

# Income Disparity, Crash Risk, and the Built Environment

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# Background

- The presence of low-income and minority populations in a community are a significant predictor of crash risk
- Safety research uses variables like race and income as control measures, rather than a focus of specific concern

# Study Area: Orange County, Florida



# Unit of Analysis: Census Block Group

- Households defined as low-income, moderate-income, or high-income based on definitions provided by the Department of Housing and Urban Development
- Area Median Income: \$51,586 (2016). BG's classified as being high- or low-income
  1. Low-income: 80% AMI or less (\$40,000 or less)
  2. High-income: 120% AMI or greater (\$65,000 or greater)

# Dependent Variables

- Crash data: 2014-2016 supplied by Florida DOT
- Dependent Variables:
  1. Total Crashes
  2. KAB Crashes
    - K = Fatal
    - A = Incapacitating Injury
    - B = Non-incapacitating Injury
  3. Total Pedestrian-involved crashes

# Independent Variables

- Population
- Income
- % college educated
- % white
- Miles of urban arterials
- # of commercial parcels
- # of intersections
- % streets with a sidewalk
- % of sidewalks with a buffer

# Baseline: Orange County Results

Orange County All Block Groups	Total		KAB		Pedestrian	
	Coeff.	P(z)	Coeff.	P(z)	Coeff.	P(z)
Population (thousands)	0.058	0.000	0.077	0.000	0.038	0.017
Income (thousands)	-0.011	0.000	-0.008	0.000	-0.015	0.000
% college educated	0.008	0.008	-0.001	0.652	0.006	0.137
% white population	-0.005	0.010	-0.004	0.048	-0.007	0.005
Miles of urban arterials	0.201	0.000	0.212	0.000	0.081	0.016
# of commercial uses	0.002	0.005	0.002	0.008	0.002	0.003
# of intersections	0.000	0.655	0.000	0.997	0.000	0.484
% of streets with a sidewalk	0.003	0.028	0.002	0.155	0.003	0.162
% of sidewalks with a buffer	0.375	0.010	0.306	0.029	0.270	0.161
Constant	4.671	0.000	3.155	0.000	1.594	0.000
N = 374	Log Likelihood = -2192		Log Likelihood = -1578		Log Likelihood = -846	

# Higher-Income Block Groups

Orange County \$65,000 and Greater	Total		KAB		Pedestrian	
	Coeff.	P(z)	Coeff.	P(z)	Coeff.	P(z)
Population (thousands)	0.068	0.001	0.069	0.000	0.071	0.002
Income (thousands)	-0.008	0.006	-0.004	0.195	-0.005	0.307
% college educated	-0.001	0.884	-0.012	0.058	-0.001	0.944
% white population	-0.005	0.527	-0.008	0.305	0.015	0.195
Miles of urban arterials	0.089	0.008	0.089	0.003	-0.006	0.891
# of commercial uses	0.003	0.055	0.003	0.051	0.004	0.011
# of intersections	0.000	0.915	0.000	0.551	0.000	0.599
% of streets with a sidewalk	0.004	0.131	0.005	0.044	0.002	0.680
% of sidewalks with a buffer	0.879	0.005	0.751	0.011	0.862	0.031
Constant	4.940	0.000	3.772	0.000	-0.918	0.354
N = 105	Log Likelihood = -573		Log Likelihood = -397		Log Likelihood = -175	



# Lower-Income Block Groups

Orange County \$40,000 and Less	Total		KAB		Pedestrian	
	Coeff.	P(z)	Coeff.	P(z)	Coeff.	P(z)
Population (thousands)	0.097	0.002	0.139	0.000	0.130	0.001
Income (thousands)	-0.008	0.262	-0.002	0.788	-0.002	0.777
% college educated	0.006	0.244	-0.005	0.412	-0.015	0.032
% white population	-0.005	0.029	-0.004	0.100	-0.007	0.008
Miles of urban arterials	0.288	0.000	0.299	0.000	0.210	0.000
# of commercial uses	0.003	0.025	0.002	0.072	0.002	0.228
# of intersections	0.001	0.682	0.000	0.787	-0.001	0.744
% of streets with a sidewalk	0.002	0.448	-0.001	0.798	-0.001	0.721
% of sidewalks with a buffer	0.242	0.350	-0.400	0.143	-0.399	0.216
Constant	4.299	0.000	2.870	0.000	1.584	0.000
N = 115	Log Likelihood = -667		Log Likelihood = -488		Log Likelihood = -281	

# Risk Factors: High-Income vs. Low-Income

Variable	High Income			Low Income		
	Total	KAB	Pedestrian	Total	KAB	Pedestrian
Population (thousands)	0.068***	0.069***	0.071**	0.097**	0.139***	0.130***
Income (thousands)	-0.008**	-0.004	-0.005	-0.008	-0.002	-0.002
% college educated	-0.001	-0.012 <sup>Ψ</sup>	-0.001	0.006	-0.005	-0.015*
% white population	-0.005	-0.008	0.015	-0.005*	-0.004 <sup>Ψ</sup>	-0.007**
Miles of urban arterials	0.088**	0.087**	-0.006	0.289***	0.299***	0.210***
# of commercial uses	0.003 <sup>Ψ</sup>	0.003 <sup>Ψ</sup>	0.004*	0.003*	0.002 <sup>Ψ</sup>	0.002
# of intersections	0.000	0.000	0.000	0.001	-0.000	-0.001
% of streets with a sidewalk	0.004	0.005*	0.002	0.002	-0.001	-0.001
% of sidewalks with a buffer	0.879**	0.751*	0.862*	0.242	-0.400	-0.399

<sup>Ψ</sup>  $p \leq 0.1$   
 \*  $p \leq 0.05$   
 \*\*  $p \leq 0.01$   
 \*\*\*  $p \leq 0.001$

# Finding 1: Commercial Uses and Arterials

- The presence of commercial uses has similarly negative effects on lower-income and higher-income block groups.
- Urban arterials negatively affect safety for both groups, but have a profoundly more negative effect when located in lower-income communities.
- In lower-income block groups, each mile of urban arterial is associated with 300% more total and KAB crashes, and 3,800% more pedestrian crashes.

## Finding 2: Sidewalks and Sidewalk Buffers

- Sidewalks and sidewalk buffers were associated with more injurious and pedestrian crashes in higher-income environments, but not in lower-income ones.

## Finding 3: Race and Income

- The percentage white population was significantly-related to crashes in low-income block groups, but not high-income block groups.

Income Group	Min	Max	Mean	Std. Dev
Lower-income	0%	100%	45%	29%
Higher-income	48%	100%	83%	11.3%

# Conclusion

- The characteristics of the built environment appear to have differing effects in low- and high-income environments
  - Arterials are more problematic in low-income environments than high-income ones.
  - Sidewalk buffers are associated with increases in total and pedestrian collisions in higher-income environments, but not lower-income ones.
  - The presence of non-white populations in lower-income areas appears to exacerbate income-based disadvantage.