

Does the marriage between **public transit** and **fresh food** help combat the “food apartheid”?

- evidence from the MARTA market, Atlanta

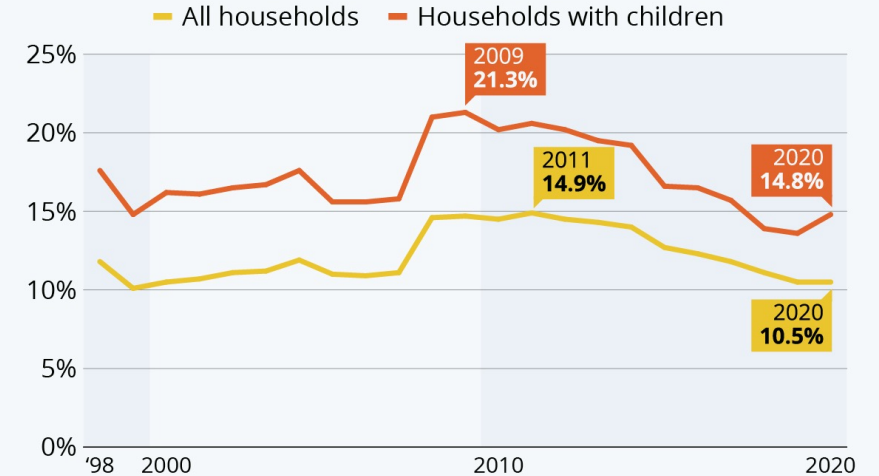
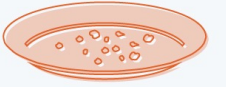
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2023.11.7

the health implications of food

- **Food insecurity** is a perpetual public health concern in the US.
- Food-related disease rates (e.g. Obesity, Diabetes, HPB, etc.,) continue to trend up.
- **The pandemic** has changed the landscape of food access in several different ways:
 - restaurant/grocery closure
 - public service disruption (transit, EBT...)
 - the rise of online delivery
 - work from home

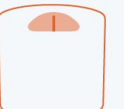
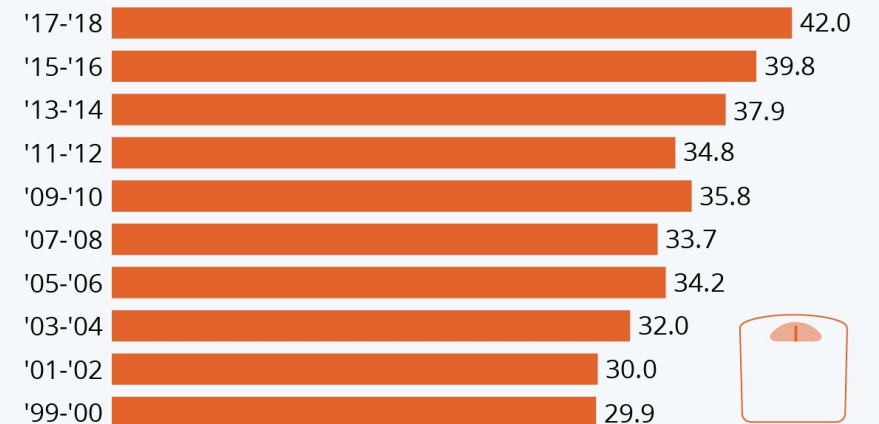
U.S. Food Insecurity Ticks up in Pandemic

Share of households in the U.S. classified as food insecure (1998-2020)



Obesity Rates Continue to Trend Up in U.S.

Percentage of U.S. adults who are obese based on height and weight survey

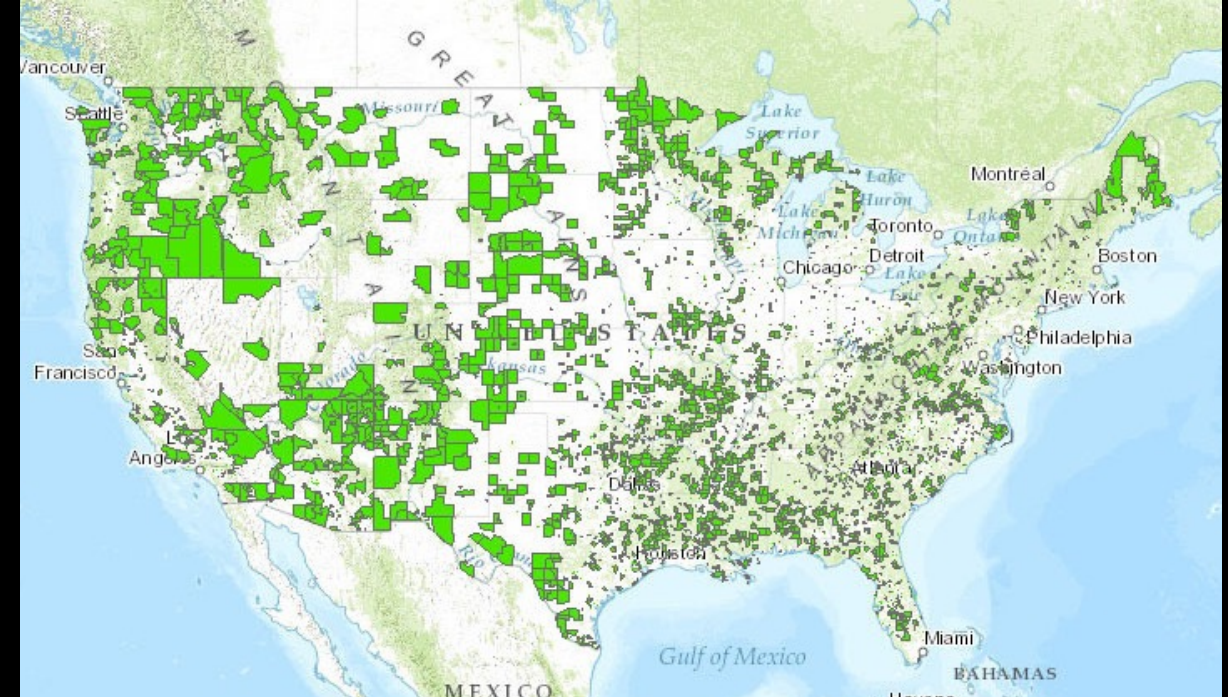


“food desert” vs “food apartheid”

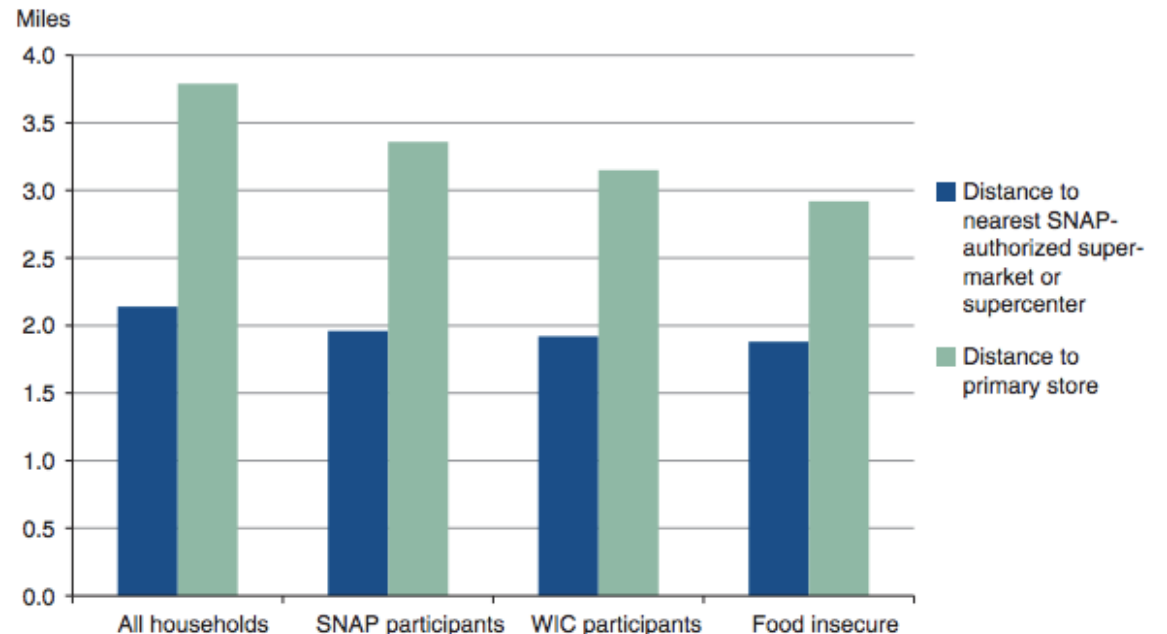
- **food desert** as the dominant narrative among public policy decision making
 - USDA: “a food desert is a low-income census tract where a substantial number of residents has low access to a supermarket or large grocery stores.”
- The food desert narrative has been criticized for both its **methodological limitations** and its failure to **recognize the complicated mechanism of food access inequity**.
 - Critiques on methods: the edge effect; uncertain geographic context problem (UGCoP)...
 - Critiques on causality: exposure vs access

“**Food apartheid** is a system of segregation that divides those with access to an abundance of nutritious food and those who have been denied that access **due to systemic injustice**.”

- Karen Washington

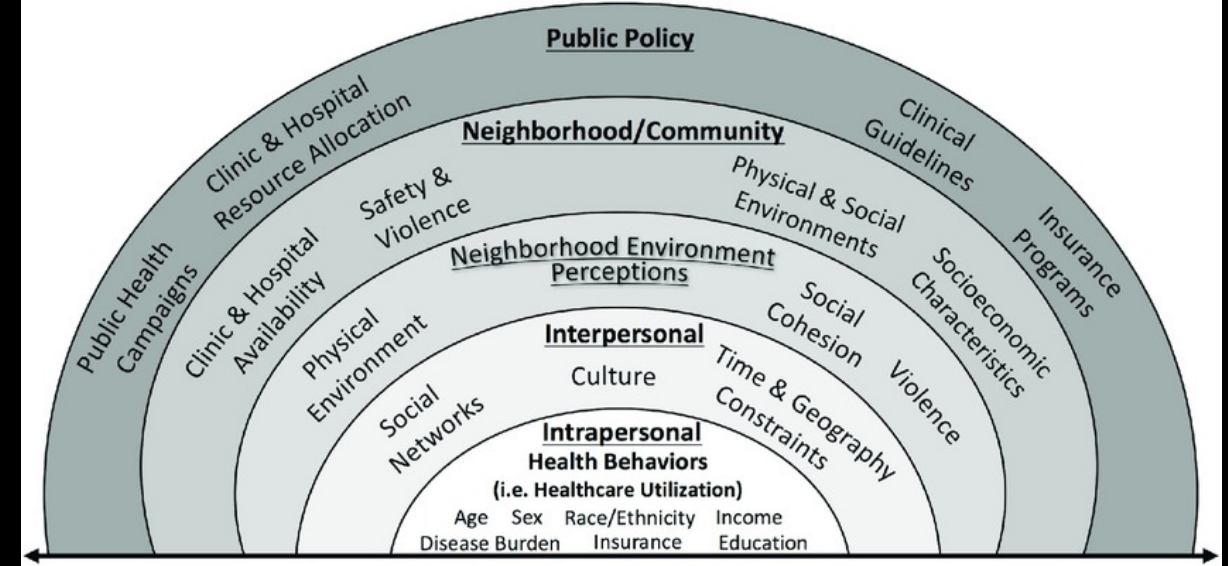


Distance to nearest SNAP-authorized supermarket or supercenter and to primary shopping store for selected subgroups

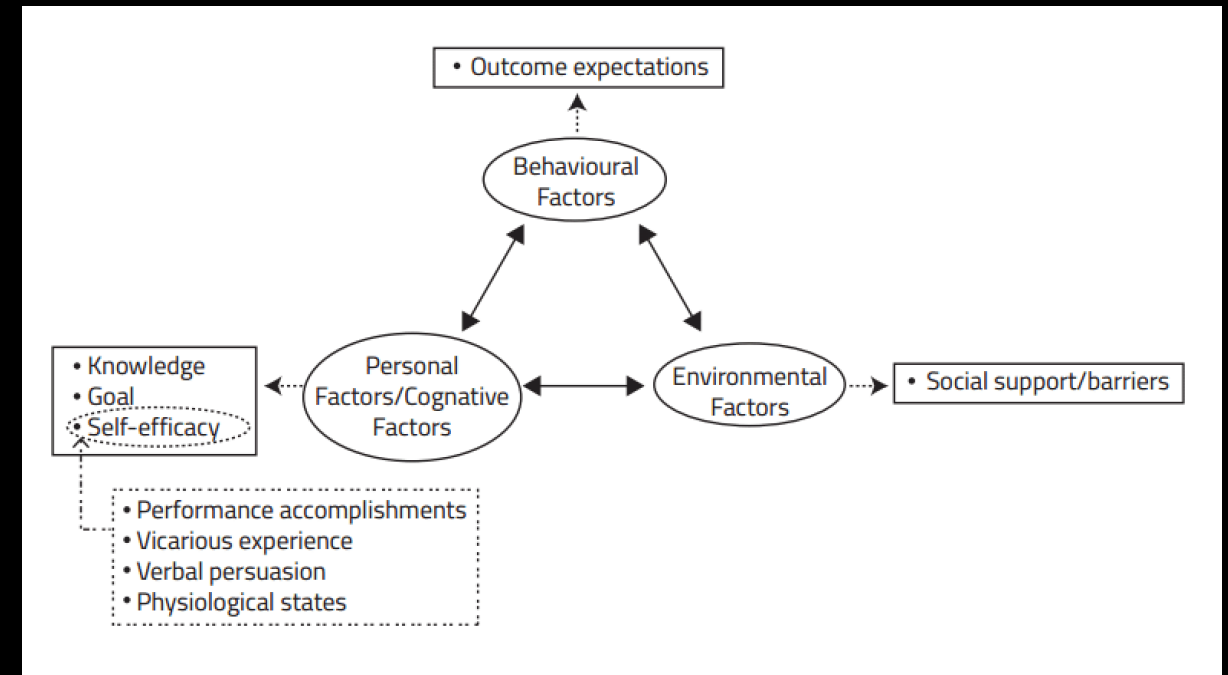


a socio-ecological model of food

- Existing studies have observed mixed results derived from **single-factor food intervention** (Jerry Shannon: **neoliberal paternalism**)
 - Ghosh-Dastidar et al, 2017: “*The supermarket opening in a ‘food desert’ caused little improvement in net availability of healthy foods.*”
 - Cummins, 2014: “*New neighborhood grocery store increased awareness of food access but did not alter dietary habits or obesity*”
- core principles of socio-ecological models:
 - Multiple influences** on specific health behaviors;
 - Cross-level interactions** of influences;
 - Behavior-specific** factors;
 - Multi-level interventions** are most effective (Glanz et al, 2008)



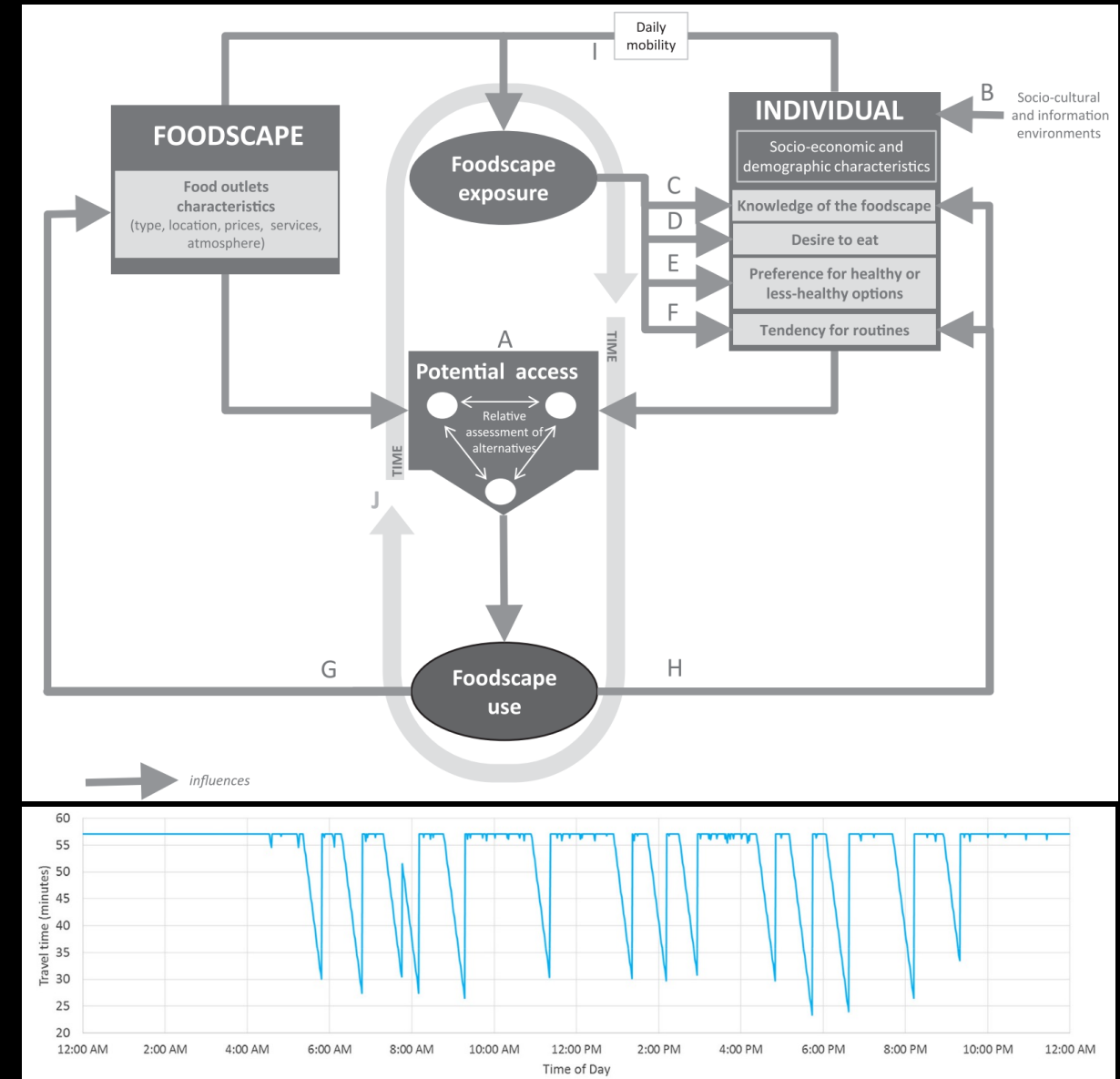
Socio-Ecological Model



Social Cognitive Theory (SCT)

public transit and fresh food exposure: an interaction

- **separate exposure from access**: food outlet choices are conditioned on by how much outlets' attributes accommodate individuals' **constraints** and preferences. (Clary et al, 2017)
- The role of public transit in shaping access to healthy food, especially for **transit-dependent population**, has long been argued (Widener et al, 2015, Faber et al, 2014).
 - Public transit accessibility
 - Household labor division
 - Employment
 - ...



the MARTA market: a multi-level intervention

- Initially launched in 2015, the MARTA market provides **farm stands right inside our stations**. The markets serve multiple areas with limited food access. Each stand operates **one-day per week**, providing fresh produce to MARTA customers from Tuesday to Friday at a different station each day.
- In 2023, MARTA operates the market in **seven** of its stations.
- research questions:
 - (descriptive)**
 - does the MARTA market promote public transit ridership?
 - (inferential)**
 - does it encourage the adoption of a better food choice architecture at the population level?



Tuesdays
West End
4.11 – 12.5
(closed 7.4, 11.21)

Wednesdays
H.E. Holmes
4.12 – 12.6
(closed 11.22)

Wednesdays
Bankhead
4.12 – 12.6
(closed 11.22)

Thursdays
College Park
4.13 – 12.7
(closed 11.23)

Fridays
Doraville
4.14 – 12.8
(closed 11.24)

Thursdays
Kensington
4.13 – 12.7
(closed 11.23)

Tuesdays & Fridays
Five Points
4.11 – 12.8
(closed 7.4, 11.21, 11.24)

3–7pm

CASH, CREDIT, DEBIT, SNAP/EBT ACCEPTED

MANAGED BY: **marta** 

key methodological settings

- **data**

- aggregated weekly public transit and food outlet visits (by day/hour): Advan / SafeGraph
- food desert designation: USDA
- socioeconomic status: American Community Survey 1-year estimate
- public transit data: GTFS

- **time span**

2023-04-03 (first week of the market season) to 2023-10-16 (expect to extend to the season ends)

- **unit of analysis**

census block group (800-1500 ppl) / census tract (3000-5000 ppl)

- **Research Design**

Q1 - direct effect: one-way ANOVA

Q2 - indirect effect : a natural experiment – dose response between exposure to the market and (positive) changes in daily food outlet choice

of visits to unhealthy food outlets (fast food, convenience store..)

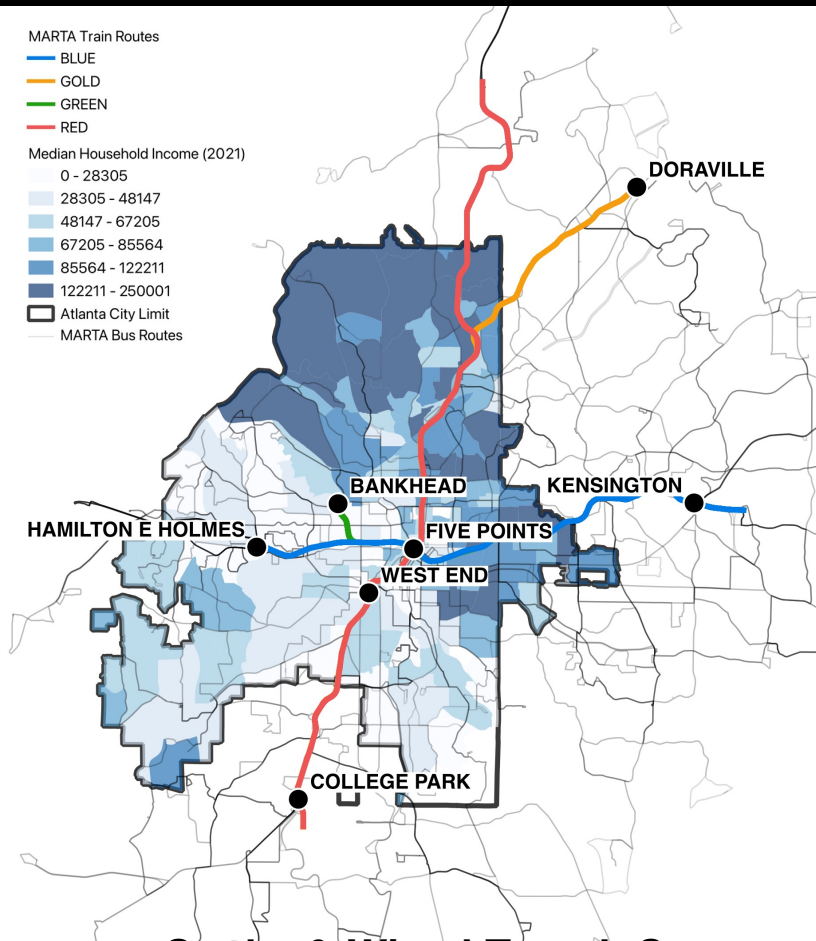
of visits to all food outlets

(CDC: mRFEI)

$$mRFEI = 100 \times \frac{\# \text{ Healthy Food Retailers}}{\# \text{ Healthy Food Retailers} + \# \text{ Less Healthy Food Retailers}}$$

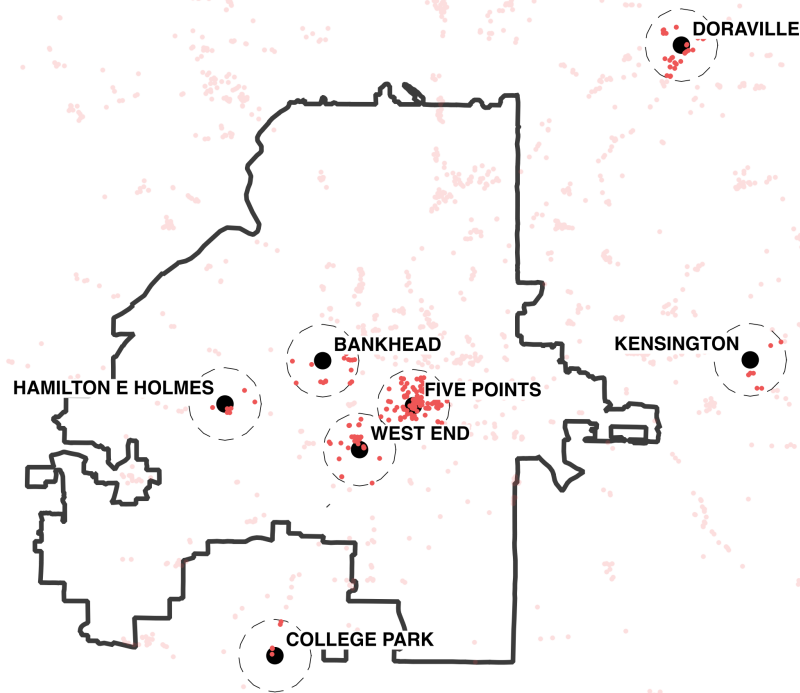
the food environment around stations

- selected stations are mostly in **disadvantaged** neighborhoods of color;
- most selected stations are not in **de facto “food desert”**, but “food swamps”, transit hub, or ethnic enclave;
- **poor walkability** substantially limits the access to food outlets within the theoretical pedestrian pockets



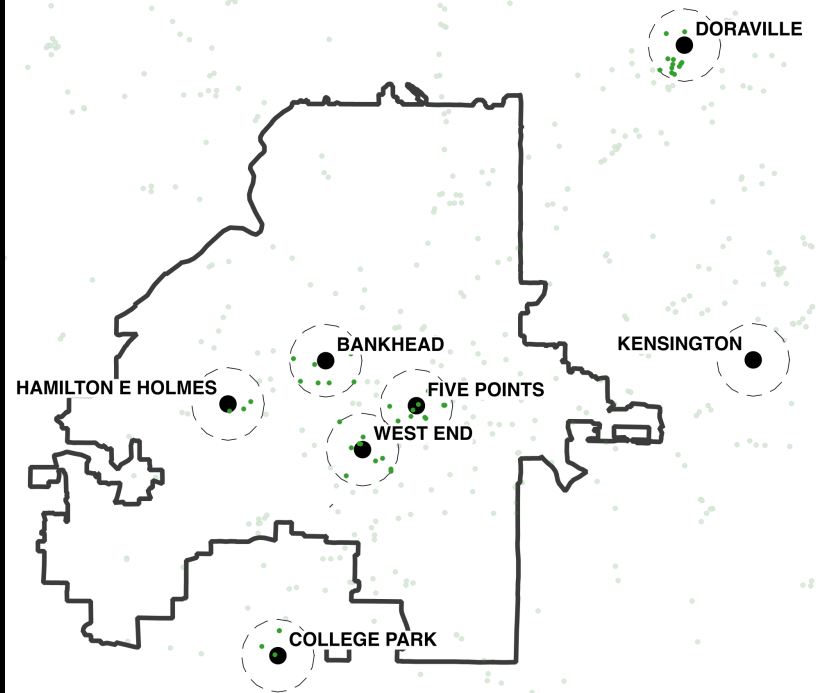
Unhealthy Food Outlets* within 1 mile

* Fast-food restaurant, Convenient Stores



Healthy Food Outlets** within 1 mile

** Grocery Store, Supermarket



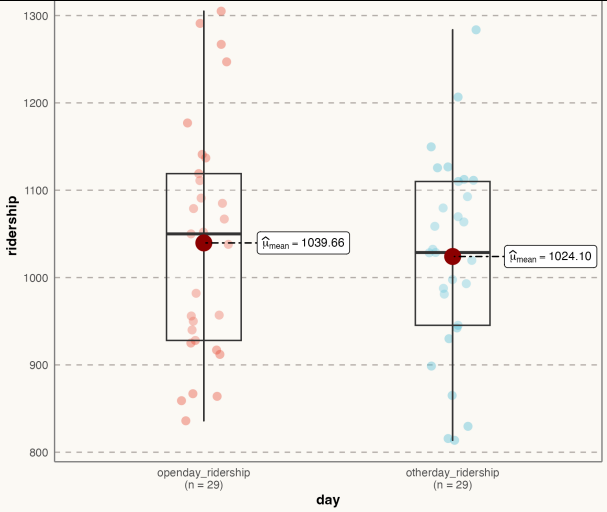
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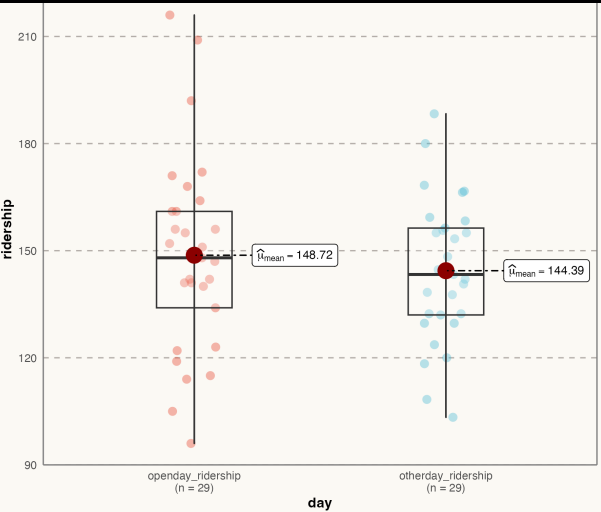


Q1: public transit ridership (2023-04-03 to 10-16)

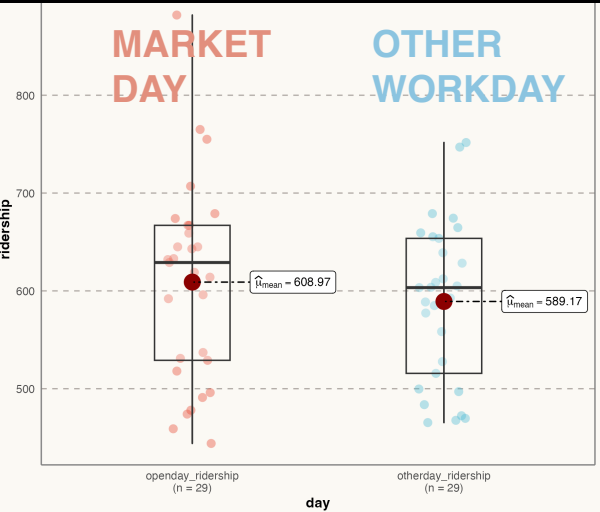
WEST END (p=0.36)



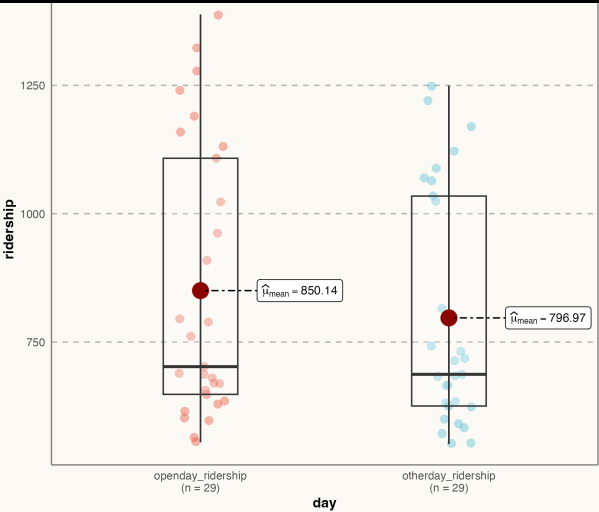
KENSINGTON (p=0.35)



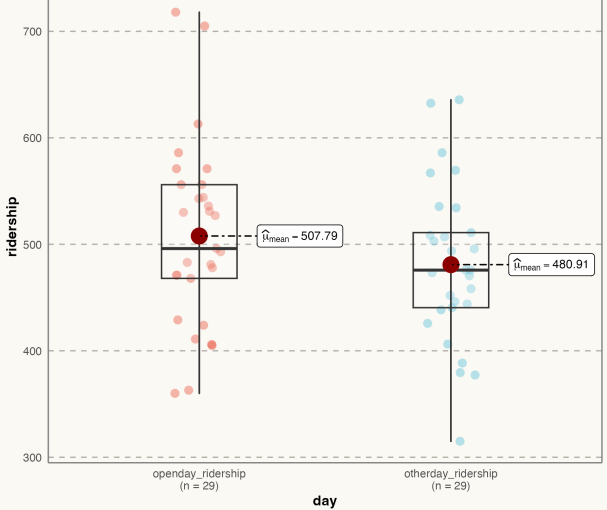
H.E. HOLMES (p=0.02**)



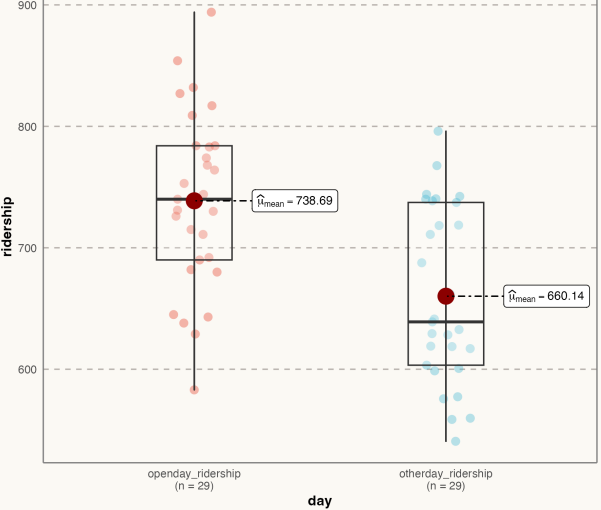
FIVE POINT (p<0.001***)



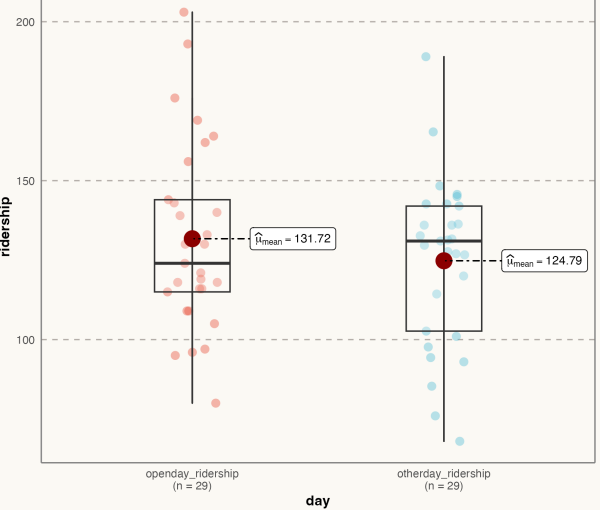
DORAVILLE (p=0.05*)



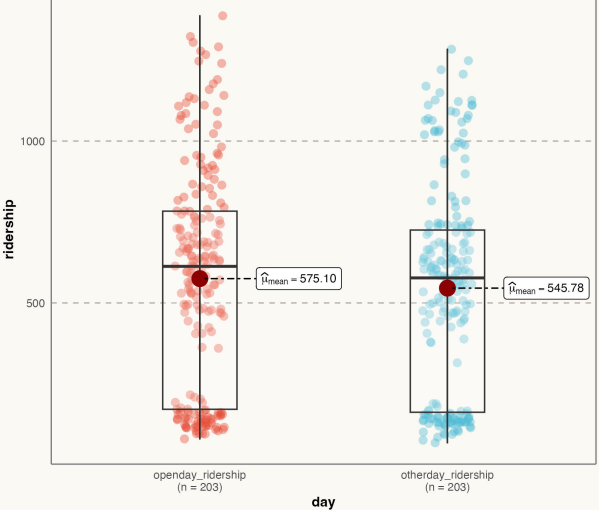
COLLEGE PARK (p<0.001***)



BANKHEAD (p=0.04*)



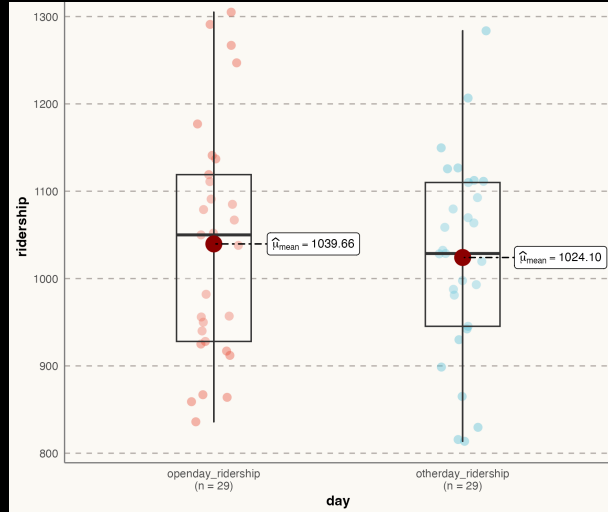
ALL (p<0.001***)



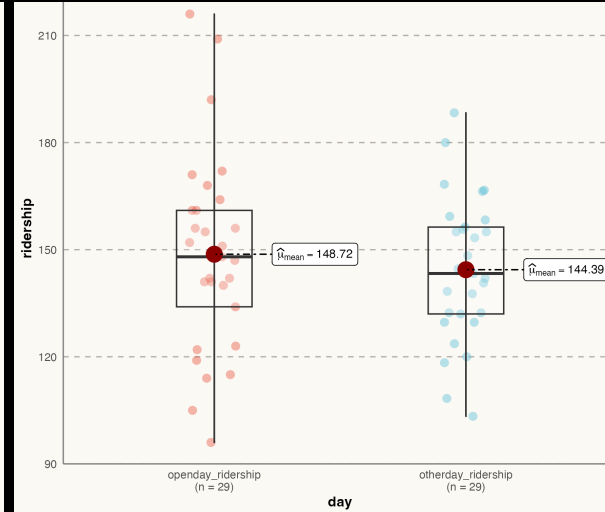
paired t-test, weeks = 29

Q1: public transit ridership (2023-04-03 to 10-16)

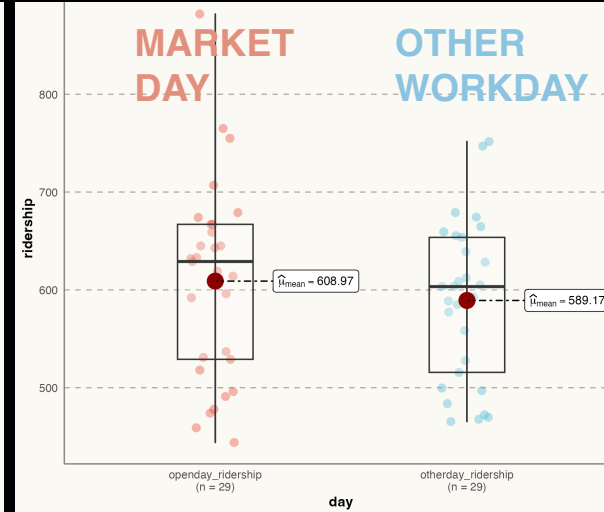
WEST END ($p=0.36$)



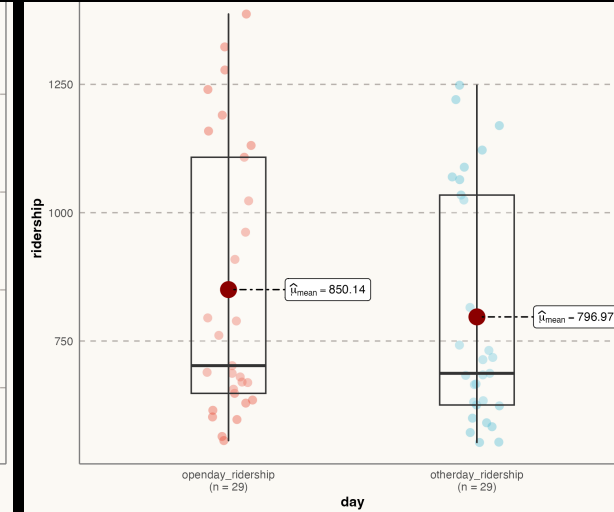
KENSINGTON ($p=0.35$)



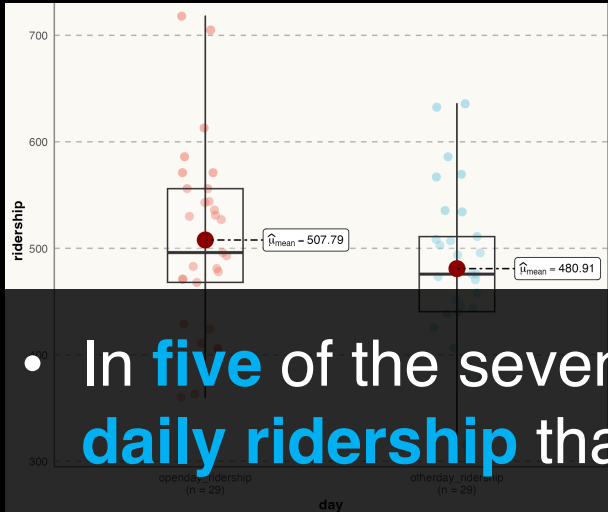
H.E. HOLMES ($p=0.02^{**}$)



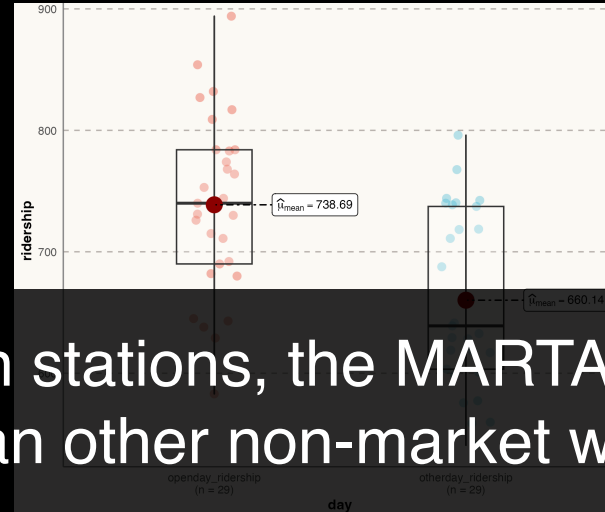
FIVE POINT ($p<0.001^{***}$)



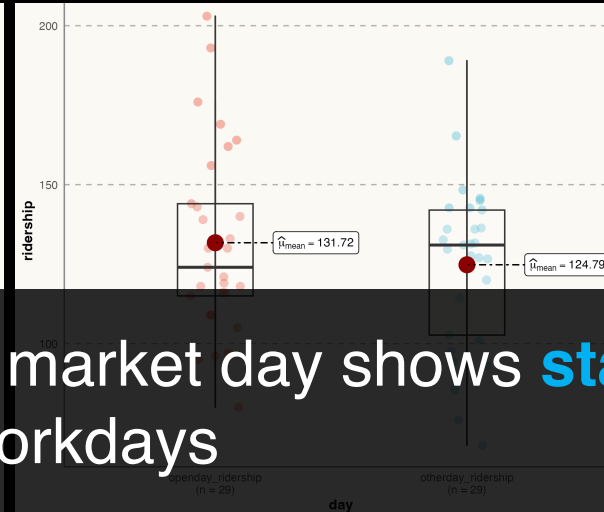
DORAVILLE ($p=0.05^{*}$)



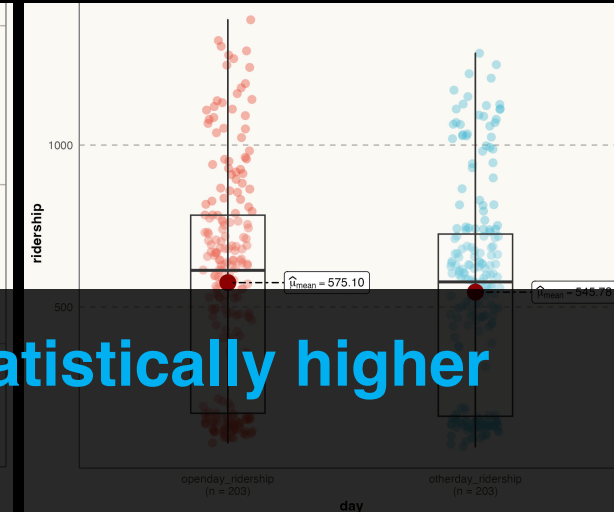
COLLEGE PARK ($p<0.001^{***}$)



BANKHEAD ($p=0.04^{*}$)

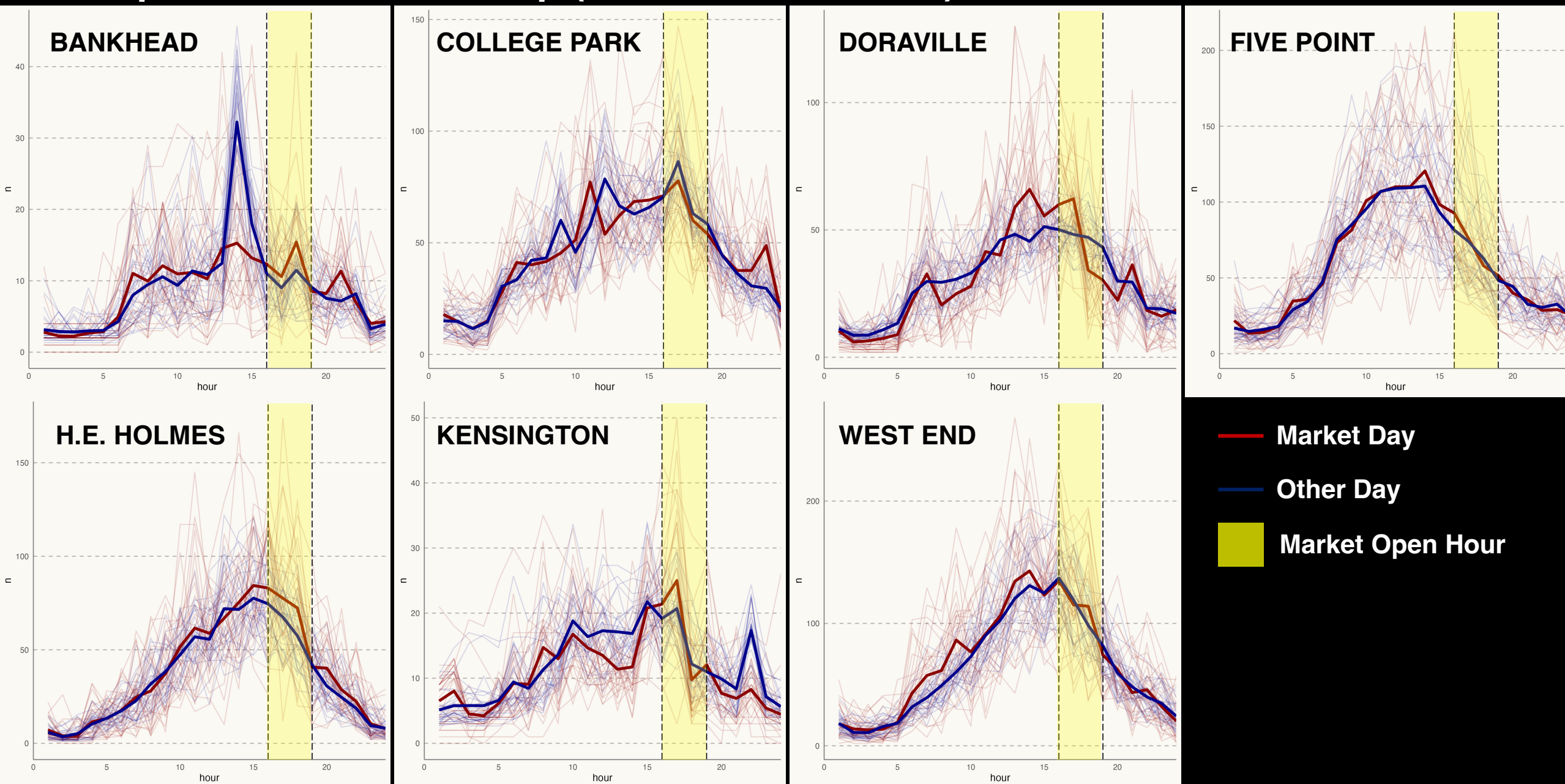


ALL ($p<0.001^{***}$)

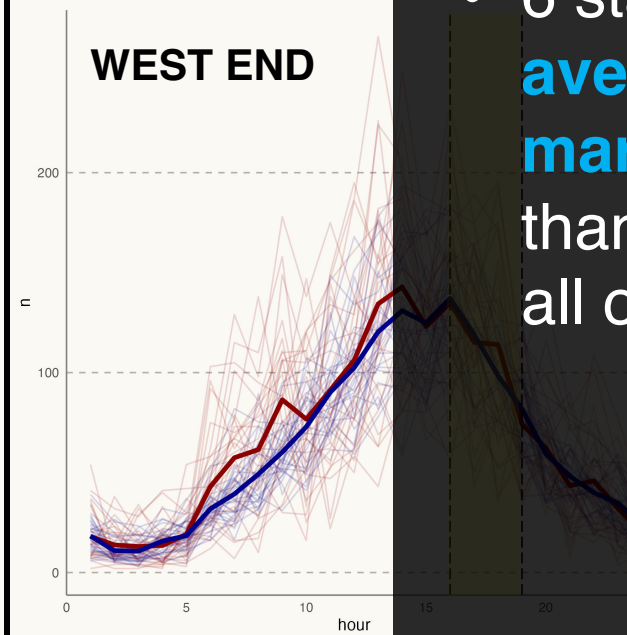
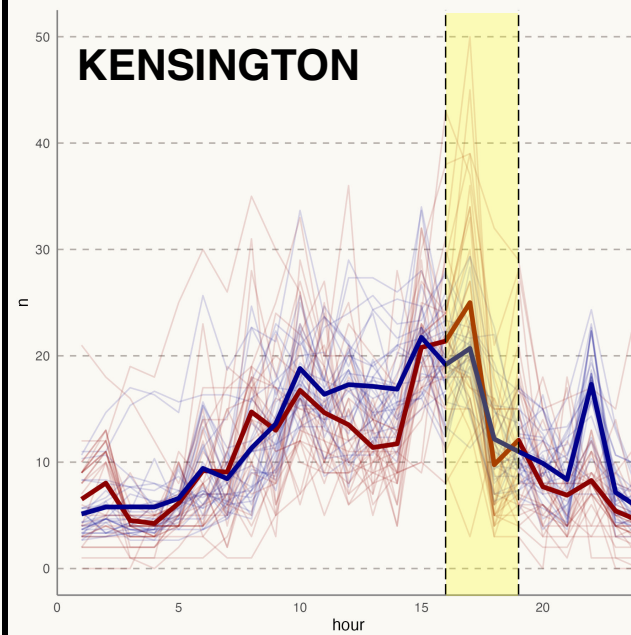
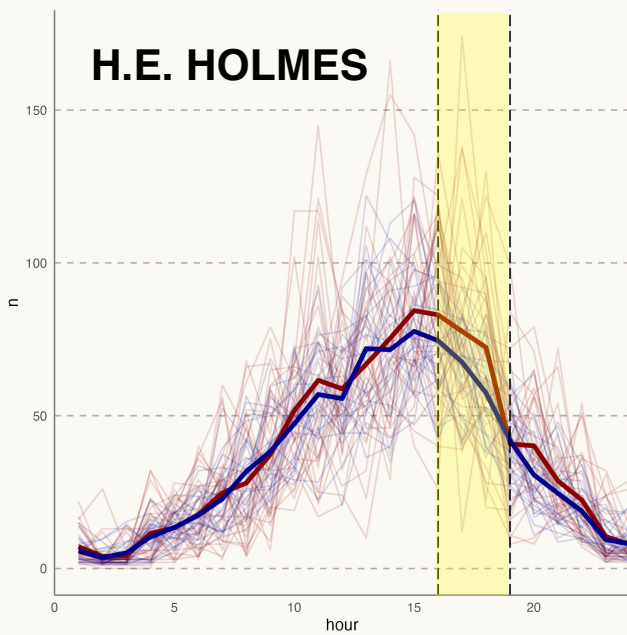
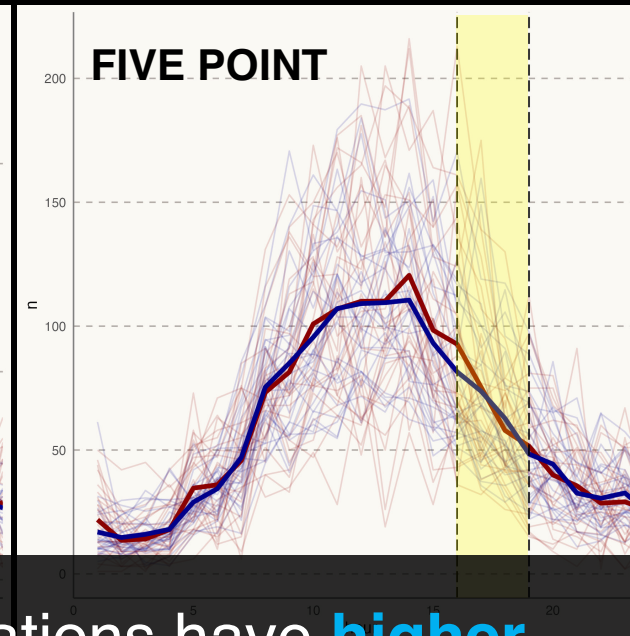
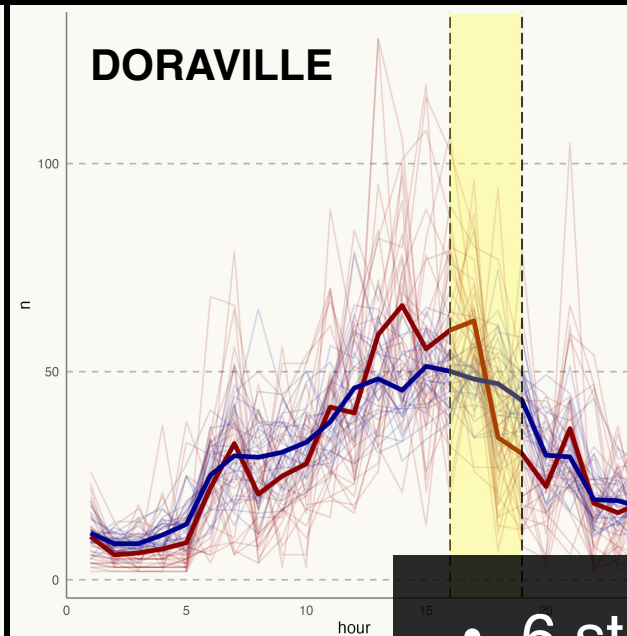
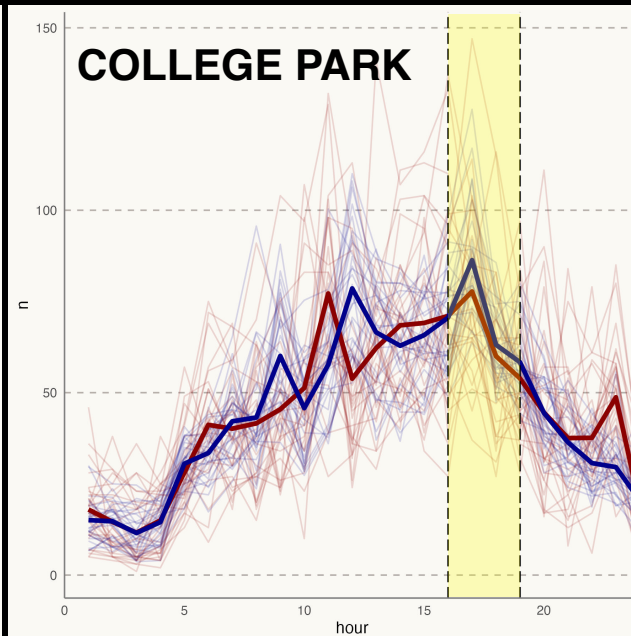
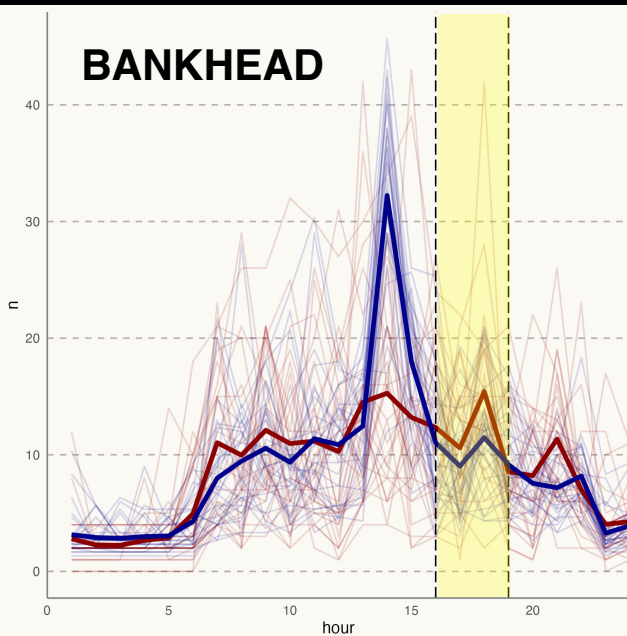


- In **five** of the seven stations, the MARTA market day shows **statistically higher daily ridership** than other non-market workdays

Q1: public transit ridership (2023-04-03 to 10-16)



Q1: public transit ridership (2023-04-03 to 10-16)



- 6 stations have **higher average visits during market hours (16-19)** than the same window on all other workdays.

Q2: behavioral change

- **Actively working on it**
- Some intermediate observations:
 - very little (highly oscillating) change in food-choice behavior during short study period;
 - confounded by strong external factors (COVID)

thoughts

- The direct effect of the MARTA market looks promising in its **direction**, while the **magnitude** of the effect needs further individual-level investigation and interpretation.
- The dose response may be hard to find in the quantitative model considering the data granularity/quality/confounding.., but is certainly worth probing with **qualitative methods** such as surveys.
- The food dimension needs to be consciously integrated into the discussion of **the public transit system expansion and revision** (on-demand transit, new light rail, grocery line, etc.)
- The impact of **the rise of online delivery** is yet to be revealed.
savior to the food apartheid, or another algorithmic punishment of the underserved?

Thank you!

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