# Geospatial Accessibility Factors Influencing HIV Care Continuum Outcomes in South Carolina

1103

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## BACKGROUND

- Ending the HIV epidemic in the U.S. requires access to comprehensive care.
- Traditional measures of accessibility have focused on distance, travel time and car ownership, which are limited.
- The enhanced two-step floating catchment area (E2SFCA) method offers innovative approaches to estimating geospatial accessibility by incorporating the number of health facilities, health providers, and the population seeking care within the catchment area.

## OBJECTIVES

- This study aimed to use the enhanced two-step floating catchment area (E2SFCA) method to measure geospatial accessibility and its association with HIV care continuum outcomes.

## METHODS

### Data source and study population

- Data from the South Carolina's 2020 enhanced HIV/AIDS reporting system (eHARS) was used.
- Study population include adults aged 18 years and above living with HIV/AIDS.

### Outcome measures

- Aggregated county-level percentage linkage to care (LTC), retention in care (RIC) and viral suppression (VS).

### Independent variable

- Geospatial accessibility index measured with E2SFCA.
- 60-minute index as the threshold, with a higher score indicating better accessibility.

### Covariates

- Percent uninsured, percent vacant household, percent household without vehicle, percent unemployed, percent Hispanic, percent education less than high school.

### Data analysis

- A linear regression model (LRM) was used to evaluate the association between accessibility index and LTC, RIC, and VS after adjusting for covariates.

## RESULTS

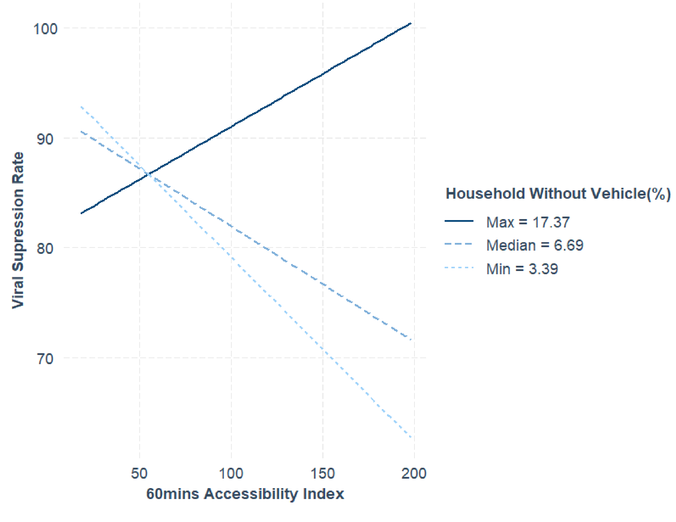
- Accessibility index ranged from 17.9 to 198 across the 46 counties (mean=67.5, SD=36.5).
- Counties with better accessibility were more likely to have a higher percentage of LTC (β = 5.07, 95% CI=0.83, 9.31) **(Table 1).**
- Counties with better accessibility were more likely to have lower percentage of VS (β = -0.29, 95 % CI= -4.60, -1.10). However, **greater accessibility** was associated with a **higher percentage of VS** in counties with **higher percentage of households without a vehicle** but associated with **a lower percentage of VS** in counties with **lower percentage of households without a vehicle** (β =2.0; 95% CI = 0.02, 4.0) (**Fig.1).**
- No association was found between the accessibility index and RIC.

**Table 1. Multivariable linear regression showing association between Accessibility index and county-level covariates with HIV care continuum outcomes in South Carolina**

| Variables | Linkage to care | | Retention in care | | Viral suppression | |
|---|---|---|---|---|---|---|
| | β (95%CI) | p value | β (95%CI) | p value | β (95%CI) | p value |
| 60mins Accessibility Index | 5.07 (0.83, 9.31) | 0.020* | - | - | -2.85 (-4.60, -1.10) | 0.002* |
| Percent Hispanic | - | - | -1.10 (-1.91, 0.28) | 0.009 * | - | - |
| Percent Uninsured | -3.11 (-5.35, -0.87) | 0.008* | 1.34 (0.13, 2.55) | 0.031* | - | - |
| Percent Education less High School | 1.58 (0.47, 2.70) | 0.006* | - | - | - | - |
| Percent Unemployed | - | - | -1.132 (-2.33, 0.06) | 0.063 | - | - |
| Percent Vacant Household | 0.48 (-0.15, 1.10) | 0.130 | 0.22 (-0.10, 0.53) | 0.170 | -0.17 (-0.41, 0.07) | 0.170 |
| Percent Household without Vehicle | - | - | - | - | 0.71 (-1.01, 2.42) | 0.410 |
| Interaction: 60 mins Accessibility Index × Percent Household without Vehicle | - | - | - | - | 2.00 (0.02, 4.00) | 0.048* |

*= statistically significant at $p < 0.05$; X=interaction term between variables; - = not included in the model (stepwise regression was applied to select the most important variables to be included in each of the models). Percent Black and Gini index were not associated with any of the outcomes, so they were excluded from the models.

**Fig. 1. Interaction effect of accessibility index, viral suppression and percentage of household without vehicle**




## CONCLUSION

- Suboptimal geographic accessibility to HIV care is an important structural barrier in South Carolina with disparities across counties.
- individuals who have greater access to healthcare services were more likely to be linked to HIV care after diagnosis.
- In areas with less vehicle ownership, improved accessibility was associated with an increased rate of VS.
- No association was found between the accessibility index and RIC in our study.
- Healthcare providers should consider proximity and ease of access when linking newly diagnosed individuals to care.
- Individuals who are engaged in care should be involved in scheduling hospital appointments, with flexibility for tele health where necessary.
- Mobile clinics and home-based care could address accessibility barriers to HIV care.

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## PLAIN LANGUAGE SUMMARY

- **Geospatial accessibility is an important predictor of HIV care continuum outcomes in South Carolina.**
- **Mobile clinics and home-based care could address accessibility barriers to HIV care.**

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