high need. Select type of care and view child care slots in the country. View poverty, see diversity, etc. Doing this, you can find the part of Marion county that has need, but the power is so low doing it this way.
  - o Found geospatial analytics people in state government - wrote a proposal for them and they took the data that we already had.
  - o Question: at what geographic level can you find large differences in assessment scores? Answer was, the most variation was between elementary school catchment areas. So that is the unit we used. It is effective on the ground, everyone understands these areas that we define as communities.
  - o Both questions will give us areas where children are not doing well and investments are low. There is so much hunger for this tool because there is pressure in this state to target these children and close this gap, and I expect many people to use this once it is available to them.
- The Oregon map is fun! Try it out!

4. Brief Summary of Discussion

Questions
- What is new and different about this?
- How can we use these tools to inform policy?
- Blue sky ideas - do we need to be thinking about uniform data at a federal level, or should we start with each state?

Roberta - my experience is that the question is the most important part of this research. Am I right?

Erin - I completely agree with you. I think that this is an area where you can miss that stuff more than other technical methods because you can add so much information in one place. There is not many people who are doing this type of work, so our capacity is limited because not many people understand it. Sometimes people look at it for a solution for an area that we are struggling in sometimes so the question isn't clear. You can get really far down the path before you realize what is going to answer your question

Jennifer - There aren't great datasets out there for where doctors are - only 2. Now we are seeing the limitations after actually using them, neither is supposed to be used for research. "Don't let the perfect get in the way of the good" - don't write off a dataset just because it isn't perfect. Licensing is a better source, but it differed by state what they collect. Working on a common data model to get states to collect it correctly. So you can go back and fix the data.

Question - Isabel Brandburn - I'm struggling with the analytic piece of this. Can one do things like take a map, and see the ideal map, and do statistical analysis to see how it is from ideal?

Erin - So something that would simulate how far people would have to move to create the ideal? I think that type of index already exists and it is being used a lot in housing literature, called the Dissimilarity Index (see recording). If we want the racial composition of every neighborhood in a metro to match the racial composition of the metro overall, then the Dissimilarity index examines how many white families would have to move and how many black families would have to move? The technology exists to figure this out, but you need to try to conceptualize what you are actually trying to get an indicator of (how many? Where?). Bottom line - if you can visualize it, GIS probably has a tool for it. For early childhood, we have tried to link kids with providers, so we emailed arcGIS and they built us a tool where we can link children to close provider and have a common identifier.

Roberta - the data analytics people use very sophisticated techniques. It's not just layering, that is limited. I don't know what they do but it's much richer than just looking identifying.

Helen - it's more of a question of when you look at the map, why does it look the way it does? Not how do you make it look like something else, but it's more understanding why it currently look the way it does. Is it

transportation costs, what could it be? Understand the elements behind why. Once you know why you can try to change it.

Rupa - using the national survey data. I would say that you've described about 15% of the data. I think that almost everything you've done can be done using the national survey data. These data have been kept in excruciating detail, and there are privacy issues but we can work through that.

Erin - Yes! Somebody has to do that.

Comment - with CCDF new rules, states are required to make a lot more information about providers available, including on a national website (childcare.gov) which is using a national data dictionary that is being finalized right now. I am wondering what potential there is in these common datasets across the states and national to answer these types of questions.

Kristen Darling-Churchill - The national center for education statistics also has an interest in this, trying to get household report of distance traveled to child care.