Food Delivery as a Tool Against Food Deserts

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Pitch: https://drive.google.com/drive/folders/1EulaJcTj8SvTj_mIrN2FwZAmC3oeVAhe

Github Repository: https://tinyurl.com/mwmwyp2h

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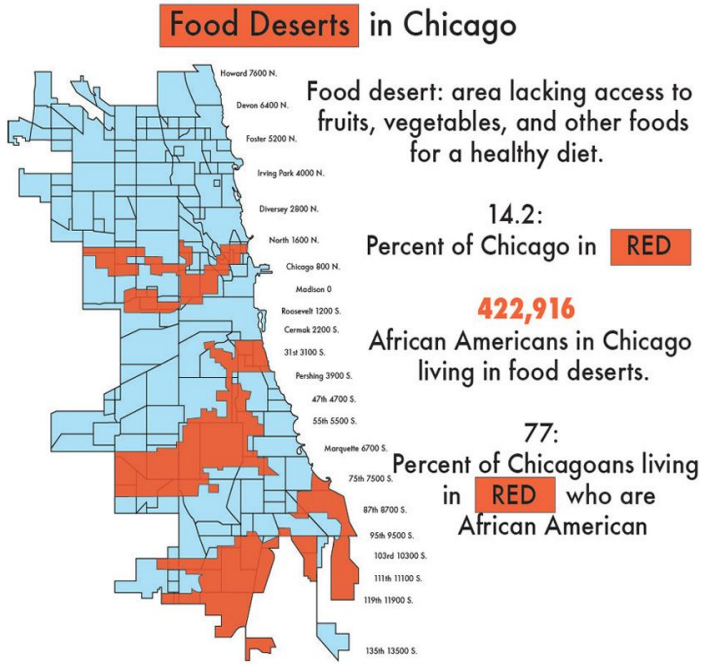
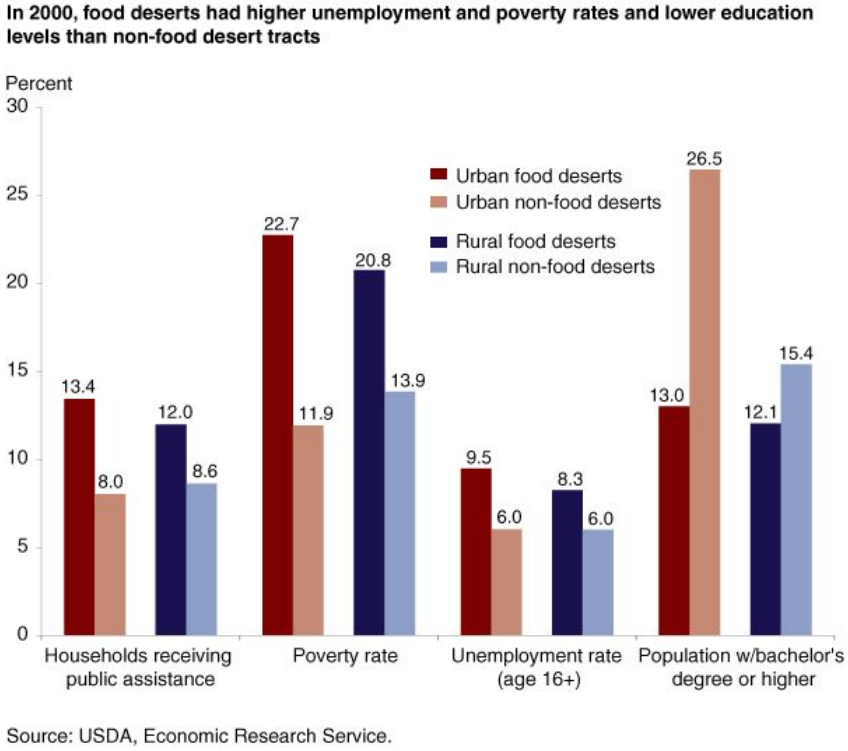
Problem

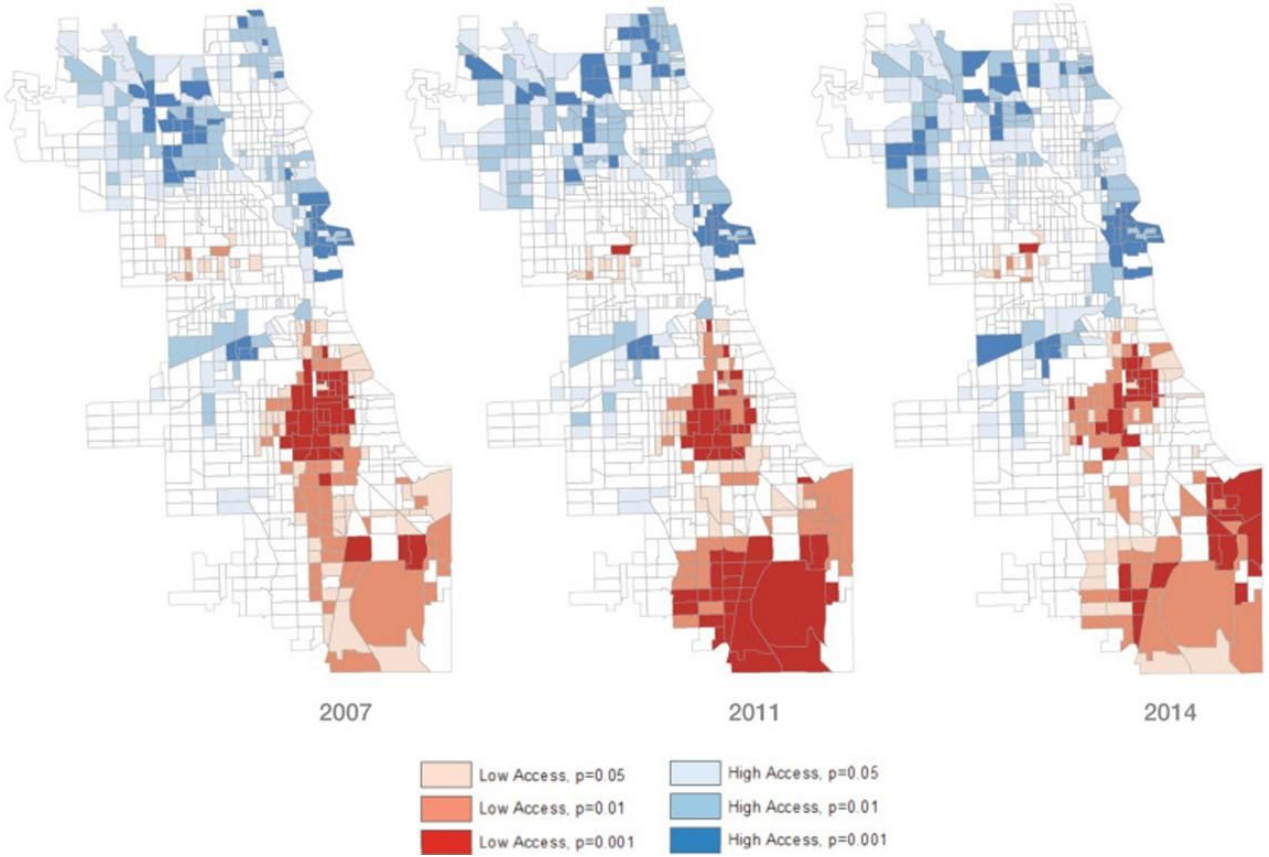
- Food deserts are areas with limited access to affordable, nutritious food.
- This problem affects approx. 39.5 million Americans (~11.6% of the US population).
- Online food and grocery delivery Stores seem to solve this problem to an extent, but issues of cost, digital access, and service availability mean not everyone benefits equally.



Why should others care?

- Public health impact
  - Food insecurity is linked to obesity, diabetes, cardiovascular disease, and other chronic conditions
  - COVID-19 accelerated digital food adoption, creating new opportunities and challenges
- Equity Considerations:
  - Only 37% of rural residents have access to major delivery services.
  - Cost, digital literacy, and broadband access create new forms of food inequality.
- Policy Implications
  - Supplemental Nutrition Assistance Program (SNAP) online purchasing expansion decisions
  - Mobile food market and delivery service integration strategies

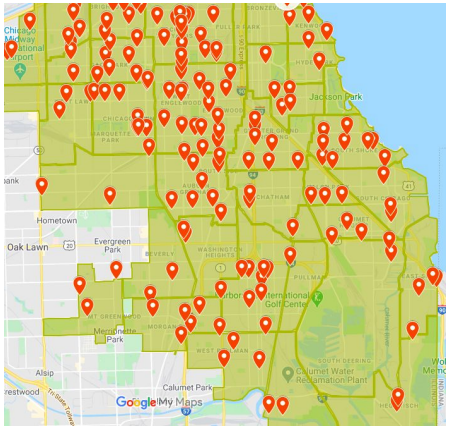




This map shows change over time of food deserts in Chicago.
Although more grocery stores opened, they did not aid areas of low food access. Source: Kolak et al. 2018

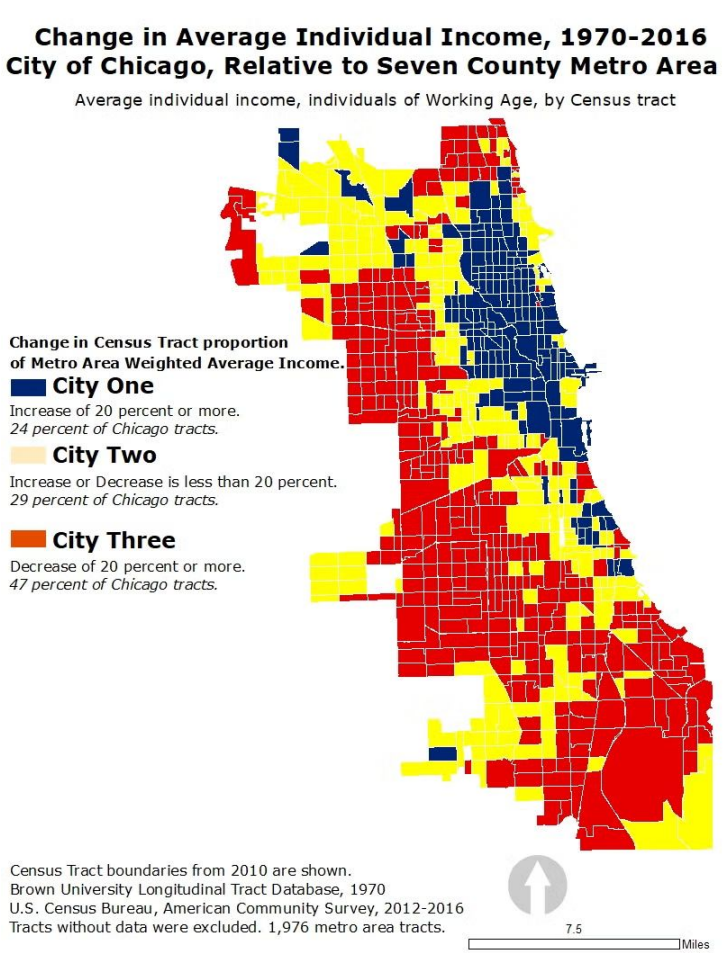
Our Idea

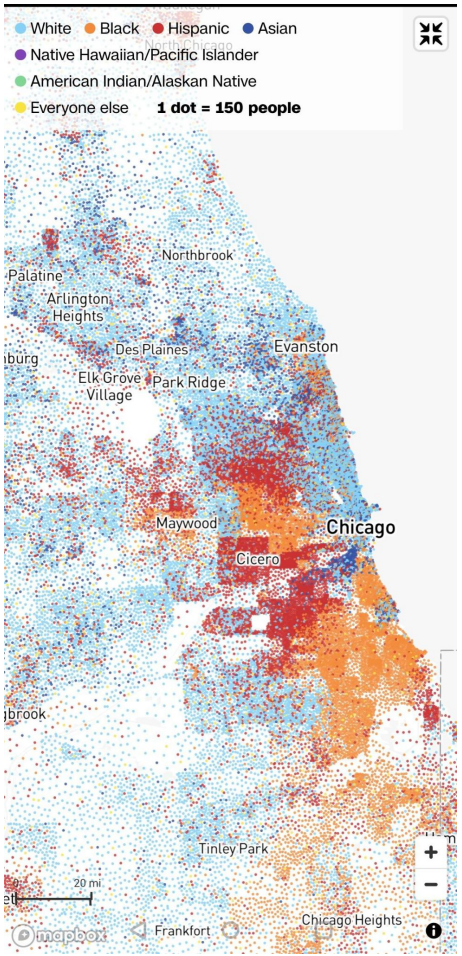
- With the rise of online food delivery services, we want to investigate the effects of these digital services on food deserts, and whether these digital services can or have effectively bridge food access gaps.



Hypothesis

- **H1:** Food delivery coverage is negatively correlated with traditional food desert metrics
- **H2:** Delivery services improve food access but may not address affordability barriers for low income populations
- **H3:** Income decline in food desert regions, contrasted with inflation-adjusted growth in wealthier Chicago areas, has widened food access disparities and is likely to worsen them further.
- **H4:** Rural and elderly populations face greater barriers to digital food access despite service availability
- **H5:** The growth of online grocery delivery services may reduce reliance on local grocery stores, leading to store closures and creation of new physical food deserts for populations .


Change in Average Individual Income, 1970-2016
City of Chicago, Relative to Seven County Metro Area
Average individual income, individuals of Working Age, by Census tract
Change in Census Tract proportion
of Metro Area Weighted Average Income.
City One
Increase of 20 percent or more.
24 percent of Chicago tracts.
City Two
Increase or Decrease is less than 20 percent.
29 percent of Chicago tracts.
City Three
Decrease of 20 percent or more.
47 percent of Chicago tracts.
Census Tract boundaries from 2010 are shown.
Brown University Longitudinal Tract Database, 1970
U.S. Census Bureau, American Community Survey, 2012-2016
Tracts without data were excluded. 1,976 metro area tracts.
7.5
Miles


White
Black
Hispanic
Asian
Native Hawaiian/Pacific Islander
American Indian/Alaskan Native
Everyone else
1 dot = 150 people
Northbrook
Palatine
Arlington Heights
Des Plaines
Evanston
Elk Grove Village
Park Ridge
Maywood
Chicago
Cicero
Tinley Park
20 mi
Frankfort
Chicago Heights
mapbox

Data

1. USDA Food Access Research Atlas (Food Deserts)
    a. 73,000+ rows of food desert identification data
    b. Key variables: Low income/access flags, poverty rates, distance to supermarkets
    c. URL: https://www.ers.usda.gov/data-products/food-access-research-atlas/download-the-data/
2. US Census Bureau API (Demographic Data)
    a. API: https://api.census.gov/data/key_signup.html
3. Federal Communications Commissions(FCC) Broadband Data Collection
    a. Fixed and Mobile availability data by state
    b. Download: https://broadbandmap.fcc.gov/data-download

4. Supplemental Nutrition Assistance Program (SNAP) Participation Data
    a. County Level Participation and Issuance Data
    b. State Level Participation and Issuance Data
    c. URL: https://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap

5. Delivery Coverage (Instacart, Doordash, Ubereats, Amazon etc.)
    a. Official APIs
    b. Manual Sampling
    c. Web Scraping

Expected Dataset Sizes

Dataset	Raw Size	Processed Size	Records
Food Access Atlas	15 MB	50 MB	~70k tracts
Census Demographics	Variable	100 MB	~70k tracts
Broadband Data	12 GB	200 MB	Aggregated to tracts
Geographic Files	500 MB	100 MB	Shapefile data
SNAP Data	10 MB	20 MB	3,000+ counties
Total Processed	~ 13 GB	~ 470 MB	~70k tracts

Solution Approach

Statistical Modeling:

- Multiple regression analysis of food access determinants
- Logistic regression for predicting underserved areas
- Time series analysis of delivery adoption trends
- Cost-benefit modeling of digital vs. traditional food access solutions

Geospatial Analysis:

- Map overlay of food deserts vs. delivery service coverage
- Spatial clustering analysis to identify service gap patterns
- Distance-based accessibility calculations

Expected Deliverables

Technical Outputs:

1. Predictive Models: Machine learning algorithms to identify areas most likely to benefit from intervention
2. Geospatial Database: Comprehensive dataset combining food access, delivery coverage, and demographic data

Research Outputs:

3. Policy Recommendations: Evidence-based suggestions for improving digital food access equity
4. Cost-Effectiveness Analysis: Comparison of delivery services vs. mobile food markets vs. traditional interventions