Spatial Accessibility of Rural Health Care in Colorado Using 2SFCA

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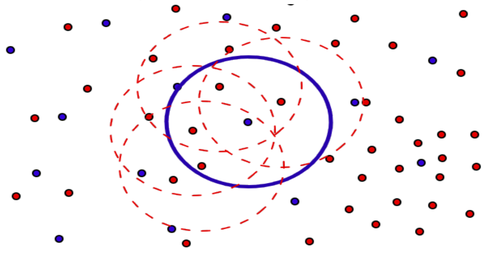
Introduction

Accessibility to primary and behavioral health care services is dependent on the patients' location. Patients living in rural or frontier locations experience greater difficulty in accessing necessary care due to the number of available clinicians and the distance between clinic location and the patients home[1,2]. Geographic Information Systems (GIS) provides unique analytical opportunities to evaluate the accessibility of Primary Care (PCC) and Behavioral Health (BHC) Clinicians. This study will analyze the spatial accessibility of PCC and BHCs via road networks in rural Colorado, utilizing a two-step floating catchment area (2SFCA) along with GIS and publically available secondary datasets from the Census Bureau, National Plan and Provider Enumeration System (NPPES), and the Rural Health Research Center.

Methods

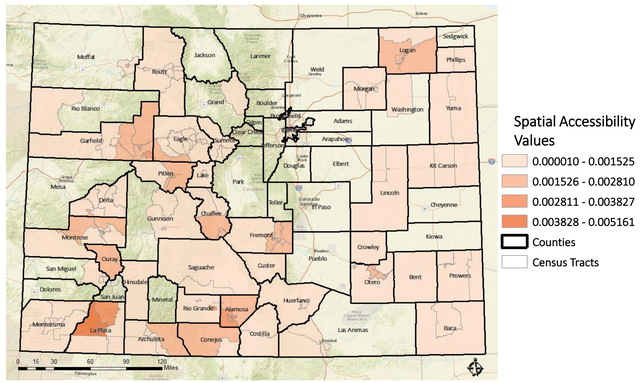
1. PCC and BHC locations were geocoded using custom Python code and the Google Maps API, then plotted using ArcGIS
2. Two Step Floating Catchment Area method[1] used to compute accessibility values



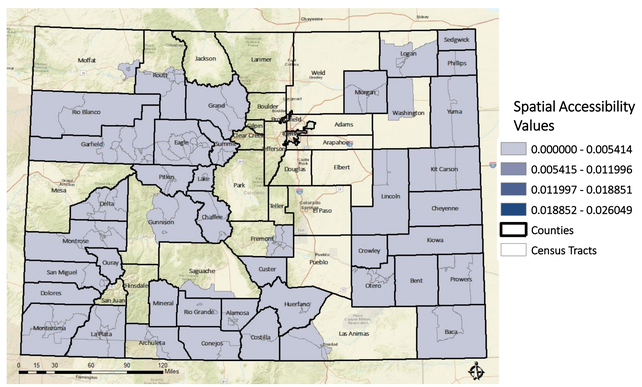
a. 2SFCA: Fix a provider, compute driving range
b. Find all census block centroids within driving range
c. Compute driving ranges for each centroid, find all care providers within union of centroid ranges
d. Score for each provider: take 1 divided by population for each census block, and then take sum for each block in catchment of the provider

Spatial Accessibility Maps

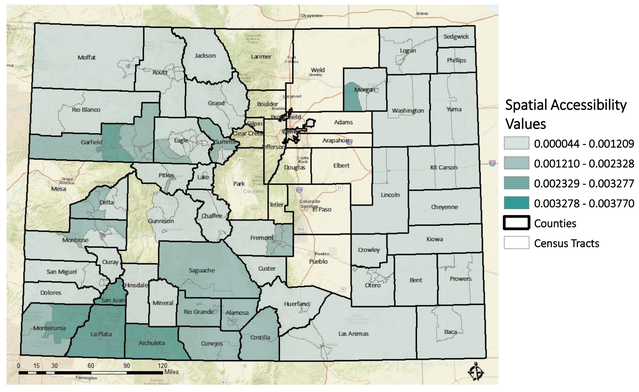
Behavioral Health – 30 min



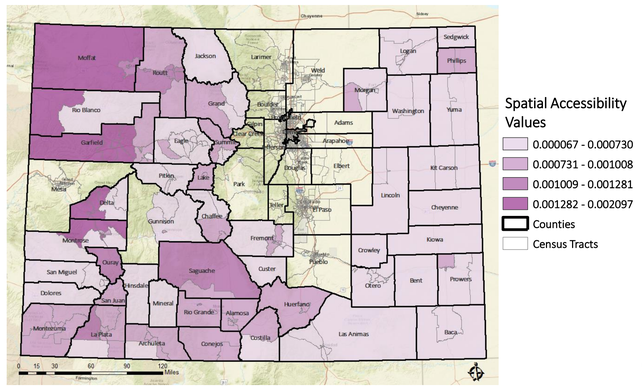
Primary Care – 30 min



Behavioral Health – 90 min



Primary Care – 90 min



Summary

Typically spatial accessibility to healthcare is measured in 30 minute drive times[2]. This study's use of the two-step floating catchment area is unique in two ways; 1) to account for real world drive times to services in rural Colorado we have increased this time to 90 minutes. 2) The 2SFCA method is generally applied to primary care accessibility, we have included behavioral health care locations.

Conclusion

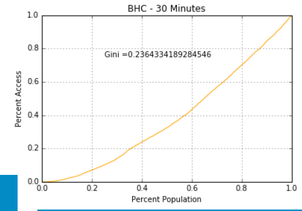
Increasing the standard drive time to primary and behavioral health care services from 30 to 90 minutes results in a more uniform distribution of spatial accessibility scores for those living in rural and frontier counties in Colorado.

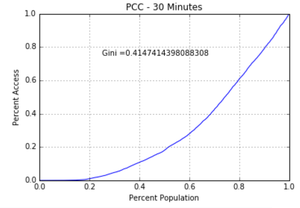
Limitations

This emerging research is limited by the data provided by NPPES which shows an over representation of clinicians who are currently providing direct patient services. It is further limited by using the standard 2SFCA method for spatial analysis.

Next Steps

As we continue this study we will move to use the Enhanced 2SFCA method[2], which allows for weighting of counties or census tracts by their respective RUC Codes where urban population centroids will be calculated at the standard 30 minute drive time and rural centroids at 60 or 90 minutes. In addition, Gini indices will be computed to determine whether or not healthcare access is equally distributed among the population. An example of this analysis is displayed below for a 30 minute range.





References

1. Vo, A., Plachkinova, M., and Bhaskar, R. (2015) Assessing health care accessibility algorithms: A compressive investigation of two-step floating catchment methodologies family. *Conference proceedings from Twenty-first Americas conference on information systems, Puerto Rico, 2015.*
2. *Lou, W., Qi, Y., (2009)* An enhanced two-step floating catchment area (E2SFCA) method for measuring spatial accessibility to primary care physicians. *Health & Place. 15, 1100 - 1107.*

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