12-2023

Scooting to a Brighter Tomorrow: Shared E-scooters and Their Use in Lincoln, Nebraska

Tanner J. Hiemer
University of Nebraska-Lincoln, thiemer3@unl.edu

SCOOTING TO A BRIGHTER TOMORROW:
SHARED E-SCOOTERS AND THEIR USE IN LINCOLN, NEBRASKA

by

Tanner J. Hiemer

A THESIS

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Master of Community and Regional Planning

Major: Community and Regional Planning

Under the Supervision of Professor Abigail Cochran

Lincoln, Nebraska

December, 2023

SCOOTING TO A BRIGHTER TOMORROW:
SHARED E-SCOOTERS AND THEIR USE IN LINCOLN, NEBRASKA

Tanner J. Hiemer, MCRP

University of Nebraska, 2023

Advisor: Abigail Cochran

As a recent addition to our transportation systems, shared e-scooters have the potential to improve how people travel in the urban environment. While there is a lot to be hopeful about, the relative novelty of e-scooters calls for closer examination into how they interact with the built environment and other modes of transportation. Additionally, the equity of shared e-scooters must be at the forefront of discussion when considering their utility in the future. Given their flexibility in use, e-scooters could fill spatial gaps in transportation systems and provide improved mobility to those who are most transportation disadvantaged. This research aims to highlight the current state of shared e-scooters and to identify trends in their usage in Lincoln, Nebraska. A literature review assesses the current understanding of shared e-scooters in North America, examining factors that influence their use, public opinions towards their presence, and equity of their implementation. Trip data from e-scooters operating in Lincoln, NE was used in spatial and temporal analyses to identify any trends in usage. A community survey was also implemented to capture the demographic characteristics of riders and their attitudes towards e-scooters. To conclude, findings from the analyses of Lincoln e-scooter data and the survey are related back to existing literature and actions are recommended to optimize the future use of shared e-scooters within existing transportation systems.

Acknowledgements

Thank you to Dr. Abigail Cochran for advising me through this process. Your insights and direction have been instrumental in the success of this project.

Thank you to Dr. Zhenghong Tang and Dr. Yunwoo Nam for their dedication in serving on my committee.

Thank you to Roberto Partida with the City of Lincoln for providing the e-scooter data used for analysis.

Lastly, thank you to my wife, Delanie. Your unwavering support over the last three years has meant the world to me. I couldn't have done this without you

Table of Contents

List of Figures

Chapter 1: Introduction

Just like everything in our lives, how we get around is evolving. Transportation is vital to a healthy community and must be treated as such. With the rise of private automobiles nearly a century ago, many cities have surrendered a large amount of space to cars. The consequences of this have led to a decline in walkability, particularly in North America. The car-centric infrastructure that followed the widespread adoption of private vehicles quickly undermined the facilities available to pedestrians and public transit (Bai and Jiao 2020). While this shift allowed for more individual freedom in our travel patterns, private vehicles contribute to increased pollution and stand as a danger to pedestrians and motorists alike (Moreau et al. 2020).

In recent years, there has been an emergence of so-called “micromobility,” a term that is used to encompass several different types of shared modes of traveling that shirk the now-entrenched car culture found throughout the country. Generally, these modes include the use of bikes and scooters, as well as their electrically assisted counterparts as a means of transportation (Kong and Leszczynski 2021). While the word “micromoblity” may still be relatively new to the lexicon of planning professionals, and certainly to those in the public, it builds upon the concept of active transportation, the use of non-motorized methods for transport by offering these means in a shared service. While bicycles and scooters have been around for generations, offering them as a shared service allows flexibility and ease of access without necessitating ownership by the rider.

Though the current systems that we know as micromobility are a relatively recent development, shared forms of active transportation have been present around the world

for decades. In 1965, the city of Amsterdam introduced Witte Fietsen, or White Bikes, widely considered to be the world's first bike sharing program (Marshall 2018). Micromobility first appeared in North America during the mid to late 2000s, with Washington D.C. becoming the first city in the United States to launch a full modern bike sharing system in 2010 (NACTO 2017).

The most impactful example of micromobility in the United States is likely the introduction of Citi bike in New York City. Citi bike is a docked bikeshare system that allows users to rent a bicycle from a docking station at a fixed location, allowing them the freedom to travel without the constraints of private vehicle use. Those in New York quickly saw the benefit of such a service and the system rose in popularity as it offered users a flexible traveling experience that other modes of transportation could not match. Soon after the introduction of the bikeshare system in New York, demand for Citi bikes was quickly high enough that the available fleet needed to be expanded to nearly double its introductory size. During the first year, more than 100,000 users rode over 14,700,000 miles (Flagenheimer 2013). The success of bike sharing in New York encouraged cities across the country to begin their own bikeshare systems. And now it is difficult to find a city that does not have a bikeshare system available to their residents and visitors alike.

For nearly a decade, bike sharing was micromobility; there were no competing systems. But this changed in 2017 when Bird, founded by former Lyft and Uber executive Travis VanderZanden, first introduced a system for dockless e-scooter sharing in Santa Monica, California (Gössling 2020). These systems are comprised of a fleet of scooters, which are electronically assisted to allow the rider to travel without needing to physically propel themselves. The company operating the system will distribute the e-

scooter throughout the operating area, typically early in the morning. From there, the e-scooters are available for riders to initiate a ride with their smartphone, riding them to their unique destination and ending the trip where it is most convenient for them. Throughout the day, and especially at night, the e-scooters are collected by the operating company charge their batteries and be redistributed to meet demand.

The newly introduced form of micromobility quickly took off, with Bird reporting 10 million trips taken by September 2018 and substantial growth in the total number of rides over the next couple of years. Not long after their first appearance, shared e-scooters were being introduced at a higher rate than docked bike sharing had seen in the previous decade. Unfortunately, this growth was quickly stymied by the onset of the Covid-19 pandemic in early 2020 (James et al. 2019). Even with the explosion in the popularity of shared e-scooters, there are still many obstacles to them being accepted by the public and proliferating to the extent of docked bike sharing (Gössling 2020).

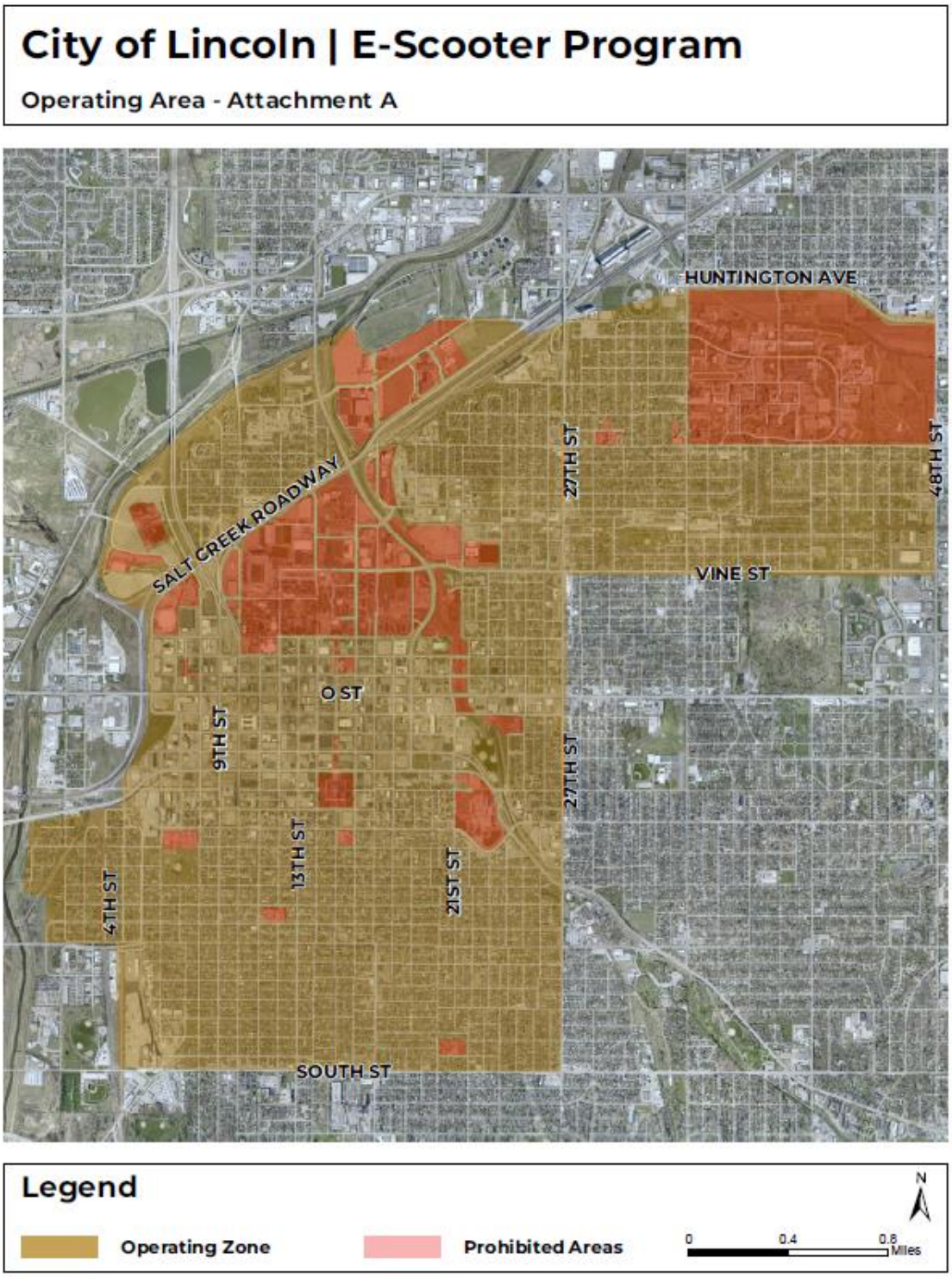
The most apparent challenge for successful implementation of shared e-scooters is the public's perception and their acceptance as a valid mode of transportation. Due to their novelty, large portions of the population in cities with active e-scooter programs do not have a favorable view of the technology, often seeing e-scooters as a nuisance and a safety hazard (James et al. 2019). These sentiments are so widely held that two major international cities have recently decided to ban shared e-scooters. Residents in Paris, France and Montreal, Canada have promoted banning e-scooters to promote increased safety and enjoyability of pedestrians. Even though these sentiments may appear common, bans like those recently enacted in Paris and Montreal are a recent development that does not appear to have a wide appeal (Nouvian 2023).

In fact, there are numerous new cities that have been adopting e-scooters since their implementation was disrupted in early 2020—one of those being Lincoln, Nebraska. E-scooters were first introduced to Lincoln in September 2020, with the beginning of a 16-month pilot program in partnership with micromobility companies Bird and Spin. This program allowed for shared e-scooters to operate in the downtown area and the neighborhoods immediately surrounding it. By the end of the pilot program, there had been 91,400 trips taken by 25,030 unique users (City of Lincoln 2022). Due to the success of the pilot, e-scooters were allowed to permanently operate in Lincoln. During the spring of 2022, e-scooter operator Lime deployed a permanent fleet of e-scooters (Figure 1) to service downtown Lincoln and the surrounding areas. In the spring of 2023, Lime was joined by Bird, returning to Lincoln after participating in the pilot program, to offer shared e-scooters in an expanded service area (Figure 2).

Figure 1. Example of a Lime E-scooter

Source: Lime

Figure 2. Shared E-scooter Operating Area in Lincoln, NE



Source: City of Lincoln

There is the potential for e-scooters to fill existing gaps within transportation systems by increasing overall mobility to address spatial and social inequalities. With the number of cities making e-scooters available to their residents continuing to grow, it is time to consider fully integrating them into our view of transportation systems. A thorough understanding of how e-scooters interact with the urban environment and the residents who will be using them is vital to ensure that their potential to provide increased mobility is met. The equity of their implementation and use should be a focus when working to understand the shared e-scooter as a tool to enhance our travel patterns.

This research aims to identify and further understand the problems within the implementation and use of shared e-scooter systems in terms of spatial and social equity. Particularly, e-scooter use in Lincoln, NE is further examined to determine trends in spatial and temporal data, rider demographics, and public attitudes. Guided by previous research, these findings are used to highlight deficiencies in shared e-scooters and suggest possible interventions to improve the equity of these systems.

Chapter 2: Literature Review

Being a relatively new development in the world of transportation, the existing body of literature focusing on shared e-scooters is still limited, especially when compared to their micromobility counterpart, the docked bikeshare. While our understanding of the utility of e-scooters and their place in the urban environment is growing there is still much to learn in order to optimize their implementation. A common theme across much of the research available today is that e-scooters have the potential to fill gaps within current transportation systems. Kong and Leszcynski (2021) state that dockless micromobilites could address gaps that have appeared within docked bike sharing systems in regard to spatial and social equity, specifically through their potential for increased accessibility.

Lee, Sener, and Jones (2017) state that there are typically two ways of thinking when it comes to transportation equity: spatial equity and social equity. While spatial equity measures how effective a transportation system serves all potential users, social equity emphasizes increasing transportation opportunities and reducing barriers to access for historically marginalized communities (Kong and Leszcenske 2021). Particularly because existing research does point to e-scooter use currently being dominated by young, educated, white males (Cuvells, Miralles-Guasch, and Marquet 2023).

2.1 Usage

E-scooters alone present a relatively inexpensive solution to first and last mile connections, which refers to the portion of a trip from a traveler's starting point to a public transit station (first mile) and from a public transit station to the destination (last

mile) (Jones 2022). Using shared e-scooter services to connect riders to public transportation offers a high potential to facilitate environmentally sustainable solutions since this would provide for greater coverage than walking alone (Wang et al. 2022). Additionally, e-scooters offer a quick and convenient alternative to private vehicle use for short trips. E-scooters also have the potential to be more beneficial than other forms of micromobility; a user survey administered by Lime found that e-scooters allow for a quick way of getting around, with travel times 22% quicker than traditional bikes (Lime 2018). While examining the public's perception of e-scooters, James et al. (2019) conducted a survey of e-scooter riders and non-riders in Rosslyn, Virginia, a suburb of Washington D.C. The results of this survey showed that 39% of e-scooter trips would have been made by Uber, Lyft, or a taxi, and 7% by a private vehicle if e-scooters had not been available (James et al. 2019). Another survey showed that approximately 25% of respondents would have used a car (private or ride hail/taxi) if the use of an e-scooter was not an option (Sanders, Branion-Calles, and Nelson 2020). These findings are validated by two separate user surveys conducted in Portland, OR and Denver, CO. Thirty-four percent of riders in Portland indicated that their most recent e-scooter trip substituted the use of a ride hailing app/taxi or a personal vehicle. In Denver, 22% of e-scooter trips were taken in place of the use of a taxi, Lyft, or Uber (Wang et al. 2022).

The results of these studies are promising when considering how e-scooters could be an effective tool in reducing the congestion of highly auto-dependent North American cities (Bai and Jiao 2020). Particularly because e-scooters are ideally suited for trips between 0.5 and 2 miles in length (Hosseinzadeh et al. 2021). Various studies relating to shared e-scooter usage illustrate this optimal range in practical terms. Researchers in

Paris, France, found that the length of e-scooter trips in the city average 15 minutes in time and 2.5 miles in distance (Christoforou et al. 2021). While a spatiotemporal analysis of various shared e-scooter pilot programs across North America showed the average trip to be 1.7km (1 mile) in distance (Abouelela, Chaniotakis, and Antoniou 2023). With this optimal range in mind, it becomes clear that e-scooters have the potential to take vehicles off our streets, especially when considering that 36% of all trips in the United States are shorter than 2 miles (US Department of Transportation 2019).

Temporal analyses of shared e-scooter programs in North America have shown patterns in usage that are consistent across several cities. These studies describe that the number of shared e-scooter trips follow a bipolar distribution throughout the day, with a minor peak in usage occurring in the morning from 8:00 - 10:00 and a primary peak in the late afternoon from 16:00 - 18:00, which suggests that they are utilized by some as a part of their commute after work (Abouelela, Chaniotakis, and Antoniou 2023). The maximum hourly demand also remained consistent across the cities that were studied, ranging between 8% and 12% of the total daily demand (Abouelela, Chaniotakis, and Antoniou 2023). Interestingly, while overall micromobility use is negatively impacted by inclement weather, e-scooter use is affected at a lower rate compared to bikeshare (Wang et al. 2023). This is likely due to the fact that e-scooter trips are often shorter and provide the ability to end the trip closer to the user's final destination compared to docked bikeshare systems.

2.2 Attitudes

Though e-scooters present a potential improvement to transportation in an urban environment, public perception of the new mode of travel currently acts as an obstacle in the path to general acceptance. As a new addition to the urban landscape, e-scooters must compete for space with vehicles, cyclists, and pedestrians, and they add complexity to the existing transit system (Gössling 2020). Impeding sidewalks, improper parking, and pedestrian safety concerns are common complaints that have appeared with the introduction of e-scooters (James et al. 2019). However, the prevalence of these complaints can, at least partially, be attributed to respondents' own familiarity with e-scooters. The perceived nuisance of improperly parked e-scooters obstructing sidewalks is likely inflated due to the novelty of e-scooter as a mode of transportation. In many cities where it has been studied, vehicles consistently impede walkways at a greater rate than micromobility (both shared bikes and e-scooters) (Wang et al. 2023; Christoforou et al. 2021). While the previously mentioned survey conducted by James et al. did show both riders and non-riders encountered e-scooters that were impeding a walkway or improperly parked, only 24% of riders reported feeling "unsafe" or "very unsafe" while walking around e-scooters compared to 76% of non-riders.

2.3 Equity

As e-scooters offer ways to improve how transportation works by providing an alternative to private vehicles and easing first/last mile connections, it is important to consider the implications that they may have on the equity of our transit systems. Equity should be a focus for efforts that aim to improve transportation, especially within micromobility. While spatial equity is important to consider, the majority of existing

work addressing micromobility and equity does so through this lens. Consequently, the understanding of e-scooters' effect on social equity is comparatively lacking and should be an emphasis of future studies.

It is currently understood that infrastructure that supports active transportation in the United States often provides greater access for more advantaged groups (Lee, Sener, and Jones 2017). To further emphasize the current inequities in micromobility, it was determined that the use of both shared bikes and e-scooters was concentrated in the least deprived, or most advantaged areas (Kong and Leszcynski 2021). This means that the populations who would generally benefit the most from access to micromobility as a transportation alternative, those who lack access to a private vehicle or public transportation, receive the worst coverage from these services. The effects of this unequal distribution are compounded when it is considered that low-income populations are more dependent on public modes of transportation for their daily lives since they typically have lower levels of access to private vehicles (Lee, Sener, and Jones 2017). The necessary infrastructure certainly promotes the use of shared mobility services, but Lee, Sener, and Jones (2017) also highlight the fact that minority, low-income, and less-educated communities have less access to bikeshares and their supporting infrastructure than other income groups. Evidence suggests that shared e-scooters are filling this gap as those in low-income households view them as more accessible than docked bike sharing systems (Wang et al. 2022).

Even if the distribution of e-scooters is spatially equitable and all population groups can access them as a valid form of transportation, the power dynamics between e-scooters/bikes, pedestrians, and vehicle traffic are often enough to keep potential users

away (Cubells, Miralles-Guasch, and Marquet 2023). Women and minorities have been found to feel vulnerable when cycling/scooting due to its high visibility and exposure (Lee, Sener, and Jones 2017). This is most prominently seen in areas that do not contain the infrastructure (i.e. bike lanes and mixed-use trails) needed to properly separate micromoibility users from pedestrians and vehicle traffic. A survey of staff at Virginia Tech, in Blacksburg, VA, showed that there was a strong preference to ride on sidewalks and bike lanes and an aversion to traveling in lanes shared with cars (Zhang et al. 2021). This survey also indicated that an e-scooter user's willingness to use a road is negatively associated with the posted speed limit, highlighting a concern for safety that is most prevalent in women and minority populations (Zhang et al. 2021).

2.4 Current Regulation

While user policies and guidelines play a critical role in the successful implementation of e-scooters, there has been little research focusing on these aspects throughout the country. Municipal guidelines that have been examined often appear to be contradictory (e.g., Arlington, VA allows e-scooters to be used on sidewalks, while Alexandria, VA prohibits the use of e-scooters on sidewalks) (Ma et al. 2021). There have been efforts through planning and policy to address the issues that have appeared with the introduction of shared e-scooters. A relevant aspect of this is the perceived conflict over space that follows the appearance of new items, seen in the past with the rise of bikesharing. Limiting e-scooters to an overall speed of under 25 km/h would better align their use with traditional bicycles, allowing riders to more seamlessly utilize bicycle infrastructure and separating themselves from pedestrian walkways (Gössling 2020).

Though this would the presence of bicycle infrastructure in the areas that e-scooters are being operated.

Several cities have worked with e-scooter operators to implement rules aimed at easing the apparent conflicts that have arisen with this addition to our built environment, such as setting a minimum age to use e-scooters and establishing mandatory helmet use in an attempt to increase safety (Gössling 2020). Additionally, restricting where e-scooters can be parked to designated areas through the use of geofencing could significantly decrease the occurrence of e-scooters impeding pedestrian walkways (Gössling 2020).

Chapter 3: Methods

Several datasets were gathered in order to capture the current state of e-scooter use in Lincoln, with a defined study period of March 15, 2023 to July 31, 2023. Trip data was provided by the City of Lincoln allowing for both a spatial and temporal analysis. Additionally, a survey was distributed to determine the demographics and attitudes of e-scooter users in Lincoln.

3.1 Survey

The online survey was published and made available for community members to complete from September 5, 2023, to September 26, 2023, being comprised of 18 multiple-choice questions designed to capture the respondent's demographics, history of e-scooter use, and attitudes toward e-scooters. This study's data collection instruments were reviewed and approved by the Institutional Review Board at the University of Nebraska–Lincoln. Distribution of the survey took place on the social media website Reddit. Posts were created on r/Lincoln and r/Nebraska, the Reddit-based groups for the city of Lincoln, NE, and the state of Nebraska. Over the three weeks, the survey was publicly available the posts received a combined total of 7,000 views, with 38 people responding to the survey. Of the 38 responses, 10 were incomplete and excluded from the analysis.

From the completed surveys (n=28), 15 of the respondents indicated that they had not used a shared e-scooter in Lincoln, though nearly all of them have a regular connection to the city with 18 being residents of Lincoln, 9 either working or attending school in Lincoln, and only one that was neither of these. Respondents were

overwhelmingly young adults with 61% being between the ages of 19 and 34. Interestingly, no responses were received from any individuals older than 44. They were also largely male, who made up 64% of responses, compared to 29% female and 7% transgender or non-binary.

Overall, the snapshot captured by the survey is not accurately representative of the general population. Of the surveys submitted, 93% came from individuals that identify as white, who make up 83% of Lincoln's population (2021 ACS 5-year estimate). There was one respondent who indicated they were Asian and one other identifying as Native Hawaiian or Other Pacific Islander, both making up 3.5% of the responses. None of the surveys received were from black or African American individuals, who make up 4% of Lincoln's population. Additionally, there was only one respondent who identified as Hispanic or Latino.

In terms of educational attainment, the majority of respondents had completed some form of post-secondary schooling, with 68% having either a bachelor's or master's degree. Responses were varied when it came to income levels. The largest number of respondents (7) reported having an annual income of between $50,000 and $74,999. The second largest income group were those earning $100,000 or more each year, making up 18% of responses. Those earning less than $20,000 and from $35,000 to $49,999 a year made up the smallest portion of responses, both contributing 11% of responses. Over half of the responses (53%) indicated using an e-scooter for either leisure or social activities. A combined 17% said they have ridden an e-scooter for either work, school, or other personal obligations.

Figure 3. Survey Sample Characteristics

Sample Characteristics		
Age		
18 or younger	1	3.6%
19-24	6	21.4%
25-34	11	39.3%
35-44	10	35.7%
45-54	0	0%
55-64	0	0%
65-74	0	0%
75-84	0	0%
85 or older	0	0%
Sex		
Male	18	64.3%
Female	8	28.6%
Transgender/Non-binary	2	7.1%
Ethnicity		
Hispanic or Latino	1	3.6%
Not Hispanic or Latino	27	96.4%
Race		
American Indian or Alaska Native	0	0%
Asian	1	3.7%
Black or African American	0	0%
Native Hawaiian or Other Pacific Islander	1	3.7%
White	25	92.6%
Educational Attainment		
Less than a high school diploma	0	0%
High school diploma/GED	6	21.4%
Associate's Degree	3	10.7%
Bachelor's Degree	14	50.0%
Master's Degree	5	17.9%
PhD or other terminal degree	0	0%
Employment		
Full-time	20	71.4%
Part-time	2	7.1%
Unemployed	2	7.1%
Student	4	14.3%
Yearly Income		
Less than $20,000	3	10.7%
$20,000 to $34,999	6	21.4%
$35,000 to $49,999	3	10.7%
$50,000 to $74,999	7	25.0%
$75,000 to $99,999	4	14.3%
$100,000 or more	5	17.9%

The attitudes toward e-scooters among the respondents varied, with positive and negatives views being quite even. Regarding the comfortability of using an e-scooter, six (22%) said they are somewhat comfortable, with five (19%) saying they are somewhat uncomfortable (Figure 4). When they are around others using e-scooters, more respondents indicated being somewhat uncomfortable (8, 29%) compared to being somewhat comfortable (7, 25%) (Figure 5).

Figure 4. How comfortable are you using an e-scooter in Lincoln?

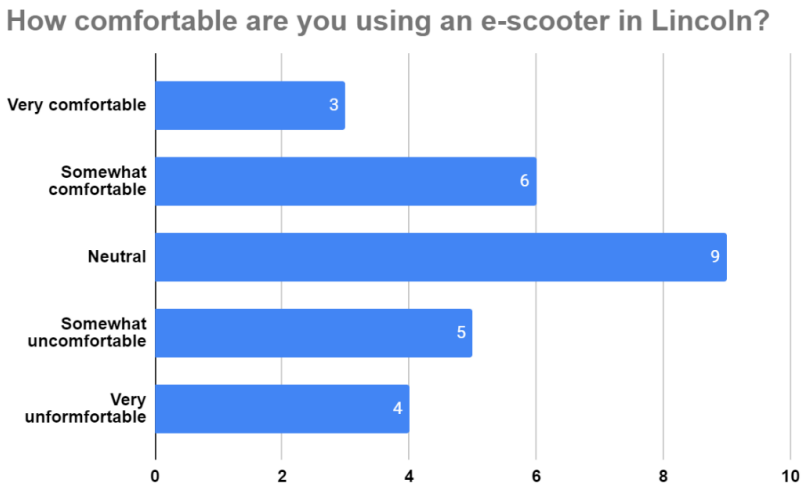
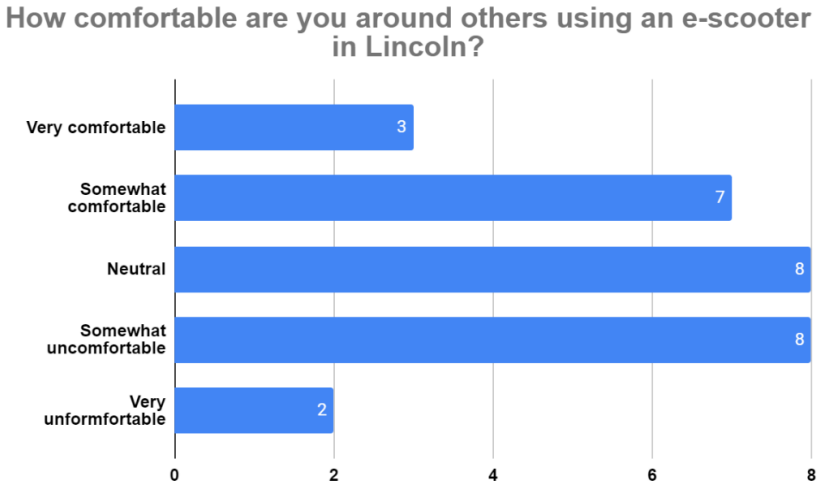


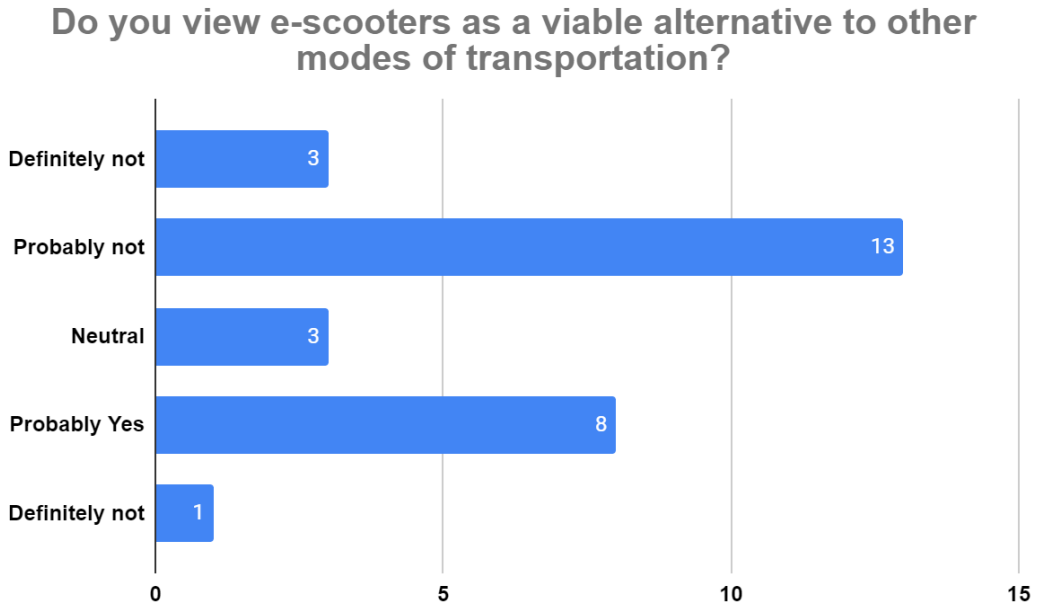
Figure 5. How comfortable are you around others using an e-scooter in Lincoln?



Even though there is a lack of comfortability while being around e-scooters, those completing the survey are generally more satisfied with their presence than not, with 39% (11) of responses indicating being either definitely satisfied or probably satisfied that shared e-scooters were offered in Lincoln. Neutral responses made up 32% (9), with definitely not satisfied or probably not satisfied combining for the final 29% (8).

While there is appreciation for the presence of e-scooters, they are generally not viewed as a viable alternative to other modes of transportation. The majority of responses said that they are definitely not (3, 11%) or probably not (13, 46%) a viable alternative to other modes of travel, with 11% (3) being neutral on the matter (Figure 6).

Figure 6. Do you view e-scooters as a viable alternative to other modes of transportation?



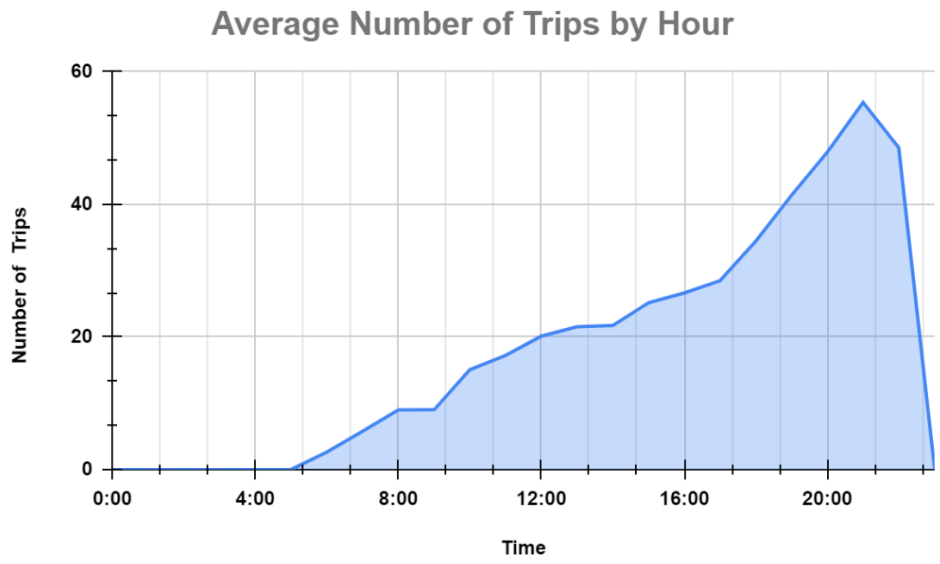
When asked what the best aspect of shared e-scooters is, 62% (16) of responses noted their convenience, with another 19% (5) selecting parking as being the best aspect. Interestingly, when asked to identify the worst aspect of e-scooters parking was the most

frequently selected of the defined option with 25% (7) of the responses. The greatest number of respondents selected the “other” option. Comments submitted with these responses most often cited safety and improper parking as being the worst aspects, with “leaving them lying around everywhere” and “risk of injury” being a couple of examples, echoing similar sentiments to those received for the survey administered by James et al. (2019).

3.2 Temporal Analysis

As mentioned earlier in this section, the City of Lincoln provided two datasets that included information from both Lime and Bird e-scooters operating in the city from March 15, 2023, to July 31, 2023. The first dataset included a count of trips taken on an e-scooter in Lincoln during the study period broken down by the hour, which was used to highlight temporal trends. Location data showing the origin and destination of each trip made up the second dataset. This spatial data was aggregated to include the number of trip origins and trip destinations within a hexagon measuring 53,00 sq. ft. While the spatial data did identify useful patterns, there was no way to associate both datasets, prohibiting a true spatiotemporal analysis. In total, during the four-and-a-half-month period, there were 65,784 trips taken on shared e-scooters in Lincoln. Interestingly, Lincoln does not show a small peak in usage during the morning and a larger one in the late afternoon like several North American cities that have been studied (Abouelela, Chaniotakis, and Antoniou 2023). Instead, trips steadily increase throughout the day until they peak in the late evening, generally around 9:00 p.m (Figure 7).

Figure 7. Average Number of Trips by Hour in Lincoln



As has been identified in earlier studies, the weather influenced the use of e-scooters in Lincoln. Examining the number of trips taken each month shows that e-scooters were used less during the early spring (Figure 8). There were only 5,758 trips taken during the month of March. And while e-scooter were only available for 15 days in March, there would only be 11,516 trips if that rate were continued for a full month. This is well short of the 14,000-16,000 trips per month once temperatures rose in late spring and into summer.

Weekdays saw fewer e-scooter trips as compared to weekend use (Figure 9). The higher daily average of trips on the weekend (496.1) versus the daily average during the week (399.7), which would support the finding from the online survey that e-scooters are used more for recreation than for commuting to and from work or running errands.

Figure 8. Total Trips by Month

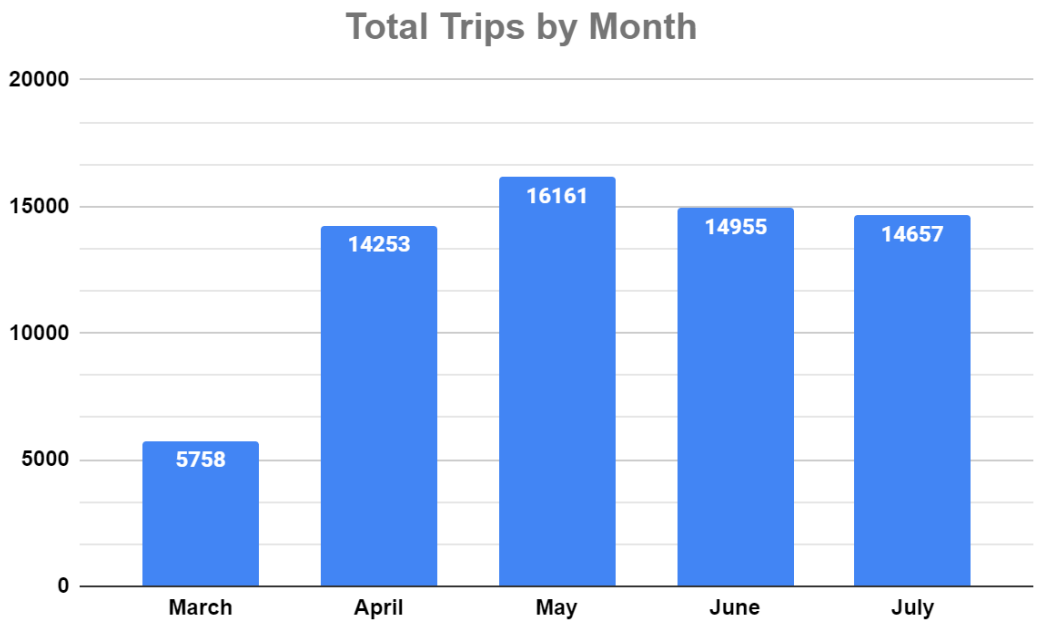
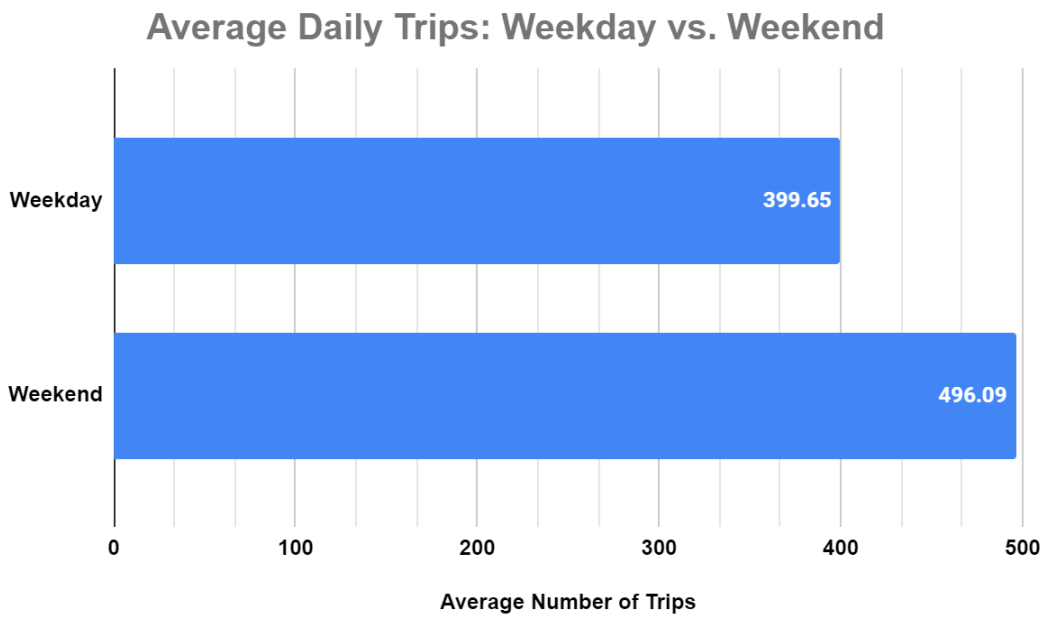


Figure 9. Average Daily Trips: Weekday Vs. Weekend



3.3 Spatial Analysis

The spatial analysis did reveal some interesting findings. Figure 10 shows the number of shared e-scooter trips that originated in each hexagon with the greatest amount being concentrated around downtown and the Haymarket area. Of the 3,751 hexagons covering the operating area in Lincoln, 1,732 (46%) had zero trips being initiated within their boundaries during the time studied.

Figure 11 is the number of trips ending in each hexagon and shows a similar distribution to where trips begin. Most trip destinations were also centered around downtown and the Haymarket, though there were fewer hexagons throughout the operating area that did not record a trip ending in their boundaries. There were 1,571 of these occurrences, making up 42% of all hexagons. This lower number may suggest that e-scooters are used to travel to a more diverse set of destinations as compared to origin locations.

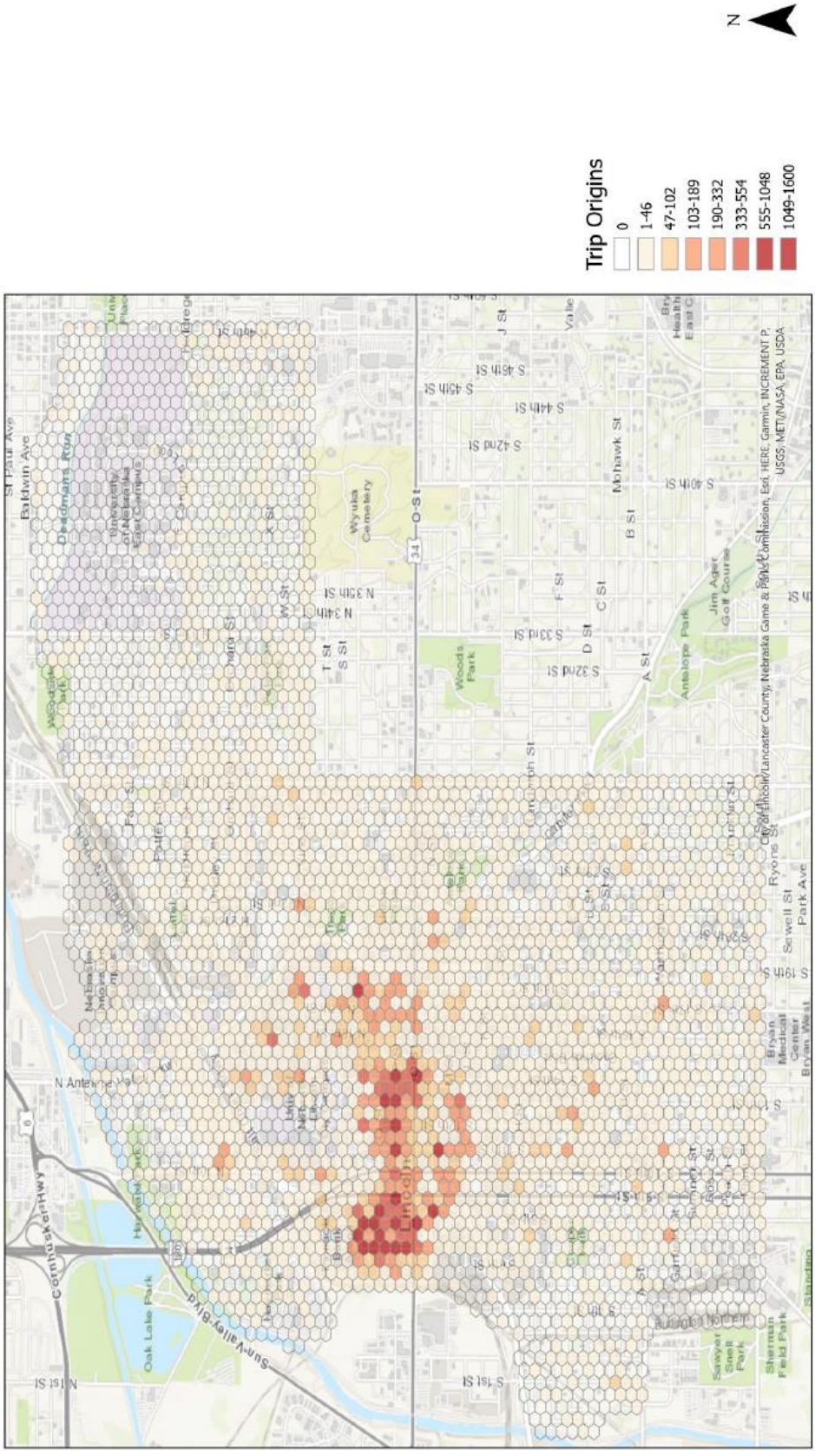


Figure 10. Total Number of Trip Origins

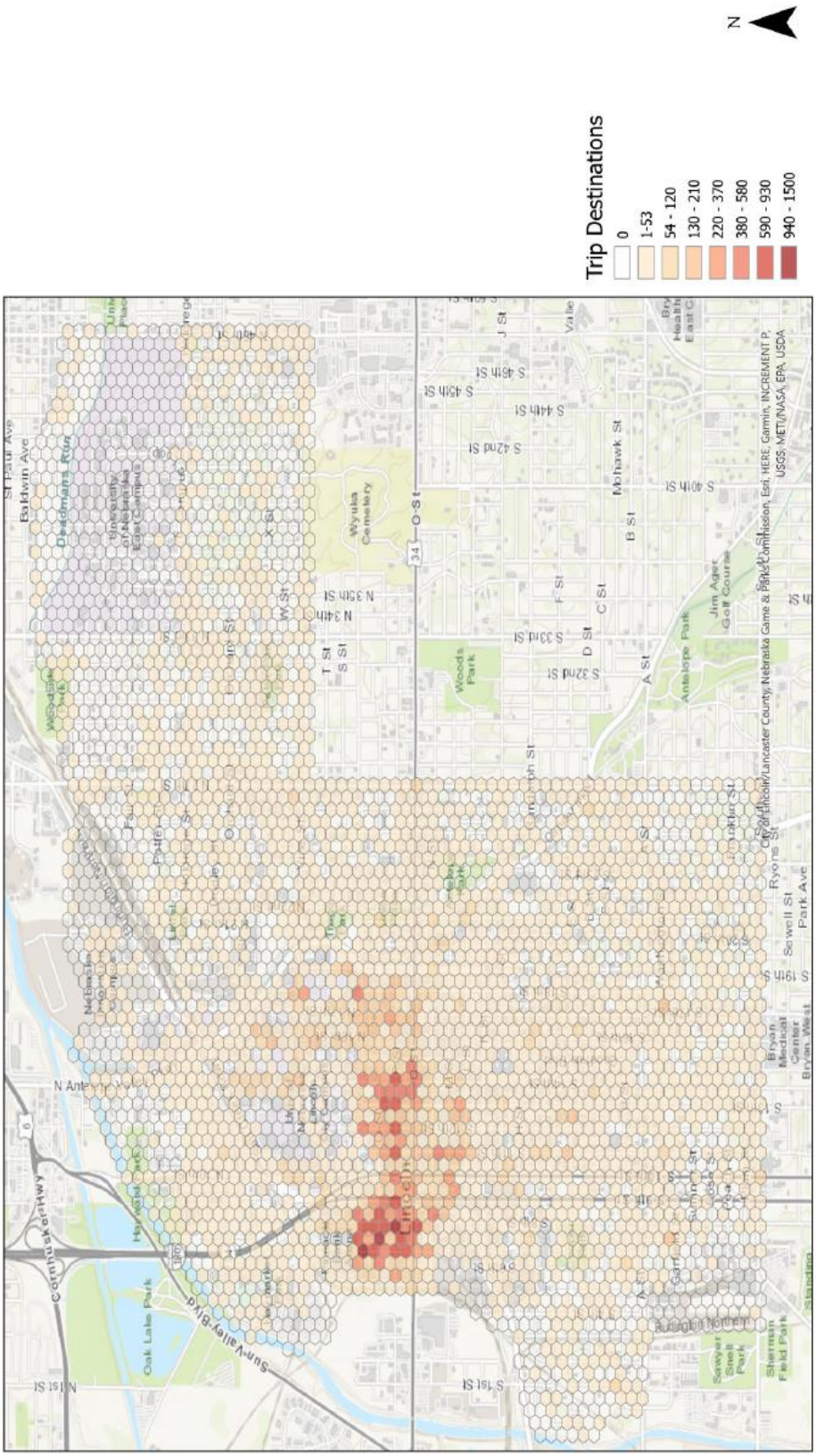


Figure 11. Total Number of Trip Destinations

To further identify trends in where e-scooter trips begin and end, a hotspot analysis was conducted using the Getis-Ord Gi* function. Figure 12 displays results of this analysis on the dataset containing the number of trips originating in each hexagon. The hotspots expectedly appear near downtown and the historic Haymarket district, though there are two areas that stand out. The first being the hotspots that stretch north to south throughout downtown, which may relate to existing infrastructure that supports micromobility (i.e., bike lanes, bikeshare docks). The second are the hotspots to the north of downtown correlating to two dormitory complexes at the University of Nebraska-Lincoln, which implies heavy use of e-scooters by the students of the institution.

The same hotspot analysis completed on the trip destination dataset, shown in Figure 13, again displays a similar distribution compared to trip origins. The notable variation between the two outcomes is to the north of downtown where destinations were less concentrated near the University's dorms, which may support the idea that e-scooters are used to travel to more unique destinations.

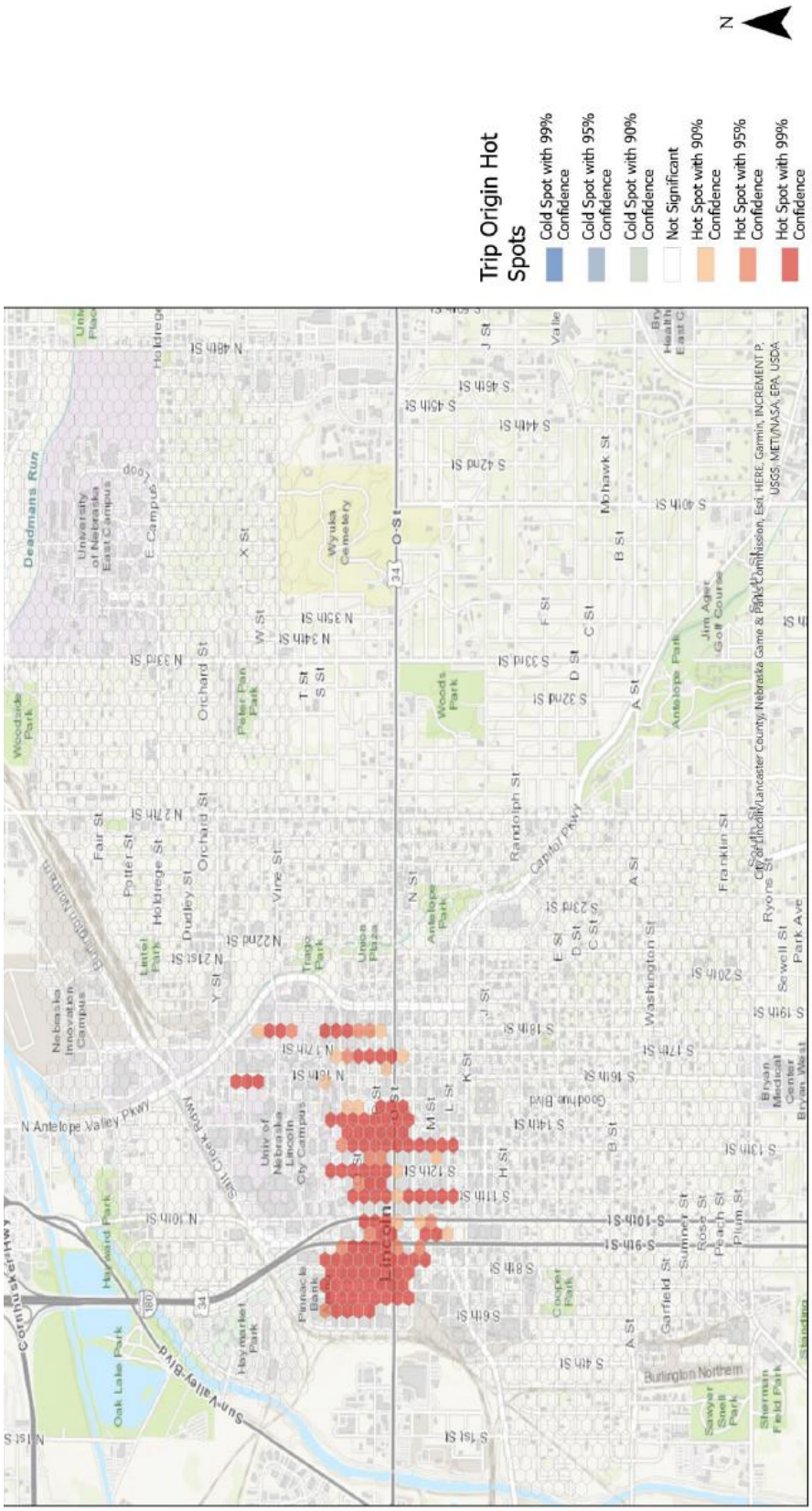


Figure 12. Trip Origins Hot Spots

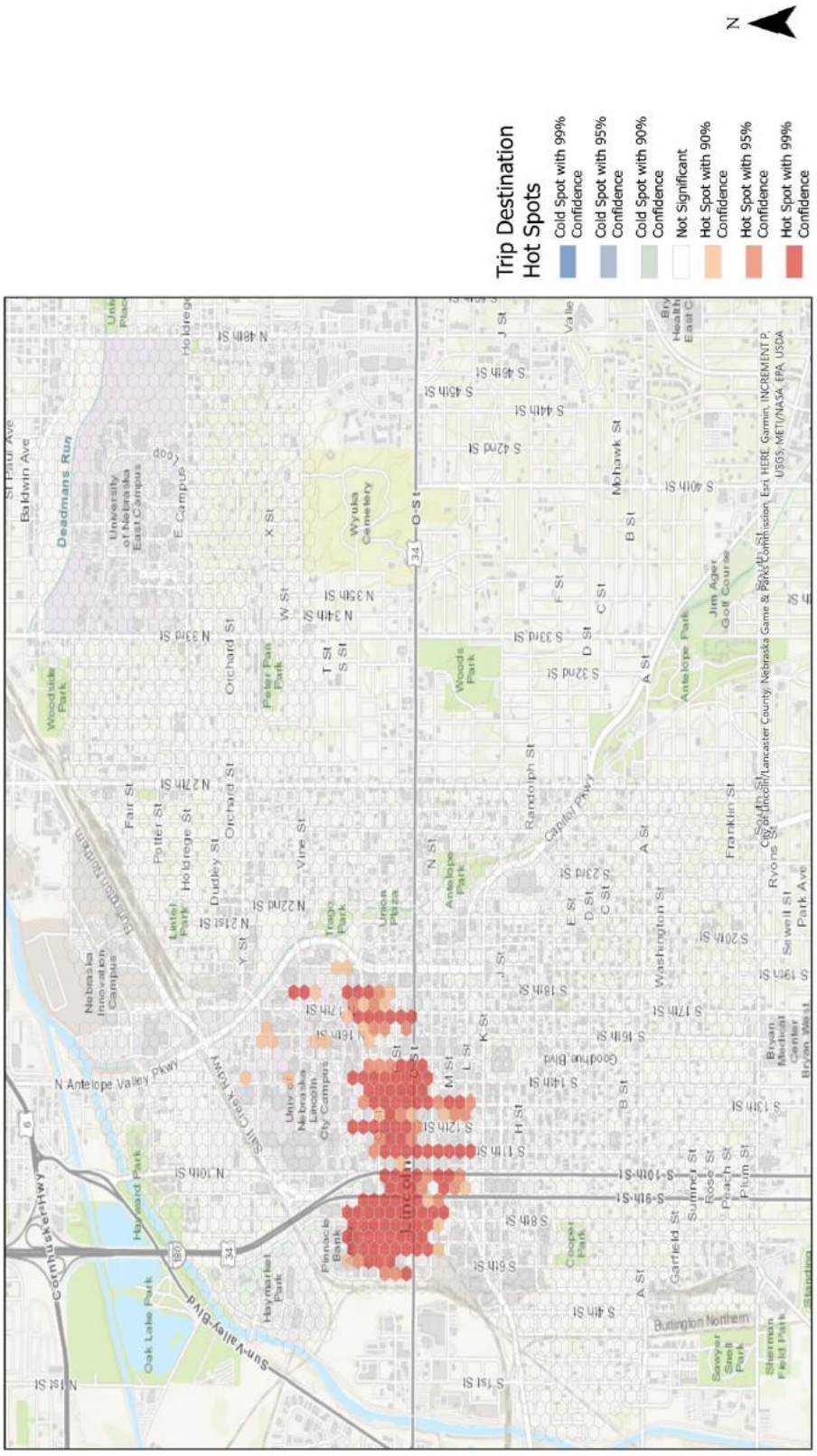


Figure 13. Trip Destinations Hot Spots

Chapter 4: Discussion

E-scooters have proven to have the utility and demand needed to fully integrate them as a functional component of our transportation systems. The number of e-scooter trips continues to rise and the list of cities allowing their operation is still growing. As this proliferation of shared e-scooters continues, it is important that they are implemented in a way that ensures their potential is met. They are an imperfect system that needs to be looked at critically in order to identify and understand what can make them better. Consideration for their distribution, accessibility, and supporting infrastructure will play a significant role in successful implementation of e-scooters.

While the data gathered limited the depth of analysis, namely because of the survey sample size and aggregation of trip origin and destination locations, the results of the analysis on the use of shared e-scooters and attitudes towards them in Lincoln, Nebraska largely align with previous studies done in North America. In terms of usage trends, the findings in Lincoln reveal a similar distribution in the number of trips when comparing between weekdays and weekends. On average, there were 21.5% more trips during weekend days, leading to suggest that e-scooters are most often used for recreation and leisure. Survey results also support this with over 50% indicating that recreation or leisure were the most often reason for completing an e-scooter trip. This was not surprising to find as several past surveys have shown the same trends of recreation or leisure being the largest draw to e-scooters (Abouelela, Chaniotakis, and Antoniou 2023).

It becomes more interesting when taking a closer look at when e-scooter trips occur. As previously stated, the general trend is that the number of e-scooter trips peak

twice throughout the day. Generally, on weekdays there is a smaller spike in the number of trips during the morning, around 10:00am, and a larger spike in the late afternoon (Bai and Jiao 2020). The observed trend in Lincoln does not conform to this, instead seeing a steady increase in the number of trips taken each hour throughout the day, ultimately peaking near 9:00pm. One explanation for this could be that Lincoln has a different overall makeup compared to the cities analyzed in previous studies. Cities such as Chicago have a more robust business district pointing towards e-scooters being used during a commute to and from work, particularly with the large increase in the number of trips during rush hour in the late afternoon. Trends in Lincoln obviously do not suggest the use of e-scooters in a commute for work within the traditional business hours. Though that does not necessarily mean e-scooters are not being used to commute. With the large presence of students, combined with the fact that most trips center around the Haymarket and P St. in Lincoln, it would not be unreasonable to assume that trips are being used to commute by those who primarily work during the evening hours.

While attitudes towards e-scooters in Lincoln were found to lean towards negative, that should not suggest that the operation should be reduced or ended. The number of trips taken in Lincoln shows that e-scooters have been successful in offering an alternate mode of transportation and have the level of demand that warrants further investment in their presence. Many of the issues driving negative opinions of e-scooters, both in Lincoln and across North America, can be addressed if there is enough will to invest in supporting infrastructure and enhancing their implementation.

Responses to the survey frequently indicated that safety was a major factor in contributing to unfavorable views of e-scooters. The findings from the survey

administered in the study by James et al. (2019) similarly show safety being a large reason why people may disapprove of e-scooters. James et al.'s survey was more robust than the one developed for this research, capturing what may influence this view and distinguishing the influence of safety on e-scooter riders and pedestrians separately. As a rider, safety concerns largely stem from their interactions with traffic and the probability of themselves getting injured. Pedestrians see e-scooters as a threat to themselves, citing riders frequently traveling on sidewalks and not in vehicle lanes (James et al. 2019). Both could be addressed through the same intervention. One way to do this would be to construct separated bike lanes where possible. The addition of separated bike lanes would allow for the use of e-scooters in a space that is exclusive to its scale of transportation (Zhang et al. 2021). Eliminating most interaction with vehicle traffic, the sense of security felt by riders would increase, prompting existing riders to take additional trips and invite non-riders to utilize e-scooters. This would also reduce the number of e-scooters being ridden on sidewalks since many of these riders do so because of the danger associated with being in traffic.

A second reason the public may have unfavorable views of e-scooters is because of their parking. Unlike their micromobility counterpart, the docked bikeshare, e-scooters can be parked anywhere once the rider has finished their trip. Previous studies, in additions to this one, show that many have noted encountering an incorrectly parked e-scooter (Abouelela, Chaniotakis, and Antoniou 2023). In these instances, the rider will typically have left the e-scooter in a way that impedes the sidewalk. While this is usually no more than an inconvenience for most, it creates a tripping hazard in addition to being a potentially insurmountable obstacle for those with limited mobility. One method being

used to improve substandard parking of e-scooters is the use of geofencing (Liazos et al. 2022). With this some cities have been designating parking areas for e-scooters, with potential fines for riders who do not leave their e-scooter in one of these zones at the end of a trip.

There will almost certainly be new issues that will continue to appear within systems of shared e-scooters, but this should not detract from the ability to fully integrate them into our transit systems. As the novelty of e-scooters continues to wane and more cities introduce this micromobility, it is necessary to consider what can be done in order to optimize their interaction with other travelers. Ensuring that e-scooters connect to transit services could be an effective intervention aiming to alleviate the problem of first and last mile connections (Wang et al. 2022).

Expanding active transportation facilities is a logical intervention to ensure the connectivity of the e-scooters within our transit systems. The presence of dedicated bike lanes, particularly ones that are physically separated from vehicle traffic increase micromobility use and strategic development of these around transit locations could make e-scooters a more attractive option when accessing transit services (Zhang et al. 2021). The ideal range of up to 2 miles allows e-scooters to grant greater accessibility over walking (Hosseinzadeh et al. 2021). There is also the possibility that e-scooters extend the distance at which you can access public transportation better than docked bike sharing systems because of their dockless nature. Instead of needing to find a docking station and walk the remainder of the way to a bus stop or transit station, e-scooters can be ridden directly to that connection.

The physical facilities allow for the use of e-scooters, but they must be where they are needed to be a successful part of the overall transportation system. The distribution of e-scooters plays a large role in determining the equity of their services. Companies that operate e-scooters will employ individuals to periodically redistribute them throughout the area. This is done to ensure that they are available to meet the greatest demand, an expected practice for a private company. While concentrating e-scooters where demand is greatest contributes to their success, it overlooks the potential to serve those who could benefit the most.

Several e-scooter programs have been attempting to address the issue of distribution being socially inequitable. The pilot program in Chicago stipulated that a certain number of e-scooters be placed in areas that are disadvantaged when it comes to transportation. A study of the pilot in Chicago found that the actual distribution to these areas was far below what was required of them (Tuli, Mitra, and Crews 2021). This is a failure to those who could benefit the most from their use as it limits the accessibility of shared e-scooters.

Considering that low-income groups tend to have a lower level of access to private vehicles, these individuals rely more heavily on alternate forms of transportation, such as public transportation and micromobility services (Lee, Senner, and Jones 2017). Given that e-scooters are found to be most often distributed in areas that are predominantly white and have a higher level of income, their ability to address the social inequities of transportation is limited. As previously stated, e-scooters can act as flexible first and last mile connectors and allow for greater distance to be traveled during this portion of a trip. These benefits could have a significant impact on the daily lives of those

who cannot rely on having regular access to a private vehicle by reducing the amount of time and effort needed to complete a trip using alternative transportation.

In addition to being inequitable in terms of distribution, there is another area of concern with e-scooters being a viable transportation alternative for lower income individuals. This is the cost of completing a trip with e-scooters and the requirement of using a smartphone to activate the trip (Button, Frye, and Reeves 2020). While the amount of the population that has a smartphone continues to grow, the necessity to possess one is an obstacle that some do not have the means to overcome. Even if the potential rider does own a smartphone, the overall cost to use an e-scooter can be highly prohibitive to regular use.

As e-scooters continue to spread across North America, it appears that their presence will persist into the future. The commonly found negative views of this new form of micromobility should not discourage additional communities from allowing their operation. In fact, the success of e-scooters found in the number of trips occurring in spite of the negative opinions are a sign that they truly have the ability to be a beneficial addition to existing transportation systems. E-scooter programs should not be implemented with the notion that they are as good as they can get.

Those in leadership positions and particularly planners have the ability to ensure that allowing the operation of e-scooters is a worthwhile addition to their communities. While having the distribution of e-scooters be completely socially equitable is unlikely due to the nature of having a private company involved in their operation, stipulations that require a certain amount of available e-scooters be distributed to transportation disadvantaged areas to address these disparities should be common. Program

requirements similar to this have been implemented, though their success in ensuring the equitable distribution of e-scooters has been limited to this point (Wang et al. 2022).

The ability to initiate an e-scooter trip is equally important as them being physically accessible. While micromobility companies like Lime do offer assistance for individuals without a smartphone wanting to use e-scooters, cities should work with e-scooter providers to develop additional accessibility programs that offer alternative methods of initiating an e-scooter trip outside of the typical smartphone application that make sense for their particular community. Doing such would empower those who could benefit the most through the use of e-scooters.

It would also be beneficial to enhance the built facilities present in the community to support the growth of e-scooters. Because of the generally negative view of e-scooters, this action to enhance the use of e-scooters could be easier to implement since it would also support those who use bicycles and eliminates most interaction with vehicle traffic and pedestrians. The construction of protected bike lanes supports an active community and can increase the safety of both its users and pedestrians by providing dedicated facilities to reduce the number of interactions between these groups (Zhang et al. 2021).

It will be important to address the negative views that a large portion of the population has of e-scooters. In time the favorability of e-scooters will likely improve as more people become familiar with them. Though there should be efforts made in the interim to accelerate this shift. As noted above, many of those are opposed to e-scooters cite two issues. The first being safety, which can largely be addressed through further building out infrastructure designed for micromobility. The second issue is the fact the e-scooters are seen as a nuisance, mostly due to improper parking. Communities with

shared e-scooter programs could consider providing designated areas so they can be parked away from sidewalks and other pedestrian right of ways. This could manifest through the building of a physical space or using geofencing to only allow the parking of e-scooter in an area with minimal pedestrian traffic.

Chapter 5: Conclusion

During the relatively short time that shared e-scooters have been operating in North America, they have seen widespread success. Considering that the total number of e-scooters trips have grown at a greater rate than when bike sharing was first introduced, it is no surprise that more and more cities are allowing them to operate in their communities. E-scooters have the ability to fill gaps in transportation systems and can offer a unique experience of efficiency and flexibility not found in other modes of travel. With an ideal range of under 2 miles, shared e-scooters appear to be suited for acting as a first and last mile connector. In this capacity, e-scooters can increase the accessibility of transit system, making an improvement in the daily lives of those without regular access to a private vehicle by reducing the amount of time needed to complete a trip.

In Lincoln, the use of e-scooters largely aligns with what has been observed in previous studies across North America. Like other cities, the number of e-scooter rides generally increases throughout the day, though Lincoln does not see a spike in the late afternoon that would suggest their use as a means of commuting from work. Overall, survey results point towards the use of e-scooters for recreation or leisure. This is supported by analysis of the number of trips per hour, which identified a greater number being taken during the weekends. Many of the cities examined in the past also present this trend. When considering the demographics of e-scooter users, Lincoln was again found to be typical. Those partaking in the survey identified themselves as male and white at a greater rate than the general population, with the entire survey sample being younger than 45 years old.

When considering the equity of e-scooters as a viable form of transportation, there are several things that require attention. Firstly, the physical distribution of e-scooters tends to be skewed towards higher income, white areas. Again, this is not too surprising since e-scooters are operated by for-profit companies; but for these systems to be equitable, those who can benefit most from e-scooters must be able to access their services. The necessity of possessing a smartphone to activate an e-scooter also acts as a significant barrier to their use by some, particularly low-income individuals. This coupled with the cost of completing an e-scooter trip surely limits how equitable these systems can be.

Moving forward, those with authority over systems of shared e-scooters can have a major impact on whether they remain a relative novelty reserved for recreation and leisure activities or accepted as a valid addition to the overall transit system. The most concrete intervention towards full integration of e-scooters is, well, concrete. The addition of bike lanes, specifically separated bike lanes, would allow for safer and more efficient use of e-scooters, while benefiting those who use active transportation in general. Introducing additional bike lanes could also increase the favorability of e-scooters by separating their use from pedestrians. Working closely with e-scooter providers to ensure e-scooters are available to the most transportation insecure individuals should be a goal of all programs. Developing programs to increase access for low-income individuals, such as reduced fares or non-smartphone activation methods, would also have a positive effect on the equitability of e-scooter programs.

Overall, shared e-scooters have shown a great potential to be a useful addition to transit systems by filling gaps that are left by existing modes of travel. Their rapid

adoption and ability to offer a convenient alternative for shorter trips and first/last mile connections is very promising. Though there is work needed to improve the systems of shared e-scooters, the actions needed are attainable. With proper care, shared e-scooters could be an integral part of the lives of many in the near future.

Sources

Abouelela, Mohamed, Emmanouil Chaniotakis, and Constantinos Antoniou. 2023. “Understanding the Landscape of Shared-e-Scooters in North America; Spatiotemporal Analysis and Policy Insights.” *Transportation Research Part A-Policy and Practice* 169 (March): 103602. https://doi.org/10.1016/j.tra.2023.103602.

Bai, Shunhua, and Junfeng Jiao. 2020. “Dockless E-Scooter Usage Patterns and Urban Built Environments: A Comparison Study of Austin, TX, and Minneapolis, MN.” *Travel Behaviour and Society* 20 (July): 264–72. https://doi.org/10.1016/j.tbs.2020.04.005.

Boarnet, Marlon G., Genevieve Giuliano, Yuting Hou, and Eun Ji Shin. 2017. “First/Last Mile Transit Access as an Equity Planning Issue.” *Transportation Research Part A-Policy and Practice* 103 (September): 296–310. https://doi.org/10.1016/j.tra.2017.06.011.

Brown, Anne, Nicholas J. Klein, Calvin Thigpen, and Nicholas S.G. Williams. 2020. “Impeding Access: The Frequency and Characteristics of Improper Scooter, Bike, and Car Parking.” *Transportation Research Interdisciplinary Perspectives* 4 (March): 100099. https://doi.org/10.1016/j.trip.2020.100099.

Button, Kenneth, Hailey Frye, and David C. Reaves. 2020. “Economic Regulation and E-Scooter Networks in the USA.” *Research in Transportation Economics* 84 (December): 100973. https://doi.org/10.1016/j.retrec.2020.100973.

Caspi, Or, Michael Smart, and Robert B. Noland. 2020. “Spatial Associations of Dockless Shared E-Scooter Usage.” *Transportation Research Part D-Transport and Environment* 86 (July): 102396. https://doi.org/10.1016/j.trd.2020.102396.

Christoforou, Zoi, Anne De Bortoli, Christos Gioldasis, and Régine Seidowsky. 2021. “Who Is Using E-Scooters and How? Evidence from Paris.” *Transportation Research Part D-Transport and Environment* 92 (March): 102708. https://doi.org/10.1016/j.trd.2021.102708.

City of Lincoln. 2022. “E-Scooter Pilot Report.” *Lincoln.Ne.Gov*. https://www.lincoln.ne.gov/files/sharedassets/public/ltu/transportation/traffic-engineering/escooter-pilot-final-report.pdf.

Cubells, Jerònia, Carme Miralles-Guasch, and Oriol Marquet. 2023. “Gendered Travel Behaviour in Micromobility? Travel Speed and Route Choice through the Lens of Intersecting Identities.” *Journal of Transport Geography* 106 (January): 103502. https://doi.org/10.1016/j.jtrangeo.2022.103502.

Flagenheimer, Matt. 20113. “The Balancing Act That Bike-Share Riders Just Watch.” The New York Times. August 14, 20113. https://www.nytimes.com/2013/08/15/nyregion/the-balancing-act-that-bike-share-riders-just-watch.html.

Frias-Martinez, Vanessa, Elliott Sloate, Himanshi Manglunia, and Jia-Hui Wu. 2021. “Causal Effect of Low-Income Areas on Shared Dockless e-Scooter Use.” *Transportation Research Part D-Transport and Environment* 100 (November): 103038. https://doi.org/10.1016/j.trd.2021.103038.

Gössling, Stefan. 2020. “Integrating E-Scooters in Urban Transportation: Problems, Policies, and the Prospect of System Change.” *Transportation Research Part D-Transport and Environment* 79 (February): 102230. https://doi.org/10.1016/j.trd.2020.102230.

Hosseinzadeh, Aryan, Majeed Algomaiah, Robert Kluger, and Zhixia Li. 2021. “Spatial Analysis of Shared E-Scooter Trips.” *Journal of Transport Geography* 92 (April): 103016. https://doi.org/10.1016/j.jtrangeo.2021.103016.

James, Owain T., J I Swiderski, John Hicks, Denis Teoman, and Ralph Buehler. 2019. “Pedestrians and E-Scooters: An Initial Look at E-Scooter Parking and Perceptions by Riders and Non-Riders.” *DOAJ (DOAJ: Directory of Open Access Journals)*, October. https://doi.org/10.3390/su11205591.

Jones, Ryan. 2022. “Potential Solutions to the First Mile/Last Mile Problem – Michigan Law Journal of Law and Mobility.” June 24, 2022. https://futurist.law.umich.edu/potential-solutions-to-the-first-mile-last-mile-problem/.

Karner, Alex. 2016. “Planning for Transportation Equity in Small Regions: Towards Meaningful Performance Assessment.” *Transport Policy* 52 (November): 46–54. https://doi.org/10.1016/j.tranpol.2016.07.004.

Kong, Vivian, and Agnieszka Leszczynski. 2021. “Dockless Micromobility Sharing in Calgary: A Spatial Equity Comparison of e-Bikes and e-Scooters.” *Canadian Journal of Urban Research* 31 (1): 97–110.

Lee, Richard T., Ipek N. Sener, and S. Nathan Jones. 2017. “Understanding the Role of Equity in Active Transportation Planning in the United States.” *Transport Reviews* 37 (2): 211–26. https://doi.org/10.1080/01441647.2016.1239660.

Liazos, Alexandros, Christina Iliopoulou, Κωνσταντίνος Κεπαπτσόγλου, and Efthimios Bakogiannis. 2022. “Geofence Planning for Electric Scooters.” *Transportation Research Part D: Transport and Environment* 102 (January): 103149. https://doi.org/10.1016/j.trd.2021.103149.

Lime. 2018. “Official One-Year Report.” https://www.limebike.com/hubfs/Lime_Official_One_Year_Report.pdf.

Ma, Qingyu, Hong Yang, Yifang Ma, Di Yang, Xianbiao Hu, and Kun Xie. 2021a. “Examining Municipal Guidelines for Users of Shared E-Scooters in the United States.” *Transportation Research Part D-Transport and Environment* 92 (March): 102710. https://doi.org/10.1016/j.trd.2021.102710.

Marshall, Aarian. 2018. “Americans Are Falling in Love with Bike Share.” *WIRED*, May 3, 2018. https://www.wired.com/story/americans-falling-in-love-bike-share/.

Moreau, Hélie, Loïc De Jamblinne De Meux, Vanessa Zeller, Pierre D’Ans, Coline Ruwet, and Wouter Achten. 2020. “Dockless E-Scooter: A Green Solution for Mobility? Comparative Case Study between Dockless E-Scooters, Displaced Transport, and Personal E-Scooters.” *Sustainability* 12 (5): 1803. https://doi.org/10.3390/su12051803.

NACTO. 2017. “Bike Share in the US: 2010-2016.” 2017. https://nacto.org/bike-share-statistics-2016/.

Nouvian, Tom. 2023. “In Paris Referendum, 89% of Voters Back a Ban on Electric Scooters.” *The New York Times*, April 3, 2023. https://www.nytimes.com/2023/04/03/world/europe/paris-electric-scooters-ban.html.

Reck, Daniel, and Kay W. Axhausen. 2021. “Who Uses Shared Micro-Mobility Services? Empirical Evidence from Zurich, Switzerland.” *Transportation Research Part D-Transport and Environment* 94 (May): 102803. https://doi.org/10.1016/j.trd.2021.102803.

Sanders, Rebecca L., Michael Branion-Calles, and Trisalyn A. Nelson. 2020. “To Scoot or Not to Scoot: Findings from a Recent Survey about the Benefits and Barriers of Using E-Scooters for Riders and Non-Riders.” *Transportation Research Part A-Policy and Practice* 139 (September): 217–27. https://doi.org/10.1016/j.tra.2020.07.009.

Tuli, Farzana Mehzabin, Suman Mitra, and Mariah B Crews. 2021. “Factors Influencing the Usage of Shared E-Scooters in Chicago.” *Transportation Research Part A: Policy and Practice* 154 (December): 164–85. https://doi.org/10.1016/j.tra.2021.10.008.

Tuncer, Sylvaine, Eric Laurier, Barry Brown, and Christian Licoppe. 2020. “Notes on the Practices and Appearances of E-Scooter Users in Public Space.” *Journal of Transport Geography* 85 (May): 102702. https://doi.org/10.1016/j.jtrangeo.2020.102702.

U.S. Department of Transportation and Federal Highway Administration. 2019. “2019 Household Travel Survey.” *Https://Nhts.Ornl.Gov*.

Wang, Kailai, Xiaodong Qian, Dillon T. Fitch, Yong-Sung Lee, Jai Malik, and Giovanni Circella. 2022. “What Travel Modes Do Shared E-Scooters Displace? A Review of Recent Research Findings.” *Transport Reviews* 43 (1): 5–31. https://doi.org/10.1080/01441647.2021.2015639.

Zhang, Wen-Wen, Ralph Buehler, Andrea Broaddus, and Ted Sweeney. 2021. “What Type of Infrastructures Do E-Scooter Riders Prefer? A Route Choice Model.” *Transportation Research Part D-Transport and Environment* 94 (May): 102761. https://doi.org/10.1016/j.trd.2021.102761.

Appendix: Survey Results

Have you used a shared e-scooter in Lincoln?		
No	15	53.6%
Yes	13	46.4%
Are you a Lincoln resident or work/attend school in Lincoln?		
Yes, I am a Lincoln resident	18	64.3%
Yes, I work/attend school in Lincoln	9	32.1%
No, I am not a Lincoln resident and do not work/attend school in Lincoln	1	3.6%
What is your age?		
18 or younger	1	3.6%
19-24	6	21.4%
25-34	11	39.3%
35-44	10	35.7%
45-54	0	0.0%
55-64	0	0.0%
65-74	0	0.0%
75-84	0	0.0%
85 or older	0	0.0%
What is your sex/gender?		
Male	18	64.3%
Female	8	28.6%
Transgender/Non-binary	2	7.1%
Prefer not to say	0	0.0%
What is your ethnicity?		
Hispanic or Latino	1	3.6%
Not Hispanic or Latino	27	96.4%
What is your race?		
American Indian or Alaska Native	0	0.0%
Asian	1	3.7%
Black or African American	0	0.0%
Native Hawaiian or Other Pacific Islander	1	3.7%
White	25	92.6%
What is your education level?		
Less than a high school diploma	0	0.0%
High school diploma/GED	6	21.4%
Associate's Degree	3	10.7%
Bachelor's Degree	14	50.0%
Master's Degree	5	17.9%
PhD or other terminal degree	0	0.0%

What is your employment status?		
Full-time	20	71.4%
Part-time	2	7.1%
Unemployed	2	7.1%
Student	4	14.3%
What is your level of yearly income?		
Less than $20,000	3	10.7%
$20,000 to $34,999	6	21.4%
$35,000 to $49,999	3	10.7%
$50,000 to $74,999	7	25.0%
$75,000 to $99,999	4	14.3%
$100,000 or more	5	17.9%
What is your primary mode of transportation?		
Walking	1	3.6%
Private vehicle	22	78.6%
Public transportation	4	14.3%
Personal bike, e-bike, scooter, or e-scooter	1	3.6%
Shared bike, e-bike, or e-scooter	0	0.0%
How many times have you used a shared e-scooter in Lincoln?		
Never	15	53.6%
1-2 times	6	21.4%
3-5 times	4	14.3%
6-10 times	3	10.7%
more than 10 times	0	0.0%
For what type of trips have you used a shared e-scooter?		
Work	1	3.3%
School	2	6.7%
Social	10	33.3%
Leisure	6	20.0%
Personal obligations	2	6.7%
Other	9	30.0%
How comfortable are you using an e-scooter in Lincoln?		
Very comfortable	3	11.1%
Somewhat comfortable	6	22.2%
Neutral	9	33.3%
Somewhat uncomfortable	5	18.5%
Very uncomfortable	4	14.8%
How comfortable are you around others using an e-scooter in Lincoln?		
Very comfortable	3	10.7%
Somewhat comfortable	7	25.0%
Neutral	8	28.6%
Somewhat uncomfortable	8	28.6%
Very uncomfortable	2	7.1%

Are you satisfied with the presence of shared e-scooters in Lincoln?		
Definitely not satisfied	2	7.1%
Probably not satisfied	6	21.4%
Neutral	9	32.1%
Probably satisfied	9	32.1%
Definitely satisfied	2	7.1%
Do you view e-scooters as a viable alternative to other modes of transportation?		
Definitely not	3	10.7%
Probably not	13	46.4%
Neutral	3	10.7%
Probably yes	8	28.6%
Definitely yes	1	3.6%
What is the best aspect of shared e-scooters in Lincoln?		
Availability/Convenience	16	61.5%
Infrastructure	1	3.8%
Price	1	3.8%
Parking	5	19.2%
Other	3	11.5%
Comments:		
There is no good aspect about these things		
Novelty item		
What is the worst aspect of shared e-scooters in Lincoln?		
Availability/Convenience	3	10.7%
Infrastructure	5	17.9%
Price	4	14.3%
Parking	7	25.0%
Other	9	32.1%
Comments:		
- They’re incredibly unsafe and many times bar hoppers use them to get around. I’m worried!		
- Leaving them lying around everywhere		
- Safety. My ambulance has had to transport 3 people in the past year due to not wearing helmets and getting hit by traffic		
- People always be riding them on the sidewalk		
- Risk of injury		