Building Resilient and Sustainable Communities (P23-20500)

Understanding Changes in Spatial Accessibility to Restaurants during the COVID-19 Pandemic: Disentangling Closures, Inequity, and Transportation Modes

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BACKGROUND

- Restrictions on people's movement and in-dining (social distancing and lockdowns) have significant impacts on restaurant industry during the COVID-19 pandemic.
- Approximately 3% of restaurants permanently closed by the end of March 2020 in the U.S.
- The restaurant closure means decreases in social and economic opportunities of a given community and neighborhood.
- How does the negative impacts differ across communities and which communities and neighborhoods are affected?

METHODS

- Measuring spatial accessibility to restaurants before (2019) and during (2021) the pandemic.
- Identifying neighborhoods that experienced a huge reduction in accessibility by comparing accssibility between two time periods.
- Examining geographic and sociodemographic characteristics of the neighborhoods.

$$A_i = \sum_j O_j(c_{ij}),$$

where

$$O_j(c_{ij}) = \begin{cases} 1 & \text{if } c_{ij} \le t \\ 0 & \text{otherwise} \end{cases}$$

A_i : the cumulative opportunity

c_{ij} : the travel time between origin i to restaurant j

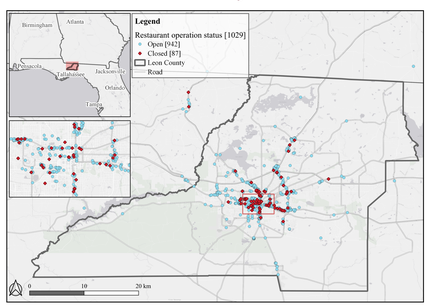
$$\text{Relative change}_i = \frac{(A_i^t - A_i^{t-1})}{A_i^{t-1}} \times 100,$$

where

A_i^t : accessibility during the pandemic

A_i^{t-1} : accessibility before the pandemic

Leon County, Florida



Analysis Procedure

Compute car and walk accessibility

▼

Calculate relative change in accessibility

▼

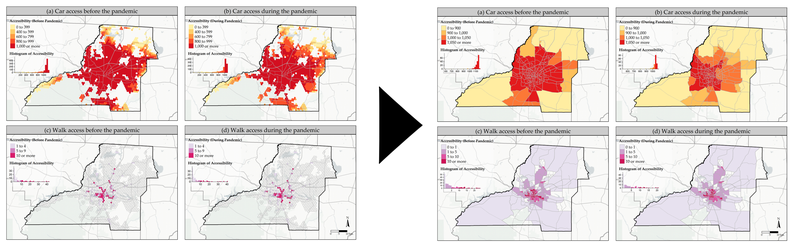
Identifying hot spot of access reduction

▼

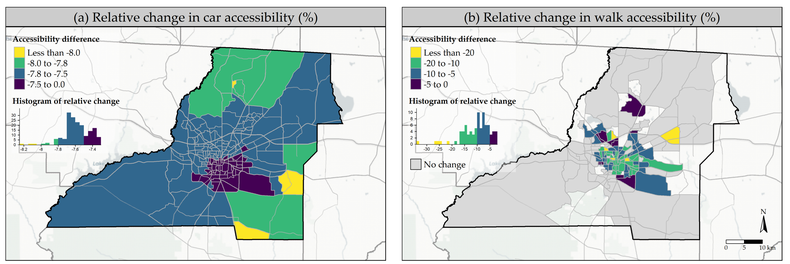
Examine neighborhood characteristics

ANALYSIS

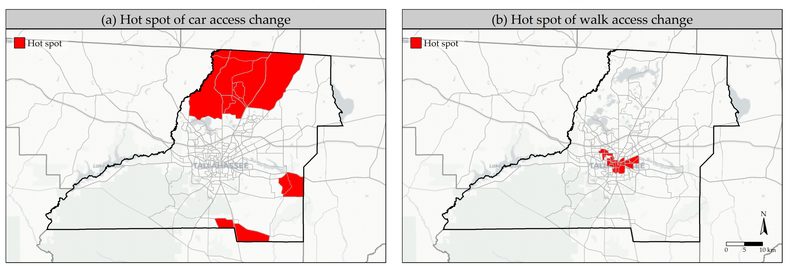
01. Measuring Accessibility from Grid to Block Group



02. Relative Change in Accessibility



03. Hot Spot of Access Change



04. Logistic Regression

Exploratory variable	Car model (Dependent = hot spots)				Walk model (Dependent = hot spots)			
	β	Odds ratio (95% CI)	Wald	p	β	Odds ratio (95% CI)	Wald	p
Intercept	-6.476	-	-3.983	.000	-5.777	-	-4.601	.000
POP Density	-1.116	0.327 (0.019 - 1.951)	-0.900	.368	0.044	1.045 (0.560 - 2.023)	0.136	.892
Age 65+ (%)	-0.317	0.728 (0.545 - 0.884)	-2.608	.009	-0.008	0.992 (0.891 - 1.079)	-0.161	.872
NoWhite (%)	-0.124	0.883 (0.769 - 0.971)	-2.159	.031	-0.015	0.985 (0.956 - 1.012)	-1.090	.276
Income	0.038	1.039 (0.969 - 1.120)	1.070	.285	-0.033	0.968 (0.894 - 1.037)	-0.849	.396
NoVehicle (%)	0.327	1.387 (0.911 - 2.183)	1.559	.119	-0.016	0.984 (0.640 - 1.409)	-0.082	.934
Distance to CBD	0.200	1.221 (1.079 - 1.438)	2.817	.005	-0.821	0.440 (0.278 - 0.625)	-4.016	.000
N	177				146			
Log likelihood	-18.62				-36.91			
LR statistic (χ^2)	50.51 (df = 6, p < .0001)				56.66 (df = 6, p < .0001)			
McFadden R^2	0.576				0.434			

RESULTS

1. The geographic patterns of reductions in access to restaurants were heterogenous by locations and transportation modes.
   - Largest reductions were greater in the outskirts for car accessibility, but also around the CBD for walking accessibility.
2. Neighborhoods with a smaller percent of age 65+, non-white populations, and far from the CBD relate to large decreases in car accessibility.
3. There were no differences between neighborhood characteristics for reductions in walking accessibility.

In conclusion, the loss of restaurant opportunities due to closure is associated with transportation modes and was significant in neighborhoods with a smaller portion of aged, non-white populations and the edge of the county.

Appendix

- Concept of converting accessibility
- Hexagonal grid classification
- Neighborhood characteristics
- Mean comparisons by t-test