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Choice theory can help measure health consequences of park access.

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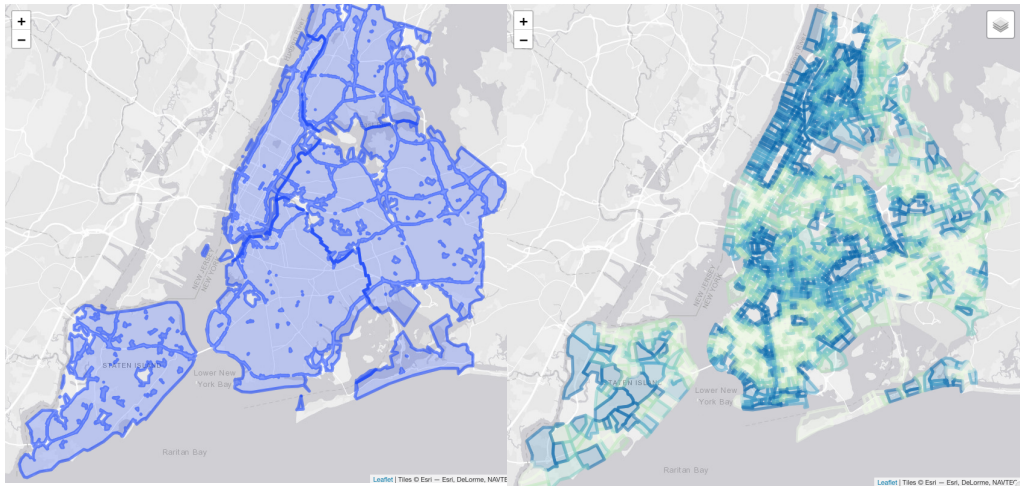

(A) The Trust for Public Lands develops a "Park Score" for a city based on the percent of people who live within a 10-minute walk of a public park, the total public park acreage, and a number of other factors. This allows for cities to be easily compared against each other, but in a place like New York almost the entire city is within the threshold.

(B) By weighting a neighborhood (census tract) based on the acreage of nearby parks and the travel costs, we can show that some neighborhoods have more options, and therefore more access, than others. This access is correlated with public health outcomes at the neighborhood level.

Highlights

- In places with many parks, most people will have 10-minute walk access. But this does not mean all access is the same.
- If we can establish how far people are willing to travel to access different park amenities, then we can create a continuous accessibility measure.
- The continuous measure may be more helpful in estimating park benefits at a neighborhood level.
- In this case, better access is correlated with more physical activity participation and lower obesity rates.

Choice model log-sums

Probability of choosing between park A and park B with different acreages and different distances is:

$$P_A = \frac{\exp(U_A)}{\exp(U_A + U_B)}$$

Where U_A is the *utility* of option A,

$$U_A = \beta_1 * dist_A + \beta_2 * size_A$$

The log of the sum in the denominator (the log-sum) is the *consumer surplus*, or the total value, of the choice set.

$$CS = \log(\exp \sum(U_A + U_B))$$

People who are closer to more and larger parks – who have better choice sets – have higher measured log-sums.

Park access is correlated with neighborhood-level obesity

	Base Model			Logsum Model			10-minute walk Model		
	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
(Intercept)	59.264	[55.7082; 62.8193]	*	59.752	[56.1302; 63.3743]	*	59.346	[55.7849; 62.9076]	*
log(Density)	-0.049	[-0.1289; 0.0304]		-0.054	[-0.1339; 0.0259]		-0.048	[-0.1272; 0.0322]	
log(Income)	-0.331	[-0.6175; -0.0445]	*	-0.341	[-0.6272; -0.0538]	*	-0.332	[-0.6184; -0.0456]	*
Fulltime	-0.016	[-0.0271; -0.0058]	*	-0.017	[-0.0272; -0.0059]	*	-0.017	[-0.0272; -0.0059]	*
College-educated	0.031	[0.0170; 0.0442]	*	0.031	[0.0173; 0.0445]	*	0.030	[0.0167; 0.0439]	*
Single Adults	0.012	[0.0027; 0.0210]	*	0.012	[0.0027; 0.0210]	*	0.012	[0.0028; 0.0211]	*
Youth (0-17)	0.013	[-0.0020; 0.0277]		0.013	[-0.0020; 0.0277]		0.013	[-0.0019; 0.0279]	
Young adults (18-34)	-0.014	[-0.0252; -0.0025]	*	-0.014	[-0.0257; -0.0030]	*	-0.014	[-0.0252; -0.0025]	*
Seniors (65+)	-0.097	[-0.1126; -0.0822]	*	-0.097	[-0.1119; -0.0815]	*	-0.097	[-0.1125; -0.0821]	*
Black share	0.067	[0.0622; 0.0721]	*	0.067	[0.0621; 0.0720]	*	0.067	[0.0622; 0.0720]	*
Asian share	-0.120	[-0.1258; -0.1142]	*	-0.120	[-0.1259; -0.1143]	*	-0.120	[-0.1257; -0.1141]	*
Hispanic share	-0.001	[-0.0060; 0.0051]		0.000	[-0.0057; 0.0054]		0.000	[-0.0060; 0.0051]	
Other Minorities	-0.053	[-0.1017; -0.0051]	*	-0.054	[-0.1023; -0.0058]	*	-0.053	[-0.1013; -0.0048]	*
Physical activity	-0.406	[-0.4278; -0.3846]	*	-0.405	[-0.4271; -0.3838]	*	-0.406	[-0.4275; -0.3844]	*
Access: Logsum				-0.083	[-0.2054; 0.0385]				
Access: 10-min walk							-0.200	[-0.6826; 0.2833]	
Log Likelihood	-3379.6			-3378.7			-3379.3		
AIC	6791			6791			6792		
λ	0.9755			0.9753			0.9755		

The spatial error model ($y = X\beta + (\mathrm{I} - \lambda W)^{-1}\epsilon$) estimates above show a plausible relationship between park access and obesity rates. The logsum-based measure allows a more precise estimate of the effect of improving park access on reducing obesity rates relative to a 10-minute walk threshold.

Ways to improve the measure include using multi-modal network based impedance terms instead of distance, and estimating utility coefficients from a survey instead of asserting them.