A New Way to Get Groceries? Ride-Hail Services and Navigating Outside of Food Deserts

A New Way to Get Groceries? Ride-Hail Services and Navigating Outside of Food Deserts

A Thesis Presented

by

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ABSTRACT

A NEW WAY TO GET GROCERIES? RIDE-HAIL SERVICES AND NAVIGATING OUTSIDE OF FOOD DESERTS

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Segregation has many negative consequences for marginalized populations, including poor health, increased poverty, low-quality housing, and limited education and employment opportunities. Scholars have recently recognized access to food as another piece of this "advanced marginality." This study illuminates how lagging food and transportation infrastructures exacerbates these interlocking inequalities and whether new ride-hail technologies' promise that ride-hail services like Uber and Lyft will help affected populations access food stores with lower prices and higher food quality. As a descriptive understanding of the intersection between food, transportation, and racial residential segregation in Chicago, Illinois, this study analyzes two questions: (1) how often are ride-hail trips crossing food desert census tract boundaries; and (2) are ride-hail trips that cross food desert census tract boundaries accessing food stores? Using spatial analyses of the City of Chicago's ride-hail transportation data, food store location data, American Community Survey data, and USDA food desert classification data, this study finds that ride-hail services are accessing food desert neighborhoods, but they are doing

so at a very low rate, and very few ride-hail rides are used to access food stores after departing from food desert neighborhoods.

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INTRODUCTION

After World War II, federal programs funded the construction of single-family homes in suburban areas to encourage white and middle-class urban residents to move out of urban areas (Jackson 1985). Following this exodus, shopping centers and malls were built in suburban areas, and previously urban-located stores moved, furthering the decentralization of urban areas. Deindustrialization, best understood as the globalization of the manufacturing industries and their movement out of rust-belt cities, left urban areas with few jobs and corporations. The remaining employment opportunities in urban areas were predominantly service-producing, rather than the previous goods-producing in the industrial companies, which requires higher educational attainment that is uncommon amongst urban residents of color (Wilson 2012:39). The decrease in employment opportunities, and the exodus of mostly white middle-class residents, resulted in increases in urban unemployment and poverty. Sociologists and other scholars have studied the resulting concentrated poverty among Americans of color within metropolitan areas, finding a combination of social and policy changes resulting in said concentrated poverty: deindustrialization, inner-city capitalist disinvestment, global and national economic transformation, and institutional racial inequality and segregation (Gotham 1998; Kasarda 1990; Quadagno 1994; Massey and Denton 1993; Massey 1990; Wilson 2012).

Following the beginnings of deindustrialization and the white exodus, supermarkets followed suit, leaving inner cities for the suburbs. In the early 1980s, supermarket companies faced mergers and buyouts, affecting 80% of the top national

chains, which further affected supermarket locations in inner cities. Following this, most large chain supermarkets left inner cities, leaving urban residents with convenience stores, bodegas, and mom and pop shops as their main source of groceries (Deener 2020). These shops are often lacking in fresh produce and meat, and the prices are often higher than those in large chain supermarkets. The loss of supermarkets leaves those who can least afford groceries to pay more for them. These macro-economic forces generated food deserts, a concept for understanding food access, which is further discussed below.

Researchers have looked at the relationships between food deserts and various life outcomes (i.e., diabetes, obesity, fruit and vegetable consumption, etc.) as well as relationships between food deserts and racial disparities (Black and Macinko 2008; Walker et al 2010; Millstein et al 2009). Others have analyzed mobility and transportation access in low-income neighborhoods (Barton and Gibbons 2017; Atkinson-Palombo et al. 2019; Dillahunt et al. 2017; Chicago MTA 2021). While the literature on racial residential segregation and poverty is extensive, and the literature on food deserts and transportation are each becoming increasingly extensive, no study has looked at ride-hail transportation access in low-income food desert neighborhoods and its connection to accessing food stores. This paper focuses on the extensive literature on urban disinvestment, racial residential segregation, transportation access, and food deserts using data from the American Community Survey, the USDA's Food Desert classification atlas, Chicago's ride-hail trip log, and Data Axle Reference Solution's business database. Together, these literatures and data are used to answer three key questions: (1) do ride-hail services like Uber, Lyft, and taxis access food desert census

tracts; (2) how often are ride-hail trips crossing food desert census tract boundaries; and (3) are ride-hail trips that cross food desert census tract boundaries accessing food stores?

CHAPTER 2

BACKGROUND

A. Urban Disinvestment and Racial Residential Segregation

Racial residential segregation continues to affect the lives of Americans of color, despite the minimal public conversation. The end of legal housing market discrimination and the passage of the 1968 Fair Housing Act ended this conversation due to many thinking these legislative changes were the beginning of the end of racial residential segregation (Charles 2003). Racial residential segregation negatively affects how residents of color access necessary resources, thus impacting their quality of life. Residential segregation is an important barrier to equality, as it restricts the development of social interaction and cohesion, and it ensures restricted access to public and private facilities (Taeuber and Taeuber 1965).

Segregation is worthy of continued conversation because of its direct ties to structural inequalities. Segregated neighborhoods often have minimal access to adequate resources including well-paying employment opportunities, affordable and healthful food stores, and adequate education institutions, while also having higher levels of poverty, joblessness, low-wage jobs, and female headed families than white neighborhoods (Peterson and Krivo 2010). Neighborhoods that are subjected to these disadvantages limit the economic success and life chances of their residents.

Despite the passage of the 1968 Fair Housing Act, residential segregation remains very high for Black Americans, and it has increased for Latinx and Asian Americans in

many metropolitan areas that have seen growth in these populations (Krysan and Crowder 2017). These neighborhoods generally have access to the bare minimum of electricity and water, but the quality of these resources is suboptimal, and the cost of energy is often higher (Drehobl et al. 2020). Food store accessibility on the census block and neighborhood level is also inequitable for neighborhoods of color (Galvez et al. 2008; Morland and Filomena 2007; Moore and Diez Roux 2006; Morland et al. 2002).

In Chicago, urban disinvestment and economic restructuring resulted in residents of segregated neighborhoods having limited access to necessary resources. These shifts directly impacted housing, and access to food, education, and employment. Chicago's manufacturing industry once provided employment for most of the Black community (Drake et al. 1970), but the industry began hemorrhaging jobs in the city in the 1970s (Wacquant and Wilson 1989). Chicago was home to approximately 1.4 million private sector jobs in the late 1960s, but that number decreased by approximately twenty percent or 280,000 jobs by 1983 (Chicago Tribune 1986). Between 1970 and 1982 alone, approximately twenty-four percent of Chicago's factories either closed or moved out of the city (ibid). Deindustrialization was further facilitated by well-known mid-century trends, like federal and state government policies (Schmachtenberger 2021), investments in suburban development (Bradford and Rubinowitz 1975), and investments in transportation infrastructure in higher income areas (Farmer and Noonan 2013). This focus on suburban areas neglected the needs of those who live in urban areas, leaving them with limited access to employment, transportation, and food stores.

B. Transportation and Food Deserts

As early as the creation of cable cars, the beginning of transportation increased real estate development, rather than create city-wide mass transportation (Farmer and Noonan 2013). One postindustrial transformation of Chicago was the creation of the transportation grid (Berry and Kasarda 1977). The transportation grid aided population deconcentration of the inner city and economic development of Chicago's suburbs. The shift in focus from urban to suburban areas left inner-city residents with limited access to resources by limiting their access to public transportation. In hopes of aiding in the mobility of low-income urban residents, the city of Chicago passed the 1964 Urban Mass Transportation Act. While this act had positive intentions for low-income residents, funding was used to improve transportation for affluent residents instead.

Access to bus and heavy-rail service has decreased for low-income, working-class, communities of color. Black Americans are the largest racial group to use public transit (Anderson 2016), and changes in public transportation disproportionally affect them. Chicago's Green Line, which services the South Side, has the largest distance between stops (1.5 miles), and these stops are in predominantly low-income, Black areas. Chicago's Red Line service, which also serves the south side, ends before the city limits, leaving 35 blocks of residents underserved.

The inaccessibility of public transportation, coupled with urban disinvestment and racial residential segregation, furthers the disadvantage of segregated, low-income neighborhoods of color and restricts access to necessary resources like food stores. Neighborhoods with limited access to transportation also have limited access to food stores due to the locations of stores and the lack of transportation. Neighborhoods of

color often have greater numbers of grocery and convenience stores (Raja et al. 2008; Moore and Roux 2006), and bodegas account for approximately 89% of food stores in predominantly Black areas and 79% in racially integrated areas (Morland and Filomena 2007). Food store location is important because grocery and convenience stores have higher prices than supermarkets for the same food. Furthermore, low-income neighborhoods are lacking in private and public transportation that would aid in accessing lower-priced food stores, leaving them to purchase groceries at higher prices in their local neighborhoods.

The United States Department of Agriculture has deemed neighborhoods like these as food deserts. Food desert neighborhoods are both low-income and have a substantial number of residents that do not have easy access to a supermarket or large grocery store (Wright 2021). In addition to higher prices, food stores in low-income neighborhoods of color offer lower-quality foods and foods with limited nutritional value. These stores are less likely to carry all types of fruits and vegetables, and they are more likely to carry canned produce (Morland and Filomena 2007), which contain high levels of sodium. In addition, stores in these neighborhoods are less likely to carry low-fat dairy products, low-fat ground meat, whole grain products (Jetter and Cassady 2006), and diabetes-friendly foods (Horowitz et al. 2004).

While benefits from the Supplemental Nutritional Assistance Program (SNAP) monetarily aid low-income individuals and families, food store geography limits access to stores with nutritious and affordable foods. For instance, there is limited use of SNAP benefits in predominantly Black areas due to the absence of supermarkets that accept these benefits (Rigby 2012). To access food stores that have lower prices and accept

SNAP benefits, residents of low-income neighborhoods must travel to the white areas in which the stores are located (Ver Ploeg 2010).

C. Ride-Hail Services

The idea that residents of low-income neighborhoods of color can leave their neighborhoods to access lower-priced and higher-quality foods comes with the assumption that they have access to private or public transportation. Tech companies have recently promised that ride-hail services like Uber and Lyft will provide alternative ways to access food stores (Stern 2019). Lyft has acted on this promise by partnering with local nonprofits and grocery stores to build the "Lyft Grocery Access Program" (Lyft 2019). This program aims to help those who don't have reliable transportation to access food stores by providing discounted rides. Lyft has made an example of how ride-hail applications can help people in low-income areas access resources.

Ride-hail services have grown both in size and popularity in the last decade, providing fast, more immediate, and often safer, mobility options. Ride-hail companies Uber and Lyft provided 12 million daily rides with 2.61 billion passengers around the world in 2017 (Carson 2018; Schaller 2018). A strong association between ride-hail usage and vehicle ownership shows that ride-hail services provide mobility in areas where personal vehicle ownership is low, replacing much of the taxi industry (Brown 2018).

Taxis have previously provided an essential service to people in low-income neighborhoods, but the industry has a history of discrimination against riders of color, especially against Black riders and riders located in Black neighborhoods. Taxi drivers often avoid serving communities of color (LaMendola 1991; Brown 2018), and they are

less likely to pick up a Black rider than a white rider (Wrigley 2013; Belcher and Brown 2015). Black riders were also 73 percent more likely to have their trip canceled, and they were more likely to have longer wait times than white riders (Brown 2018).

The introduction of ride-hail services has taken over much of the business that the taxi industry once had. With the replacement of taxi services with ride hail services, one might hope that the discrimination found among taxi drivers dissipated with the industry. Recent research has shown that racial-ethnic discrimination has dissipated in ride-hail services (Brown 2018), while others assert similar discriminatory practices as taxis (Ge et al. 2016). Ride-hail drivers in Boston and Seattle have been found to cancel rides at a higher rate when the riders had first names that sounded "African American" to drivers (Ge et al. 2016).

In addition to racial biases, ride-hail services also have set price differences depending on demographics of the pick-up areas. In a recent study of Chicago, Panadey and Caliskan (2020) found four ways in which riders face social biases in pricing: (1) if riders are picked up or dropped off in an area with a low percentage of residents over the age of 40; (2) if riders are picked up or dropped off in an area with a low percentage of residents with a high school degree or less; (3) if riders are picked up or dropped off in a neighborhood with a low percentage of houses priced less than the median house price in Chicago; or (4) if riders are dropped off in a neighborhood with a low percentage of white residents.

The relationship between ride-hail services and driver biases is complex. Mentioned studies have shown that ride-hail services are serving cities in very important ways, but these services also harm those who may need them the most. It's unclear

whether ride-hail services serve residents of low-income areas with limited transportation access. Racial biases impede services in Boston and Seattle (Ge et al. 2016), while serving almost 100% of Los Angeles County (Brown 2018).

Ride-hail services may be a viable option for many Americans who don't have access to a personal vehicle or reliable public transportation. In this case, understanding the spatial distribution of residents and resources across Chicago is important when analyzing how said residents access resources, specifically food stores. Because the spatial distribution of Chicago residents is racially segregated, residents of color or residents in lower-income areas may face bias in receiving or paying for ride-hail services. The following descriptive analyses are guided by the following questions: (1) do ride-hail services like Uber, Lyft, and taxis access food desert census tracts; (2) how often are ride-hail trips crossing food desert census tract boundaries; and (3) are ride-hail trips that cross food desert census tract boundaries accessing food stores?

CHAPTER 3

DATA & METHODS

A. Data

The descriptive analyses used in this study include four sources of data. Each source of data provides an important insight into ride-hail trips and the neighborhoods they access. The first dataset is provided by the City of Chicago's open data portal, which provides up-to-date data on various city services, and this study utilizes its dataset that contains ride-hail trip data. This dataset includes Uber, Lyft, and taxi pick-up and drop-off times, dates, longitude and latitude points, as well as other variables for quality of

ride, time rating, and price of trips. I downloaded this dataset for the time period of January 1, 2019, to December 31, 2019. This dataset contains data for 7,320,963 ride-hail trips. This dataset was adjusted to only include rides with complete data for each of the variables, which decreased the number of observations to 4,882,625. The individual longitude and latitude coordinate variables were also adjusted to create longitude and latitude coordinate points for pick-up and drop-off locations, with each point being approximately 111 meters. This dataset provides the essential data for where residents of Chicago are utilizing ride-hail services.

The second dataset used is the United States Department of Agriculture's (USDA) food desert atlas data. This data includes census tracts in the United States for the year 2015, and each tract is categorized by poverty rates and access to food stores. The USDA categorizes census tracts as food deserts if they are both low-income and have "a substantial number of residents that do not have easy access to a supermarket or large grocery store" (Wright 2021). Easy access is measured as having one of these food stores located within a mile or half a mile of the census tract. The low-income status of census tracts is determined by the Department of Treasury's New Markets Tax Credit (NMTC) program. This program defines census tracts as low-income when: (1) the poverty rate is 20 percent or higher; or (2) the median family income is less than or equal to 80 percent of the state-wide median family income; or (3) the tract is in a metropolitan area and has a median family income that is less than or equal to 80 percent of the metropolitan area's median family income (USDA 2022). This dataset contains all food desert census tracts in Cook County, IL, where Chicago is located, and when it was merged with the ride-hail data, only Chicago census tracts remained. When identifying whether a ride-hail trip has

accessed a food desert neighborhood, this USDA data, coupled with ride-hail data, identifies whether rides have crossed the boundaries of food desert census tracts.

The USDA food desert atlas data, coupled with the Chicago ride-hail transportation data, was merged with data from a third dataset for racial demographics and family income from the 2019 American Community Survey (ACS). This third dataset was incorporated into this study because the food desert data did not have racial demographics included, and the included family income and poverty rates were for 2015. Both 2015 and 2019 ACS family income data were compared and there was very little difference between the two. Using updated family income data and creating poverty rates for census tracts allows for a more accurate representation of the census tracts that were accessed by ride-hail services in 2019.

Food store location data is provided by Data Axle Reference Solutions (formerly ReferenceUSA). This dataset includes longitude and latitude points, names of stores, addresses, and other administrative data like manager names and phone numbers for food stores. Data Axle Reference Solutions provides historical business losings, which I used to access food stores in Chicago for the year 2017. Data from 2017 is used because it is two years from each of the other datasets. Having store location data closer to 2015 than 2019 allows for fewer discrepancies between food desert classifications. Similarly, having food store location data closer to 2019 than 2015 allows for fewer discrepancies in pick-up and drop-off locations due to business closures. Using Standard Industrial Classification (SIC) codes, which are used to categorize businesses, I filtered data for the stores in Chicago that were categorized under SIC codes for non-wholesale food stores. Before removing mischaracterized food stores, this dataset contained 907 food stores.

After removing any stores that are not convenience stores, bodegas, supermarkets, and other food stores, 732 stores remained.

Table 1: Standard Industrial Classification (SIC) Codes

SIC Codes	Associated Businesses
541101	Supermarkets
541105	Retail Grocers
541103	Convenience Stores

B. Methods

The datasets outlined above were merged to make one final dataset with ride-hail trip data, census tract demographics, and food store access. I began these analyses with only keeping complete cases of ride-hail data. In the ride-hail data, longitude and latitude coordinates were separate variables for both pick-up and drop-off locations, and I merged them to create one longitude and latitude coordinate point for each pick-up and drop-off locations. The longitude and latitude coordinates were enlarged to match across datasets, and they cover approximately 111 meters, or 364 feet. These coordinates were used to merge with the food store location data twice to create two dichotomous variables: (1) *DOstore,* which has a value of "1" when the ride-hail trip ended at a coordinate point matching that of a food store; and (2) *PUstore,* which has a value of "1" when the ride-hail trip began at a coordinate point matching that of a food store. By creating these variables, each ride-hail ride can be categorized based on whether it accessed a food store.

Two additional dichotomous variables were created to indicate whether individual ride-hail rides accessed food desert neighborhoods, *startFD* and *endFD*. Similarly to *PUstore* and *DOstore*, *startFD* had a value of "1" when the rides started in a food desert,

and *endFD* had a value of "1" when the rides ended in a food desert. These two variables were used to create subsets for reach of the four subcategories of rides: (1) rides that begin in a food desert and end in a non-food desert; (2) rides that begin in a non-food desert and end in a food desert; (3) rides that begin and end in a non-food desert; and (4) rides that begin and end in a food desert. This process was conducted twice: once for ride-hail trips that accessed food stores and once for all ride-hail trips regardless of origin and destination.

To analyze the demographics of the neighborhoods accessed by ride-hail services, the 2019 ACS data was narrowed to only contain measurements of poverty, race, and family income. Both 2015 and 2019 ACS data were analyzed to decide which would be more appropriate for analyses of the entire dataset, and because there was very little difference, 2019 was chosen to match the year of the ride-hail data. Each observation in the final dataset is a complete ride-hail trip accompanied by a trip ID, and it includes (1) the pick-up and drop-off locations in longitude and latitude coordinates, census tract number, and community area; (2) the cost of the trip; (3) whether the trip started or ended in a food desert; (4) what store was accessed if applicable; and (5) median family income, percent nonwhite, and poverty rates for pick-up and drop-off census tracts.

Joining all four datasets allowed for descriptive analyses of all ride-hail rides. Each individual ride has data on pick-up and drop-off location, which provides insight into the racial and economic demographics of the neighborhoods, as well as categorization as food deserts or non-food deserts. Coupled with grocery store locations, the locations of pick-up and drop-off allow for analyses of types of neighborhoods and stores accessed by ride-hail applications. This final dataset contains 4,882,625 ride-hail

rides, and of these rides, 658,162 accessed a food store of some kind, and 28,026 accessed both a food desert neighborhood and food store.

CHAPTER 4

FINDINGS

A. Ride-hail Trips

Residents of low-income neighborhoods in Chicago face difficulties in accessing necessary resources due to residential segregation and inaccessible public transportation. Because these neighborhoods are often missing food stores with lower-cost, nutrient dense foods, residents must either pay the increased costs or exit their neighborhoods to find better stores. It has been asserted that ride-hail rides help people access food stores, but previous research has shown mixed evidence of ride-hail services in low-income areas (Ge et al. 2016; Brown 2018). This descriptive analysis focuses specifically on Chicago and ride-hail trips in 2019.

To understand how ride-hail rides access food desert neighborhoods, the trips are split up into four types. Table 2 shows neighborhood demographics and ride-hail information by type: (1) rides that pick-up in a food desert and drop-off in a non-food desert; (2) rides that pick-up in a non-food desert and drop-off in a food desert; (3) rides that pick-up and drop-off in non-food deserts; and (4) rides that pick-up and drop-off in a food desert. Food desert neighborhoods accessed by ride-hail services had an average poverty rate of 27 percent, which is 8 percent higher than Chicago's overall poverty rate (U.S. Census Bureau 2019). The median family income for Chicago was $62,682, while the median family income for food desert neighborhoods was $58,912. These

neighborhoods also had high percentages of residents of color, accounting for between 67 and 81 percent of the populations.

Ride-hail trips that only accessed non-food desert neighborhoods had median family incomes of approximately $142,000, which is more than double the median family income for both the city and for food desert neighborhoods, which were roughly $59,000 and $63,000, respectively. The poverty rates of non-food desert neighborhoods were low, with percentages between 11 and 15 percent, which is approximately 13 percent lower than poverty rates in food desert neighborhoods. Non-food desert neighborhoods had smaller populations of people of color, with percentages between 29 and 42 percent, which is about 20 to 40 percent lower than food desert neighborhoods. Ride-hail rides in these neighborhoods account for 4,475,282 rides, or 91 percent of all rides in 2019.

Ride-hail trips that crossed food desert neighborhood boundaries show the very real differences between food desert and non-food desert neighborhoods. The rides that originate in food desert neighborhoods and arrive in non-food desert neighborhoods have the highest costs and the highest ride times ($10.97 and approximately 19 minutes). These rides also have the greatest difference in racial demographics between pick-up and drop-off neighborhoods, with people of color accounting for 42 and 68 percent of the population in non-food desert and food desert neighborhoods, respectively. These rides account for just over 8 percent of all ride-hail rides in 2019, showing that very few rides are crossing food desert neighborhood boundaries.

Finally, ride-hail rides that picked-up and dropped-off riders in food desert neighborhoods, whether that be the same neighborhood or different, accounted for approximately 1.5 percent of all ride-hail rides in 2019. These rides also had the lowest

costs and shortest ride times ($8.90 and 15 minutes), showing that food desert neighborhoods are often clustered within racially and economically segregated areas.

Table 2: Ride-Hail Rides in Chicago 2019 with Demographics

		FD-NFD (n = 185758)	NFD-FD (n = 185099)	NFD-NFD (n = 4475282)	FD-FD (n = 36585)
Distance		5.49	5.45	4.57	4.40
Poverty	Origin	0.25	0.15	0.11	0.27
	Destination	0.15	0.25	0.11	0.27
Income	Origin	63231.29	129668.43	161593.14	52921.71
	Destination	115636.00	64984.43	161990.14	54511.29
Percent Minority	Origin	0.68	0.44	0.29	0.81
	Destination	0.42	0.67	0.29	0.81
Cost		10.97	10.94	10.97	8.90
Ride Time		1156.43	1082.57	995.79	900.13
Tip		0.41	0.41	0.61	0.18

N = 4,882,625

B. Ride-Hail Trips to Grocery Stores

While looking at ride-hail rides by food desert classification shows us where rides are originating and ending, the introduction of grocery store location data allows for better understanding of the relationship between ride-hail services, food desert neighborhoods, and accessing food stores. Table 3 shows the differences in ride-hail trips across all four types of rides to grocery stores. In ride-hail trips that access a food store and both a non-food desert and a food desert neighborhood, the median family income differs by approximately $90,000. In other words, when a ride-hail ride accesses both types of neighborhoods while transporting a rider to or from a food store, the non-food

desert neighborhood has a median family income approximately $90,000 greater than the food desert neighborhood. This income gap is nearly three times that of the gap between the same type of neighborhoods accessed by ride-hail rides without food store distinctions. In addition, the poverty rates are nearly double in areas that are food deserts than those of non-food deserts, with approximately 19 percent in food deserts and 10 percent in non-food deserts. The racial demographics of food desert and non-food desert neighborhoods also differ, with populations of color accounting for approximately 56 percent and 31 percent, respectively. These trips also have the longest distances with mileage between 7.36 and 7.79 miles and the highest cost, with an average price that is close to $15. The rides that access food desert and non-food desert neighborhoods, while also accessing a food store, have stark differences in income, poverty rates, racial demographics, trip mileage, and cost. Non-food desert neighborhoods have higher incomes, lower poverty rates, and lower percentages of residents of color.

The number of ride-hail trips differs across the four types of rides with rides only accessing non-food desert neighborhoods being the predominant type of ride. These rides account for approximately 95.5 percent of ride-hail rides that access food stores. Rides that crossed food desert neighborhood boundaries account for just over 4.25 percent of all rides to food stores, and they have the highest costs.

Trips to grocery stores that only access food desert neighborhoods have the highest percentages of residents of color, accounting for between 58 and 60 percent of the neighborhood population. The cost of these rides averages around $8.82, which is approximately $6 cheaper than accessing a food store by crossing a food desert boundary. These rides are also shorter in time, with the average trip being approximately 14

minutes, which also saves about seven minutes in trip time in comparison to crossing food desert boundaries.

Ride-hail trips that access both food desert neighborhoods and food stores in non-food desert neighborhoods in Chicago are not zero, but they're infrequent in comparison to other types of rides. These rides account for a mere 0.6 percent of all ride-hail rides in Chicago in 2019. Without the distinction of accessing a food store, ride-hail trips that access food desert neighborhoods are still low, being just 8 percent. Residents of food deserts are using ride-hail services at a relatively low rate, and the ride-hail market is dominated by those in higher-income, non-food desert areas that are deemed more desirable by parent companies. Traveling between non-food desert neighborhoods to access food stores is only about four miles, while the distance across food desert boundaries is about 7.5 miles. Traveling between non-food desert and food desert neighborhoods both costs more and takes longer to access a food store.

Table 3: Ride-Hail Rides Accessing a Grocery Store in Chicago 2019, with Demographics

		FD-NFD (n = 185758)	NFD-FD (n = 185099)	NFD-NFD (n = 4475282)	FD-FD (n = 36585)
Distance		7.36	7.79	3.86	4.18
Poverty	Origin	0.18	0.10	0.08	0.17
	Destination	0.10	0.19	0.11	0.16
Income	Origin	69774.56	164242.56	176403.01	61154.24
	Destination	163627.09	72064.71	174073.86	63128.60
Percent Minority	Origin	0.56	0.31	0.28	0.60
	Destination	0.31	0.56	0.29	0.58
Cost		13.76	15.37	10.17	8.82

Ride Time	1292.71	1321.10	891.31	849.67
Tip	0.86	0.87	0.64	0.40

N = 658,162

CHAPTER 5

DISCUSSION

Racial residential segregation negatively affects the life chances of residents in disadvantaged neighborhoods. The residents of Chicago have experienced the shifts of the city's priorities away from its residents and instead to tourists and suburban expansion. This disinvestment in urban communities, coupled with the deindustrialization that Chicago faced, left urban residents with limited access to employment, educational opportunities, public transportation, and food stores. Previous studies have looked at residential segregation and access to resources, but this descriptive analysis introduces ride-hail transportation as a potential resource that could improve the life chances of those who do not have access to adequate neighborhood resources. With findings from previous studies in other parts of the United States noting discriminatory pick-up practices, this study looks at three questions in Chicago: (1) do ride-hail services like Uber, Lyft, and taxis access food desert census tracts; (2) how often are ride-hail trips crossing food desert census tract boundaries; and (3) are ride-hail trips that cross food desert census tract boundaries accessing food stores?

Ride-hail services have dominated public and private transportation systems, providing trips to residents that have been previously marginalized by the taxi industry (Brown 2018). Ride-hail drivers, and the algorithm within the ride-hail application, have also shown discriminatory practices through avoiding certain areas, canceling rides on riders with "African American" sounding names, and charging higher fares in certain

areas (Ge et al. 2016; Ge et al. 2020). Overall, the literature has provided mixed results on whether ride-hail technologies are accessing and transporting residents in lower-income communities.

The analyses in this study have shown that ride-hail trips are accessing and serving low-income food desert neighborhoods in Chicago, but they are doing so at a low rate. Roughly 8 percent of all ride-hail rides, or 407,343 rides, in Chicago accessed a food desert neighborhood. While this percentage is low, ride-hail applications are serving low-income neighborhoods that have limited access to local resources. Of the almost five million ride-hail rides in Chicago in 2019, only about half of a percent, or roughly 29,000 rides, accessed both a food store and a food desert.

It is important to compare ride-hail rides that accessed food deserts and food stores with those that accessed food stores and non-food deserts. The greater number of food stores in non-food desert neighborhoods allows residents in those areas to access ride-hail services at lower costs, travel shorter distances, and have shorter ride times. Because of this, non-food desert neighborhood residents, who, on average, have higher incomes, are accessing a lower-cost resource using a service that is also at a low cost. If residents of food desert neighborhoods, who have lower incomes, accessed the same store, the ride time would be longer, resulting in a higher cost. In other words, it is more time- and cost-efficient for higher income, non-food desert residents to utilize ride-hail services to access food stores. Ride-hail trips are more efficient for higher-income residents in non-food desert neighborhoods than lower-income residents in food desert neighborhoods. This efficiency is shown in the data, as rides that only access non-food desert neighborhoods account for more than 90 percent of all rides.

While ride-hail transportation services are convenient and accessible in many areas, especially those that are higher income, it is important to recognize the barriers that lower-income communities face. The low percentage of ride-hail rides in Chicago's food deserts may be attributed to many things that other research has acknowledged like discriminatory practices through racial profiling and price peaks in certain areas. If residents do get a ride despite discriminatory practices, they face a higher cost and increased trip time, meaning it requires more time and money to use ride-hail.

This analysis has shown that ride-hail services are accessing food desert neighborhoods and food stores. While the percentage of rides that access both a food store and a food desert neighborhood are extremely small, it is important that those rides are occurring. The rides that access a food desert neighborhood are also important as they indicate that residents can and are using ride-hail services to travel outside of their neighborhoods, thus increasing accessibility. The claim that ride-hail services help low-access residents access resources is true, but the results of this study show that ride-hail services are catered more toward residents of higher-income, non-food desert neighborhoods.

The limitations of this study lie within the data. The Chicago ride-hail dataset includes all ride-hail services, including taxi services. Because of this, it is impossible to know whether a ride-hail application like Uber or Lyft accessed food deserts and food stores, or if a taxi service did so. In addition, approximately 3.5 million rides were eliminated from the dataset due to being incomplete or were a duplicate. Because of this, the final counts of ride-hail rides in various neighborhoods could be quite different, which could affect the conclusions made in these analyses.

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