Spatial Models of Education Deserts and Workforce Opportunities in the Southern United States

By: Amal Himayyid Aljaddani (1) & Patricia Solís, PhD (2)

(1) PhD Candidate, Department of Geosciences, Texas Tech University, (2) Research Associate Professor, School of Geographical Sciences and Urban Planning, Arizona State University; Adjunct, Geosciences Department, Texas Tech University

INTRODUCTION

Many military veterans who seek to transition to higher education or workforce pathways find it challenging to translate the skills they acquired during service to civilian STEM settings (Mobley et al. 2017; Danish & Antonides 2013; Simpson & Armstrong 2009). Yet many returning veterans have significant experience with STEM fields, including mapping and geospatial technologies, because of their unique functions and service assignments. Such geospatial skills are useful for location-aware industries, citizen science and public services. At the same time, military and veteran families may be overlooked by Geography and GIS departments as an important source of new student talent for recruitment efforts, in addition to supporting goals for inclusion of significant numbers of underrepresented groups in STEM fields, such as Black and Hispanic, first-generation, as well as disabled populations.

- Like it does for most college students and job-seekers, proximity and location matters to enlisted and veteran individuals (Solís & Miyares, 2014).
- Many adult Americans live in education deserts. Myers 2018 found that 11.2-million adults, or 3.5 percent of the adult population, live more than a 60-minute drive from a public college in the US.
- Military bases and veteran communities are often concentrated in certain geographic areas, which disproportionately lack opportunities for access to higher degree pathways and to transitional civil jobs. These education deserts for veteran and military students covered larger areas, in nucleated-but-scattered spots from 2005 to 2014, such as in the east coast, the northeast, the center, and the west coast states.

We seek to understand the spatial context of veteran and military communities as compared to non-veterans to join higher education and or the civilian workforce between 2005 and 2017 in the Southeast and Southern United States. We implement fuzzy membership and fuzzy overlay functions to help us understand and analyze the geographical locations of "deserts" and opportunities for both education and workforce prospects.

We employ accompanied geospatial analyst tools to assist building four models in order to locate both the education and workforce opportunities and deserts: 1) Educational Opportunities for Veteran (EOV), 2) Educational Opportunities for Non-Veteran (EONV), 3) Workforce Opportunities for Veteran (WOV), 4) Workforce Opportunities for Non-Veteran (WONV). These four models will help facilitate access where the education and workforce opportunities are for both veterans, military communities, and non-veterans.

METHODOLOGY

Research Questions

Where are education and workforce deserts for veterans and non-veterans over time? Where are education and workforce opportunities of each over time? Where do the greatest changes over time occur?

Data Acquisition

Actions: incorporate different variables, that were downloaded from different sources, building four models for education and workforce landscapes for veteran and non-veteran communities.

The sources of data variables were the following:

- **American Community Survey**
- **Institute of Education Sciences (IES)-National Center for Education Statistics (NCES)**
- **United States Geological Survey (USGS)-Colleges and Universities**
- **Department of Defense (Military Installations, Ranges, and Training Areas)**
- **Center for Geospatial Technology at Texas Tech University**

Data Analysis Models and Techniques

The variables that were used for each model vary from one to another based on the related variables that assist the goal of each model (see figure: 1). The variables for each model were:

1. For the Educational Opportunities for Veteran (**EOV**) model, we employed: a) Age from 18 to 34, b) Age from 35 to 54, c) Age from 55 to 64, d) High school graduate (includes equivalency), e) Some college or associate's degree, f) University and college, g) Military installations, h) Median income, and i) Employment status. All the data was for veteran only.
2. For Educational Opportunities for Non-Veteran (**EONV**) model, we used a) Age from 18 to 34, b) Age from 35 to 54, c) Age from 55 to 64, d) High school graduate (includes equivalency), e) Some college or associate's degree, f) University and college, g) Median income, and i) Employment status. All the data was for non-veteran only.
3. For Workforce Opportunities for Veteran (**WOV**) model, we employed: a) Age from 18 to 34, b) Age from 35 to 54, c) Age from 55 to 64, d) Military installations, e) Median income, and f) Employment status. All the data was for veteran only.
4. For Workforce Opportunities for Non-Veteran (**WONV**) model, we employed: a) Age from 18 to 34, b) Age from 35 to 54, c) Age from 55 to 64, d) Median income, and e) Employment status. All the data was for non-veteran only.

Model Builder: We developed four Models***: EOV, EONV, WOV, and WONV*** (*see Figure 1*).

Geospatial Analyst Tools:

i. **Feature To Points: c**onverting the polygon feature into point feature.

ii. **Inverse Distance Weighted (IDW):** interpolating an estimate cell value by averaging the values of sample data points in the neighborhood of each processing cell.

iii. **Euclidean Distance:** generates the Euclidean Distance to the closest source from sample data.

iv. **Reclassify:** categorizing the raster into 10 different classes based on the classification type which is Quantile.

v. **Fuzzy Membership:** we applied two specific Fuzzy membership types which were: Fuzzy Small and Fuzzy Large (*See figure 2*).

vi. **Fuzzy overlay:** combing Fuzzy membership raster data based on selected overlay type which is And.

Fuzzy Membership is a useful technique for assessing site suitability, and in this case also unsuitability of where veterans live relative to the locations of changing offerings of educational opportunities.

Figure 2 illustrates the different types of fuzzy membership. Based on the objectives of the research, we applied only fuzzy small and fuzzy large on different variables. Fuzzy small is that the smaller the number, the higher membership (most suitable), and the larger the number, the lower membership (least suitable). Yet, fuzzy large is that the larger the number, the higher the membership (most suitable), and the smaller the number, the lower the membership (least suitable).

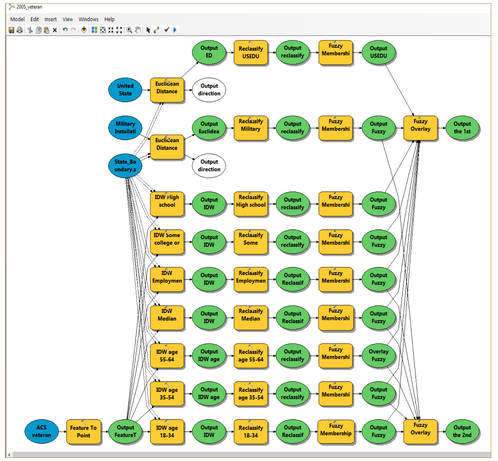


Figure 1 depicts the flowchart of the method of the research.

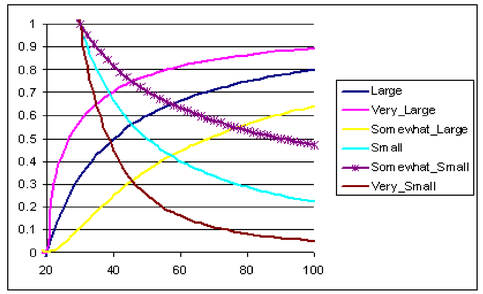
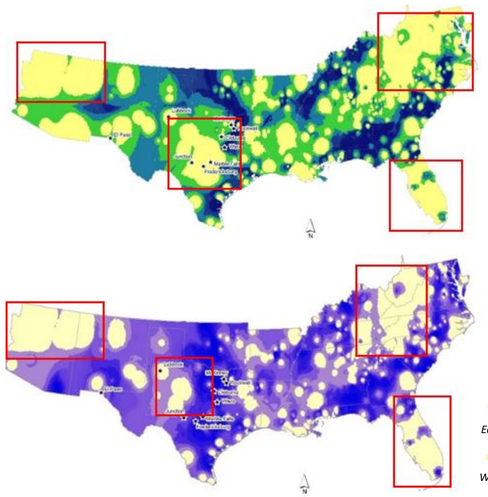


Figure 2 presents the fuzzy membership type of the research : small and large.

RESULTS

We provide two examples of educational and workforce results for veterans to answer the research questions.

- ***Figure 3*** *(A)* displays the educational deserts EOV for 2014, in yellow.
- ***Figure 3*** *(B)* displays the workforce deserts WOV for 2014, in yellow.
- ***Figure 3*** *(C)* displays the most distinct changes in results of EOV, as shown by increase in education opportunities (darker blue) from 2005 to 2017.



Scan the QR code to view story map

Figure 3 displays the (A) education deserts (TOP) and (B) workforce deserts (BOTTOM) in EOV and WOV models for the year 2014. Highlighted areas in yellow, show that there are key regions of the Southern US that have simultaneously experienced desert conditions for both education and workforce for veterans.

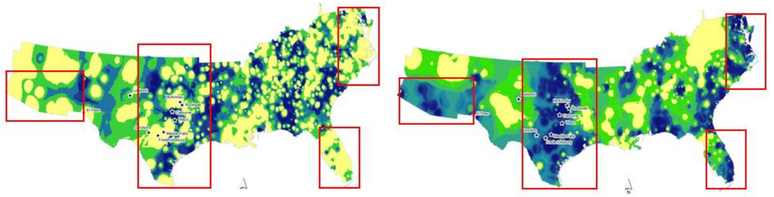


Figure 3 *(C)* Change in education deserts EOV, 2005 (LEFT) to 2017 (RIGHT). Darkening of areas in red box highlights hint that educational deserts are lessening over time for veterans and military families in the South.

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