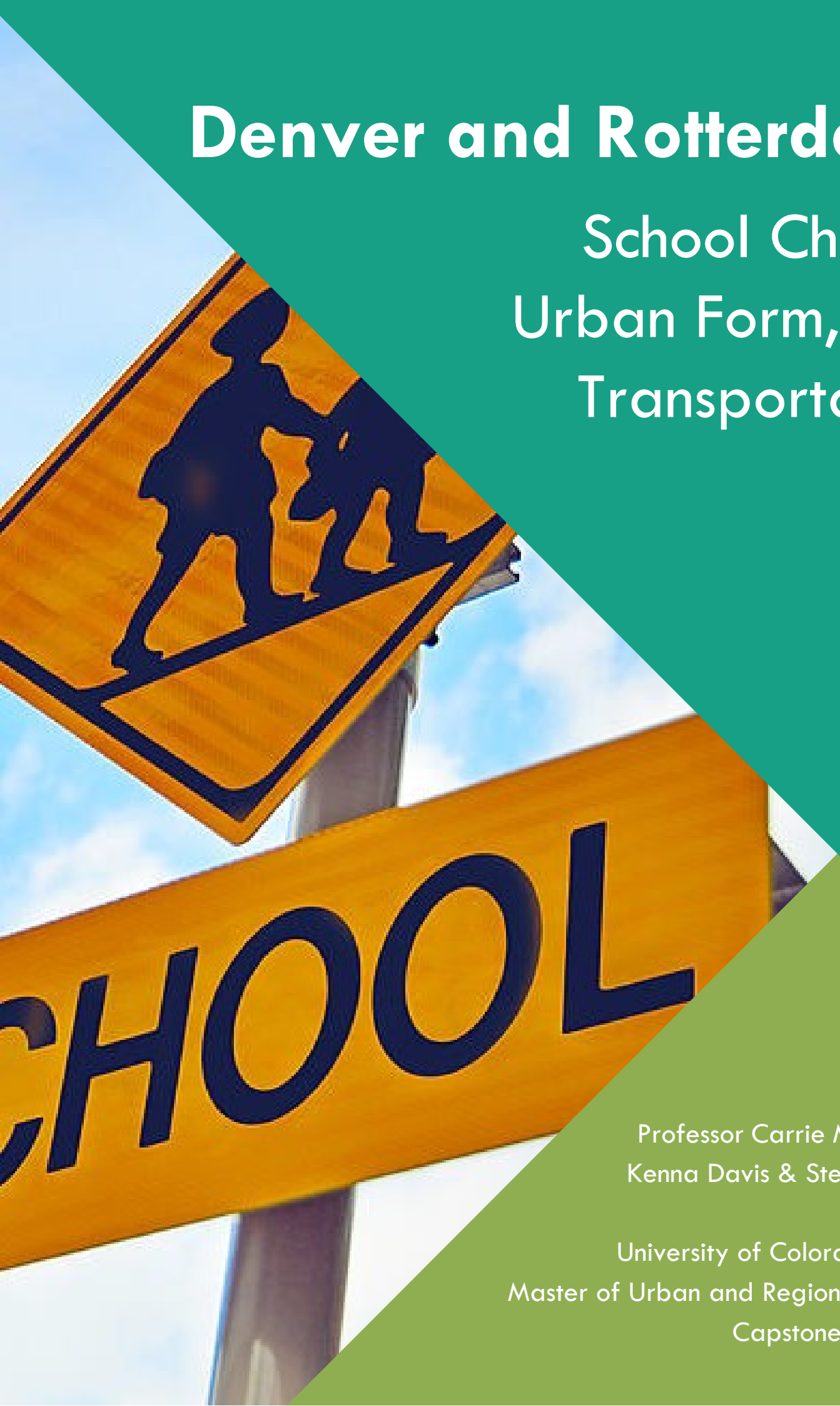
Denver and Rotterdam:

School Choice, Urban Form, and Transportation



Professor Carrie Makarewicz
Kenna Davis & Stefania Szrek

University of Colorado Denver
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Denver & Rotterdam: School Choice, Urban Form, and Transportation

Kenna Davis & Stefania Szrek

Carrie Makarewicz, Assistant Professor, University of Colorado Denver, Denver

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Executive Summary

Executive Summary

Research Question

The purpose of this Capstone project is to provide research, both primary and secondary, to add to existing research regarding school choice and transportation. This project aims to add an element of urban form and family errand patterns to further the research on this topic, both in a domestic and international context.

This report is being produced as supplemental research for Professor Carrie Makarewicz (University of Colorado Denver, Department of Urban and Regional Planning) on her ongoing research into the phenomenon of school choice policies and what this means for our cities in terms of transportation, equity, and design.

This report will support and add to both Dr. Makarewicz's research, and to the topic generally, by providing detailed background information, a review of existing literature, and add more primary research into the realm of existing research. This project is intended as a steppingstone for future research and more in-depth exploration of school choice, transportation patterns, and urban form.

This study mainly focuses on the built environment and analyzes how urban form and transportation systems can either support or hinder mobility in conjunction with school choice policies. More specifically, human behavior was observed as to how it responds to urban form and the transportation system within the context of family travel patterns to and from schools.

Methodology

The following table shows the two selected cities, four selected neighborhoods, and four selected schools researched.

Table 1: Cities and Urban Form

City	**Rotterdam**				**Denver**			
Urban Form	Urban Neighborhood		Mid-urban Neighborhood		Urban Neighborhood		Mid-urban Neighborhood	
Schools	Urban Neighborhood School		Mid-urban Neighborhood School		Urban Neighborhood School		Mid-urban Neighborhood School	
Street Analysis	Local 1	Local 2	Local 1	Local 2	Local 1	Local 2	Local 1	Local 2
	Collector 1	Collector 2	Collector 1	Collector 2	Collector 1	Collector 2	Collector 1	Collector 2
	Arterial 1	Arterial 2	Arterial 1	Arterial 2	Arterial 1	Arterial 2	Arterial 1	Arterial 2

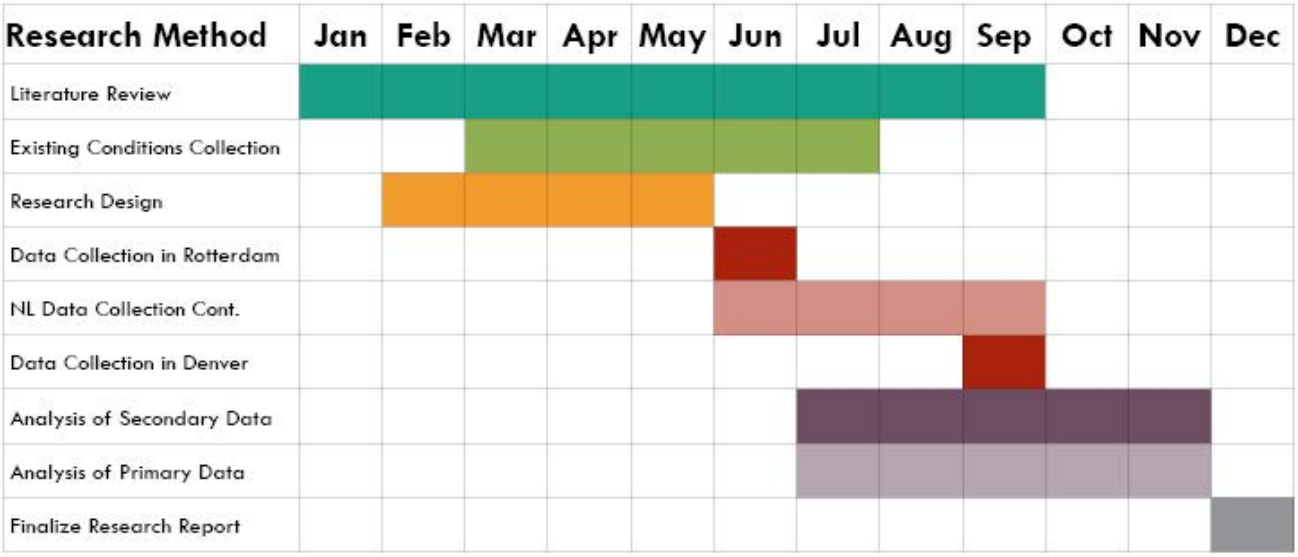
The following methodologies were deployed to study these locations in Table 1:

1. Observations of parents dropping off and picking up their children at the schools in each of the four study neighborhoods
2. Short surveys of parents in each study neighborhood collected through three methods (intercept/on-street verbal surveys, paper surveys handed out on the street, and online website surveys)
3. Extended interviews with a subset of parents who took the survey agree to a long form interviewed

4. Interviews about school travel with urban planning professionals, school administrators, and teachers ineach city;
5. Primary data collection of the urban form in each neighborhood through on-site observation of the urban form and transportation system infrastructure
6. Secondary data analysis of the urban form and transportation system within each neighborhood and each city

All research was collected over the course 2019 and then analyzed and compared for the final report. The timeline for data collection and analysis can be seen in Figure 1 below.

Figure 1: Research Timeline



Research Findings

The study revealed how the urban form of four chosen neighborhoods, two typologies from each (Urban Neighborhood and Mid-urban Neighborhood) influences family transportation patterns. Parent surveys and professional interviews provided further qualitative insight into some of the patterns seen. The following key takeaways were discovered through the research process:

- **Children in Rotterdam bike much more than in Denver, in both neighborhoods.**
- **Collector streets in both cities are of very high quality.**
- **Parents care about school culture and school ratings.**
- **In Denver, socio-cultural economics are highly informative about potential travel patterns.**
- **Economic factors play into school choice decisions, outside of the effect of urban form**
- **Cultural factors also play a part in travel behaviors**
- **While school choice was created as an instrument to enact more equity among families, it has not succeeded for all socio-economic statuses.**

It was generally found that Denver has lower quality multimodal transportation options, especially when compared to European bicycle, pedestrian and transit networks, which was as predicted. Rotterdam not only has a lower use of automobiles, but also differs in its social and cultural behaviors around multimodal travel, government policies, existing facilities, safety statistics, and school policies and oversight. The urban form and robust multi-modal infrastructure in Rotterdam, aids in student active travel. School choice is used by a wider breadth of populations that are of higher income typically, but some families in both cities do choose housing based on the school location, if that is available to them economically.

Recommendations include further research into further exploration of how cultural and socio-economic factors affect travel patterns, how urban form and school choice affect one another, and how child independence effects school choice decisions.

02

Introduction

Introduction

Research Question

The goal of this study is to compare two neighborhoods in Rotterdam, Netherlands, with two neighborhoods in the city of Denver. [1] The study focused on the built environment and analyze how urban form and transportation systems can either support or hinder mobility in conjunction with school choice policies. More specifically, human behavior was observed as to how it responds to urban form and the transportation system.

The Netherlands has a higher rate of resources funneled to their school systems due to their social policies, types of funding, and school-autonomy structure. This study aims to identify transportation-related behavior change due to school choice policies and whether transportation and built form issues are better mitigated due to this country's social political structure. The study will also be considering other factors such as school quality, educational programs, and social factors such as gentrification, white flight, and urban revitalization in post-industrial cities. Rotterdam was chosen as a comparison city for this project due to its similar population size to Denver and the presence of school choice policies.

The study will research and analyze urban form of each chosen neighborhood, including categorizing two typologies from each: Urban Neighborhood and Mid-urban Neighborhood. Urban Neighborhood is characterized as high density, built form, with majority of residential occurring in multi-family apartment complexes, as well as mixed use land use patterns, high walkability and high transit accessibility. Mid-urban Neighborhood is characterized with a lower density and less mixed use than the Urban Neighborhood typology. Residential is manifested with generally low-density multi-family, and single-family homes.

Transportation systems include, multimodal networks such as transit networks and typologies (high speed rail, commuter rail, light rail/tram systems, bus systems, etc.), bicycle infrastructure (protected/unprotected bike lanes, bicycle boulevards, sharrows, multi-use pathways, etc.), and pedestrian infrastructure, along with neighborhood amenities such as food access and food quality will also be included within the study. Analysis of these systems will question whether this built environment in each city supports children and families in their daily travel needs due to changing transportation patterns stemming from school choice policies.

Compared to Rotterdam, Denver has lower quality multimodal transportation options, especially when compared to European bicycle, pedestrian and transit networks. Rotterdam not only has a lower use of automobiles, but also differs in its social and cultural behaviors around multimodal travel, government policies, existing facilities, safety statistics, and school policies and oversight.

This study seeks to answer if school choice policies are used by a greater breadth of the population (socioeconomic status, race/ethnicity, geographical location, commute mode used, etc.) due to their urban form and/or policies surrounding the identified variables. Current literature has little to no mention of place and urban form as a variable to school choice effects. This study will try to fill in gaps within published literature to see if urban form influences mobility for families utilizing school choice. This study aims to test assumptions of European city models on whether denser urban forms provide better accessibility, mobility, and overall decrease school travel times via the presence of robust transportation systems and safe, high quality trip routes.

[1] The names of the neighborhoods and the schools in this research have been changed, they will be referred to as Urban and Mid-urban, and Urban School and Mid-urban School, for both Denver and Rotterdam.

Research design

Research was conducted using six methods in a phased approach:

1. Observations of parents dropping off and picking up their children at the schools in each of the four study neighborhoods
2. Short surveys of parents in each study neighborhood collected through three methods (intercept/on-street verbal surveys, paper surveys handed out on the street, and online website surveys)
3. Extended interviews with a subset of parents who took the survey agree to a long form interviewed
4. Interviews about school travel with urban planning professionals, school administrators, and teachersin each city;
5. Primary data collection of the urban form in each neighborhood through on-site observation of the urban form and transportation system infrastructure
6. Secondary data analysis of the urban form and transportation system within each neighborhood and each city

Method 1: Observations of parents dropping off and picking up their children at the schools in each of the four study neighborhoods

Observations of parents dropping off and picking up their children at the schools in each of the four study neighborhoods took place over a two-day period in the public right-of-way near each school. Morning and afternoon bell times were observed, and travel modes were coded as walking, biking, and automobile. Due to school locations and observation vantage points, public transit was unable to be captured; presumably parents and children who took public transit were coded as pedestrians. Additionally, active transit methods were counted as accompanied by an adult versus alone, and for automobile transit, the number of children in each vehicle was recorded in order to gain insight on carpooling.

Method 2: Short surveys of parents in each study neighborhood collected through three methods (intercept/on-street verbal surveys, paper surveys handed out on the street, and online website surveys)[2]

Surveys were five minutes in length and were collected in three ways: 1) intercept/on-street verbal surveys, 2) paper surveys handed out on the street, and 3) online website surveys. All survey answers were recorded either by the researchers or parents on paper forms for Rotterdam participants and paper or electronic forms for Denver participants. The survey answers were then entered into a single Excel database where information was analyzed. Survey questions were derived from three themes including school choice policies, travel behavior in response to urban form and transportation systems, and individual transportation patterns to errands and food access. The survey questions were related to if the parent exercised school choice and why, what factors influenced their decision to either use or not use school choice, including whether transportation was an issue, how their child(ren)'s school location affects their family's other travel needs and modes, and their satisfaction with their child(ren)'s school(s) and commutes. On the Denver survey researchers also asked demographic questions, such as age, gender, marital/relationship status, and number of kids. All questions are completely voluntary, and all participants were able answer all or none as deemed appropriate. Consent was received before proceeding with all surveys.

Method 3: Extended interviews with a subset of parents who agree to be interviewed[3]

[2] See Appendix A
[3] See Appendix B

A subset of parents was recruited for these interview types of the research via personal and professional contacts in each city, intercept surveys and those who find out about the project via our website or advertisement flyers for the Denver portion of the study. Interviews were conducted in one of three ways: in-person, remotely using video-conferencing software, such as Zoom or Skype, or by phone. These extended interviews were semi-structured based on a flexible interview script related to our study questions. Questions were derived from our survey but asked more in-depth questions with the goal to have additional narrative to explain their binary (yes/no) answers on the survey. Interviews lasted between 30 to 60 minutes and may vary by participant. More specifically, the parent interview questions ask why the parent exercised school choice, what factors influenced their decision to either use or not use school choice, how they selected their child's school, how their child(ren)'s school location affects their family's other transportation patterns, their satisfaction with their child(ren)'s school(s), and their satisfaction with their work and school commutes. Consent was received before proceeding with all interviews.

Method 4: Interviews about school travel with urban planning professionals, school administrators, and teachers in each city[4]

Interviews with school administrators, teachers, and urban planning professionals were conducted from contacts in both study cities. These interview participants were recruited for this portion of the research via contacts within each city through email requests, from intercept requests in public or semi-public (e.g. city hall) places, and from those who find out about the project via our website or advertisement flyers. Consent was received before proceeding with all interviews.

The Interview questions are derived from our research hypothesis. Questions are related to how school choice policies have changed family travel patterns, if the city and/or neighborhood have done any work around these topic areas, whether changing transportation patterns to school have affected travel for errand trips and in these neighborhoods, etc. The goal is to understand whether school or city professionals have gathered data on parent travel that could be useful to our data analysis of parent travel based on the parent surveys, parent interviews, and parent observation. Additionally, interviews with professionals were to understand how planners and designers in each city handled these topics in their personal work, as well as their perspective on how best to mitigate issues arising out of child transportation, school choice and urban form.

Method 5: Primary data collection of the urban form in each neighborhood through on-site observation of the urban form and transportation system infrastructure[5]

Primary data was collected on the urban form and transportation system infrastructure of each neighborhood through on-site observation. Observations collected were both quantitative and qualitative in nature. Quantitative observations will include physical inventories of items such as road widths, traffic speeds, existing pedestrian and bicycle facilities, etc.:

- Physical inventory: width of roads, speed of traffic, streetscaping including trees, quality of transit stops, setbacks, height of buildings, activity level
- Modal infrastructure: transit types, schedules and frequencies (tram, rail/light rail, bus), bicycle (lanes, paths, etc.), pedestrian facilities (sidewalks, paths, cross walks), automobile (two- or four-lane roads, one way/two way, etc.)
- Neighborhood amenities: grocers, coffee shops, libraries, parks, etc.

[4] See Appendix B
[5] See Appendix C and Appendix D

Qualitative observations included descriptions of existing conditions, neighborhood, character and feel, perception of safety, etc.

In addition to the previously mentioned observations, researchers utilized the following chart developed by Jan Gehl Architects for the "Seattle: Public Space and Public Life" plan to quantify urban form elements. Four main themes of the chart include protection, comfort, delight, and place. Researchers observed and document the elements described within each of the four themes and rank each neighborhood on a scale of 1-15, with a poor-quality neighborhood scoring 1-5, an average quality neighborhood scoring 6-10, and a good quality neighborhood scoring 11-15.

Figure 2: Jan Gehl Example

Source: Gehl Architects for International Sustainability Institute - *https://issuu.com/gehlarchitects/docs/565_seattle_pspl/49*

Method 6: Secondary data analysis of the urban form and transportation system within each neighborhood.

The analysis of existing conditions in Rotterdam and Denver, as well as neighborhood specific conditions in both selected urban and Mid-urban Neighborhoods in both cities (for a total of four neighborhoods) include the following:

- Demographic Data
- Transportation
- Land Use and Zoning
- Analysis of Urban Form
- History of Rotterdam and development patterns

03

Literature Review

Literature Review

Introduction:

School choice programs are spreading in countries throughout the world at a rapid pace. In the United States, several researchers have identified that school transportation as a factor that must be considered for school choice programs to be equitable and easily accessible to all parents and their children. For some families, transporting children to a "school of choice" is not problematic. For other families, the transportation becomes a financial and time burden. For others, transportation is a prohibitive barrier and school choice may not be able to be exercised. Other issues, such as social and racial segregation, false illusions of choice, child competencies and independence, quality of family time, among others, arise as well. The crucial issues within this is the conversation of access, transportation, and urban form within the realm of school choice.

School Choice Policies Internationally:

School choice assignment policies in place of neighborhood-assigned schools are becoming a worldwide phenomenon. The World Bank has actively promoted school choice policies in numerous countries on several continents (Musset, 2012). Of the 33 OECD (Organisation for Economic Co-operation and Development) countries, 23 have some sort of school choice policy in place. This concept of school choice has been historically implemented as a way to bring equity to students attending low performing schools, leveling the playing field with higher income students who have always had some form of choice due to private schools and residential mobility (Musset, 2012). In terms of the social and cultural implications of school choice, there are various philosophies on school choice policies. Egalitarians promote the equality of access to education for disadvantaged children, where libertarians promote parental freedom and believe that the market should regulate school outcomes. School choice policies follow the more libertarian philosophy that schools will improve if they are forced to compete against one another in the market, while egalitarians argue that this market should be regulated. Furthermore, they argue that not all children will receive better educational outcomes due to competition and will suffer unintended consequences such as limitations on transportation (Brando, 2017).

Choice overall is quite a complex phenomenon with varying opinions and research. Some note that different choice contexts vary from place to place depending on their autonomy, and supply and demand markets. Even if formal educational policies encourage school choice, this is not the case on a local scale due to the limited availability of information, bureaucratic choice procedures, strictly enforced admission criteria, and overall lack of educational diversity between schools. These factors all result in actual discouragement of choice. (Teelken, 2004).

Other research on choice notes that, parents of students that are in rural or disadvantaged areas report as having less choice than those in urban and more advantaged areas. Across OECD countries (using data collected from PISA in 2015), 64% of parents reported that they had a choice of at least two schools available to them. (OECD, 2017). While proponents of school choice policy argue that equality of opportunity results from school choice, educational choice intensifies class segregation due to differing information availability and parental preference. Low income families are less likely to exercise choice and then suffer from weakened schools due to the flight of highly motivated students. This intensifies in minority schools where students can choose out instead of having to move residences (Ambler, 1994). School choice policies in Sweden mirror those in the Netherlands: tuition free for all types of schools (public and private), as well as continued central oversight through national curricula, finances, and regulation. Similar results to the US, UK, New Zealand, and Australia, housing segregation and immigration has increased segregation in schools due to open choice policies (Bunar, 2010). Demand for housing also increases in areas with popular schools (i.e. strategic location behavior). Parents are very interested in a school's "image", including its ethnic

makeup and may use those factors, including their own social background, to make school choice decisions (Croft, 2004).

In addition to school choice policies, education decentralization has also been a worldwide phenomenon, allowing for more local autonomy and less central oversight. Economic and institutional globalization has pushed nations to decentralization administrative and social services, with the hopes of greater educational efficiency and quality through marketization, but which has also created a mismatch of some centralized and decentralized education systems across the globe (Astiz, Wiseman, & Baker, 2002). However, decentralization can be detrimental in developing countries because structures of local accountability are not in place (Bardhan, 2002). Additionally, in places where urban sprawl is exacerbating, local governments are not able to keep up with growing populations or needed social services such as schools (Gouda, Hosseini, & Masoumi, 2016). Implementation of school decentralization policies rely mainly on local resources and management capacity. Research of decentralization in Indonesia shows that local authorities perform at the same level if not worse in oversight of schools than the central government (Leer, 2016).

Transportation Internationally:

Transportation specifically in relation to school choice, has been minimally studied in other countries (Van Ristell et al., 2012; Makarewicz, 2013), even though there is school choice in many other countries and there is an extensive body of research on why children are no longer walking to school in other countries.

Transportation to school has been a focus of transportation planning research since at least the 1990s when researchers started to explore the reasons for the decline in the number of children who could walk to school (Makarewicz, 2013). The International Safe Routes to School (SR2S) program began in Copenhagen, Denmark. The decline in children walking is for several reasons, including increasingly unsafe walking conditions in many countries, parents heightened concerns about their children walking as cities continue to urbanize, and more recently, the increased distances to school as more parents exercise school choice options (McDonald 2008; Makarewicz, forthcoming; Wilson et al., 2010, Van Ristell et al., 2012). Studies focused on school choice also document that transportation can be a barrier that prevents families from exercising school choice due to the costs and time resources school travel requires as distances increase (Teske et al., 2009).

Parental engagement is important when it comes to choice, as well as student transportation itself. Parent, school and community involvement are among the most influential components of active transportation to school interventions. (Chillón, Evenson, Vaughn, & Ward, 2011).

In addition, when parents spend more time and money taking their children to school, they may have less time for other essential activities in their daily life, such as going to the grocery store, taking their children to the park, etc. (Makarewicz, 2018). Although food strategies and urban agriculture projects have been used by the city of Rotterdam to address social and environmental problems, the main goal in these radical policies have really been spurred as a way to attract middle class residents, and enhance economic development in the city by increasing real estate values. (Cretella & Buenger, 2016), but little to no research has shown an intersection in how family errand and food shopping patterns have affected overall transportation.

Active student travel has been researched on an international scale, but not necessarily in conjunction with school choice policies. Factors such as increased traffic, distances to schools, organized extracurricular activities, and pressure on family time have caused more students to drive, (Fyhri, Hjorthol, Mackett, Fotel, & Kyttä, 2011) but school choice as a causing factor is not discussed often. This decrease in child independent mobility has created an insulare childhood phenomenon, where children are transported from one island of activity to another, defamiliarizing them from their own environment. Mobility is complex in and of itself, with factors such as gender,

social interactions, safety and parent travel behaviors (Panter, Jones, & van Sluijs, 2008; Fyhri & Hjorthol, 2009). All of these factors are relevant to our research, as added complexities are important to be noted throughout this project.

Food Access

There is a need for solutions in order for urban environments to become more resilient, especially when it comes to food and food access. It is projected that by 2050, 68% of the world population will live in urban areas (UN DESA). These urbanized areas that are highly populated and densely developed pose another issue, that of food access and a lack of locally produced foods. In the U.S. alone, 23.5 million people live in food deserts, defined as those in urban areas who live more than a mile away from a fresh foods store (United States Department of Agriculture). Due to a lack of local farms and food production in urban areas, one of the main issues with the distribution system in the U.S. is food miles. The average grocery store item travels and average of 1,500 miles from farm to consumer (Pirog et. Al. 2001). This unnecessary mileage creates increased CO2 emissions and higher energy usage which a exacerbate the negative effects of climate change and complied with. With increased effects of climate changes' extreme weather events such as stronger storms, more droughts, wildfires, and flooding – these issues present a need of more disaster risk reduction by communities, especially for those in urban environments (National Climate Assessment 2014).
Food production is a global issue, as the UN points to decreasing world hunger as number two in its Global Development goals, and one of the subcategories includes to "…ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality" (United Nations Department of Economic and Social Affairs.). Localized food production, such as urban gardens, farms community gardens, and orchards can create more resilient cities, decrease food miles and increase food access, especially for low income households.

USA:

In the United States, school choice policies have been promoted to improve schools by introducing competition into the school system. USA has parental choice, greater school autonomy, and shared decision making. Compulsory education in the United States is primarily the responsibility of individual states (Whitty, 1997).

Education system/school choice:

The proponents of school choice argue children in neighborhoods with less advantaged schools will have access to better schools through the ability to choose a school in a different neighborhood that may have more resources. Studies are mixed, however, on whether choice has improved schools overall, or whether the policies have created opportunities for children with fewer advantages (Miron and Urschel, 2012; Ozek, 2009). Parents see geography as connected to parenting choices, identity, family life; parental social networks were first point of contact for making school choice decisions, second by transportation time and its effect on quality of family life outside of school (Bell, 2007).

Looking at what motivates Latino parents compared to non-Latino parents for school choice decisions, results found that Latino parents use the same mechanisms for choosing schools; academics, discipline, safety, class sizes, location and transportation, social perception of schools (i.e. charter and private schools are superior to traditional schools). Economic, linguistic, and cultural barriers engage with school choice in different ways which are different than market theory may suggest (Mavrogordato & Stein, 2016). Most of the meta-studies on the public charter form of school choice in the United States have found they have not improved student outcomes or school quality (Miron

and Urschel, 2012). Thus, the fact that school choice programs may be creating more transportation burdens for families and cities (Makarewicz, forthcoming) without improving student outcomes raises the question of whether these policies need to be reevaluated, or whether school transportation needs to be addressed in conjunction with school choice policies.

Despite the lack of improvement in overall school quality, if school choice policies can provide other benefits to families and their students, such as the ability to find a school with special programs more suited to their children's needs or to choose a school that is closer to the parents work location, then certain types of school choice may, in fact, be beneficial for some families. Further, if parents are able to manage the travel to a school of choice because the transportation system in their neighborhood and city is more convenient and more affordable, then school choice policies may have fewer travel impacts in such cities.

Segregation and housing:

Considering the racial makeup of schools since desegregation of the mid 1950's, currently most schools are representative of their neighborhoods, with self-segregation of the housing market representing the school composition. Charter schools see higher rates of segregation (higher percentages of black populations) which can partially be explained due to charter school locations, as well as social perceptions of charters compared to traditional public schools (Charles, n.d.).

Families tend to "district shop" and sort neighborhoods by family income, and this "shopping" is inclined to be informed by one dimensional school ratings, and this is the main driver of segregation in the US. Further, some studies recommend that marketing platforms and realtors should highlight more important factors than test scores such as: the value of student diversity, year-to-year growth, school climate, and personal parent reviews. Better rating system could encourage more well-informed choices by letting families consider purchasing housing in more diverse school districts, which would help maintain housing prices and residential stability over time (Tegler, 2017). School district boundaries and school assignment policies are key drivers of school segregation, as well as residential segregation. All of this creates an ongoing cycle; more high-income students in a district means higher test scores, further increasing the demand for more high-income students, increasing house prices. (Tegler, 2017).

Housing, segregation, school choice and parent engagement are all distinctly intertwined. A tool by HUD called the "*Assessment of Fair Housing*" acknowledges that "the geographic relationship of proficient schools to housing, and the policies that govern attendance, are important components of fair housing choice," and further that "the quality of schools is often a major factor in deciding where to live, and school quality is also a key component of economic mobility" (Tegler, 2017). Many factors are intertwined when it comes to school choice, housing and mobility. While research on segregation is not the main purpose of this project, it is an important aspect that is closely connected to school choice, transportation and urban form. Denver schools experience quite a high amount of segregation as well, with over 55% of schools having high segregation of their populations (Wingerter, 2019). Comparisons to the European model will show whether or not these other factors have an effect on school and neighborhood segregation.

Transportation:

The relationship between the physical environment and active travel are extremely important. Distance supersedes destination, if the distance is too large, children will not walk or bike. Some readings have created conceptual frameworks that integrate the environment into decision making process for children and their travel choices. Distance is the largest determinant of active travel, this is why school choice is very important. (Panter, Jones, & van Sluijs, 2008). Currently, planning does not include schools and historically since WWII, school planning has gone to larger,

campus-like schools (+1,000 students) and away from community centers as they were in the past, which do not promote active transportation (Morris, n.d.).

Active transportation is highly influenced by adult and/or caregiver behavior. Urban environment, traffic and personal safety perception, street connectivity, pedestrian comfort and attractiveness, and social networks are major influencers on active transportation (Mitra, 2013). In a study that looked at five "school-choice rich" cities, results show that older students travel further to school, and black students travel further than white or Hispanic students. In Denver, black families are more likely to travel to a high quality distant school, the city has a lower charter growth than other cities in study, higher income families travel further than low income families, and students travel further to traditional public schools; additionally, car transportation was higher in Denver than the other four cities. Student trips to school can affect academic outcome and engagement due to quality of trip, ability to get to school on time, number of absences, and involvement in before or after school activities (Blagg et al., 2018).

Socio-demographics are important in shaping travel behavior. Factors like income, race, ethnicity, gender, education, marital status, etc. can influence travel behavior and vary in importance within influence. Studies done on multimodal trip generations have concluded that the role of the larger context plays into the success of that site itself. It is important to remember things on a regional or city scale not just per neighborhood or single site (Clifton, Larco, Currans, & Wettach-Glosser, 2017).

The Netherlands:

The Netherlands is an appropriate case to study school choice in relation to school travel for two main reasons. First, the Netherlands has had school choice policies for over a century and over 25% of families exercise school choice (Musset, 2012).

Their large cities also have high shares of daily travel by walking, biking, and public transit. Within the Netherlands, the city of Rotterdam was chosen to compare to Denver, Colorado due to the similar population sizes of the two cities, the presence of school choice policies in each city, similar levels of urban density, and similar investments in fixed-rail infrastructure. Yet, Rotterdam has more transportation options, including extensive infrastructure for bicycling, walking, and taking transit, and greater transit route frequencies. Thus, while Rotterdam has better transportation infrastructure, it is not as dense or walking and transit-oriented as other European cities, which would be less comparable to Denver, CO.

Education systems/school choice:

The educational system in the Netherlands varies from the US, although key piece is that both have school of choice policies, and choice has been implemented for a much longer time in the Netherlands which can provide some beneficial insights. The Dutch have a central government which is through the Ministry of Education, Culture and Science, and it creates and establishes frameworks and governs testing, salaries, buildings and the national curriculum. Then, a specialist EDU Council advises the national government on education policy and helps provide guidance to municipal authorities. The roles that the provinces in NL have are limited, they have to make sure that there are sufficient schools. They deal with the funding, annual plans, and monitoring (in compliance with the Compulsory Edu Act). All schools have a legal competent authority, which is essentially a school board that administers one or more schools (Slater, n.d.).

Due to the education system in the Netherlands (which first allowed choice in 1917), the makeup of schools is roughly ⅔ faith-based (Catholic or Protestant) and only ⅓ traditional public, or another type of philosophical school. All schools are state funded per pupil though. Religious education is focused less on the school's denomination and more

so on worldview education of religion. As the Netherlands itself because more secular, parents choose schools less on their denomination and more so on geographical location, school quality, or "atmosphere". Orthodox Protestant schools are an exception to this rule (Franken & Vermeer, 2017).

The large number of schools in the Netherlands causes an administrative burden at the district and state level. Even with a mix of school types there a relatively uniform curriculum, pedagogy, and structure due to parent involvement and satisfaction, secularism, and few standardized tests beyond those at the high school level to determine university/trade school paths. While the majority of schools remain Christian, there has been an emergence of Muslim or other non-western schools due to immigration. However, while there is a large percentage of private schools in the country, they still have a high level of oversight from the national government unlike private schools in the U.S. (Louis, n.d.).

In Rotterdam, all schools (including public and denominational) advertised themselves in a collective brochure, which is different than in other cities in the Netherlands. Each school used the brochure to show their unique profile. (Teelken, Driessen, & Smit, 2005). As well as having long time existing school choice policies, Rotterdam also has good opportunities for school choice, but in recent years the choice has become more varied. This is largely due to the diverse supply of schools stimulated by increased financial and administrative autonomy. (Teelken, Driessen, & Smit, 2005). Even with these high amounts of choice in the city, popular schools tend to fill up quickly, which limits the availability of schools in certain neighborhood areas (Teelken, Driessen, & Smit, 2005). Additionally, Dijkgraaf (2013) observed whether or not choice (in other words, competition) lead to better quality schools. It was found that the result is actually minimal, and that secondary factors such as sports and music facilities, factor into choice more so (Dijkgraaf, Gradus, & Jong, 2013).

Segregation and Housing:

In Rotterdam, commute mode is strongly associated with ethnicity and distance. Young students of non-Western ethnic background were more likely to walk or use non-active transportation when compared to native Dutch adolescents. (Bere, van der Horst, Oenema, Prins, & Brug, 2008). The study hopes to draw new conclusions on mobility within school choice factors, as well as other socio-demographic ones.

Homeownership is positively related to neighborhood safety and overall satisfaction. But while homeownership can foster neighborhood stability, create social networks and decrease crime, it can also decrease a household's mobility and economic resources. (Brounen, Cox, & Neuteboom, 2012). Rotterdam has "child friendly" initiative to entice more middle-class families to live in the city (as compared to suburbs). The city plans that have come out of the initiative are catalysts for gentrification, especially for YUPPs (Young Urban Professional Parents), which are typically white as compared to the ethnically diverse makeup of the existing city. Initiatives include housing, public space, amenities, and better connectivity. These initiatives are trying to attract "opportunity-rich", middle class, dual-income, nuclear families to replace "opportunity-poor," low-income children (van den Berg, 2013). Additionally, food strategies and urban agriculture projects have been used by the city of Rotterdam to address social and environmental problems, but also as a way to attract middle class residents, enhance economic development in the city by increasing real estate values (Cretella & Buenger, 2016).

It is evident from research that mobility, housing and other socio-economic issues are closely related, each one having an effect on the other, even on an international scale and in the Netherlands specifically as well. One this note, some research also speculates as to why some middle class families do not choose typical suburbs and conclusions draw that social embeddedness of families provides them with a reason to stay, time-geographical reasons for urban living, and personal perception of themselves as urbanites that reject the suburbs (Karsten, 2007). Changes over time in demographic compositions of neighborhoods can also be a factor of this research. Urban form and mobility can

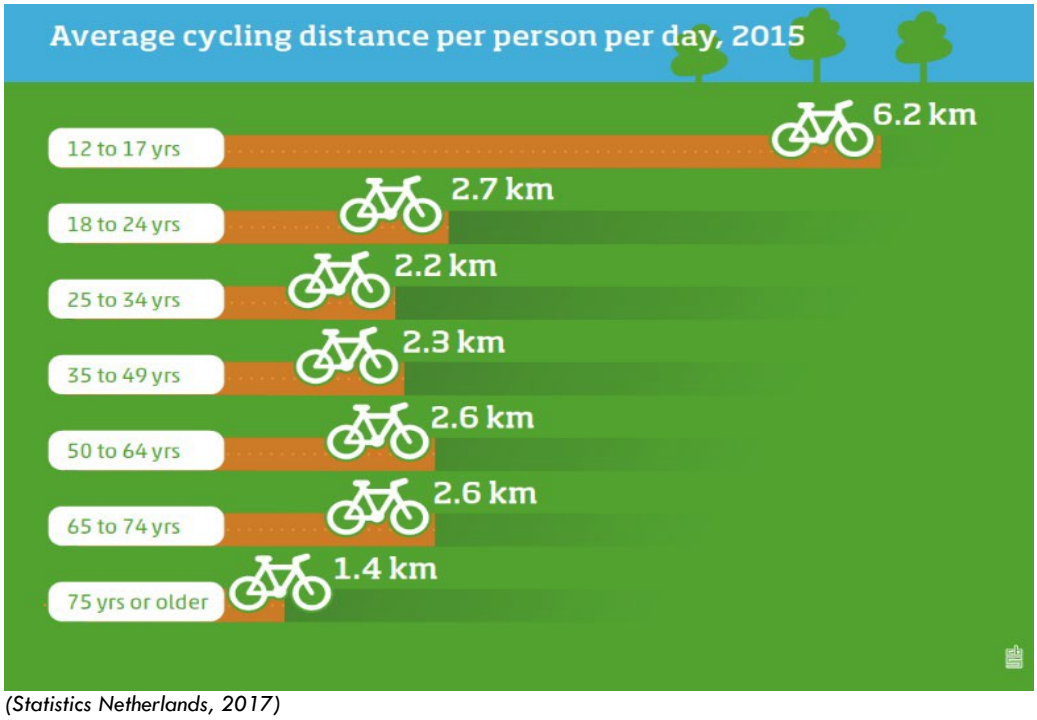
vary in both neighborhood forms and demographic compositions, both in the US and in the Netherlands comparatively.

Transportation:

Mobility in Rotterdam is embedded within the culture, with extensive research in sustainable mobility, planning, and policy making that surrounds the research done on human travel in the Netherlands. (Musterd, Jobse, & Kruythoff, 1991). Studies have shown that car and public transportation travel times are equal in the Netherlands, and about 55% of people choose to drive in all of the country (Vugt, Meertens, & Lange, 1995) which can attest to the urban form and transportation systems of the European model and context.

Dutch and Scandinavian cities are generally known to have higher amounts of cycling, which is a highly embedded cultural trait (Plazier, Weitkamp, & van den Berg, 2017). Children have been reported to partake in bicycling the most, but bicycling is highly popular for all age groups.

Figure 3: Netherlands Average Cycling Distance



(Statistics Netherlands, 2017)

Cultural differences also play a part in transportation choices, whether they are regional or even on a local or family level. Parental mode choices typically affect the child's mode choice as well (Black et. al., 2004), and a trickle-down effect is seen to take place from parent to child.

Main Takeaways:

Although some literature has studied the transportation impacts of school choice policies, these studies have not analyzed whether the specific urban form and transportation infrastructure of a neighborhood or city affects the travel (Van Ristell, 2012). The existing research mostly focuses on distance, or urban form, but not these factors combined. By looking at urban form, in addition to distance and parent demographics, within the umbrella of school choice policies and governmental educational structures, this study will further inform the debate on school choice and

whether the transportation impacts erode the benefits of school choice, or whether school choice is a more viable option for more families when there are more robust transportation systems. The comparison portion of the project provides insight into the differences in urban form and ideologies, but also similarities in school choice structure and school autonomies, all of which have literature on them, but not in an overarching, multi-faceted and complex way.

04

Existing Conditions

Existing Conditions

The following section will provide information on existing demographics, transportation systems, school systems, urban morphology, and food systems for Rotterdam, followed by Denver.

Rotterdam and the Netherlands

Urban Morphology

Rotterdam History

The city of Rotterdam was originally settled around 900 CE and was named for its "muddy waters" – or "Rotte" in Dutch. Started as a fishing village, settlers constructed dykes and dams to combat consistent flooding. Serving as the seat of the Dutch East India Company, which led to the increased development of the city and establishing it as the Netherlands' second most important city and one of the largest ports in the world; however it was known for its industry and not as a cultural hub such as Amsterdam, Delft, or Leiden. During WWII the city was bombed by both the German and Allies, destroying most of the inner city. After the war, the city decided to rebuild in a modern style, leading to more emphasis on the automobile as most post-war urban designs did. Today, Rotterdam is known for its modernist architecture and still serves as Europe's largest port. While the city was not designed after WWII with multimodal transportation in mind, a grassroots effort by residents in the 1970's pushed the city to install much more pedestrian and bicycle friendly infrastructure that can be seen throughout the city today (Planet, n.d.).

Figure 4: Historic Rotterdam

Historic Image of a bridge in Rotterdam, pre-WWII (Rotterdam before the world war and now, 2019).

Figure 5: Modern Rotterdam

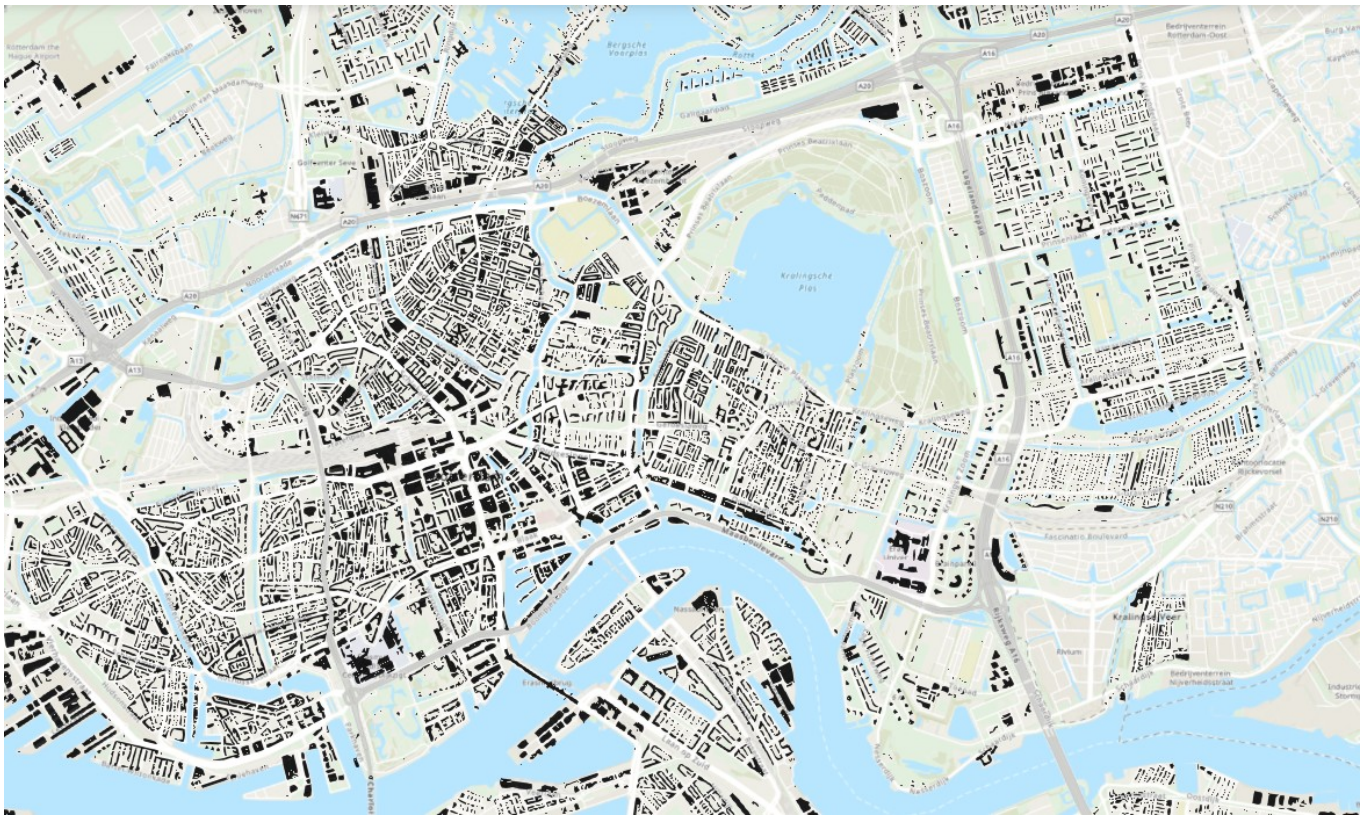
Current day Rotterdam, with historic elements amidst a modern city. (Rotterdam Before the world war and now, 2019).

Urban Neighborhood

The Rotterdam Urban Neighborhood was developed in the 1930's as a mainly residential neighborhood with easy transit access to the main downtown. The main style of development was courtyard style apartments which have since been designated as historic monuments. The neighborhood was not affected by the bombings of WWII, so most of the original architecture and planning has remained intact. The neighborhood offers certain retail and transit corridors, as well as some civic amenities such as parks and a zoo (Rotterdam, n.d.).

The Rotterdam Urban Neighborhood has one major canal and its street design is mainly in a grid pattern, as well as conforming to the natural geography of the area. While most of the neighborhood is residential, main corridors are mixed use retail and residential. Not much construction has occurred in the area, with most of the original buildings staying intact since construction pre-WWII. The neighborhood mainly consists of courtyard mixed-use apartment buildings, ranging between 4-5 stories.

Figure 6: Rotterdam Urban Neighborhood Figure Ground



(Source: ESRI)

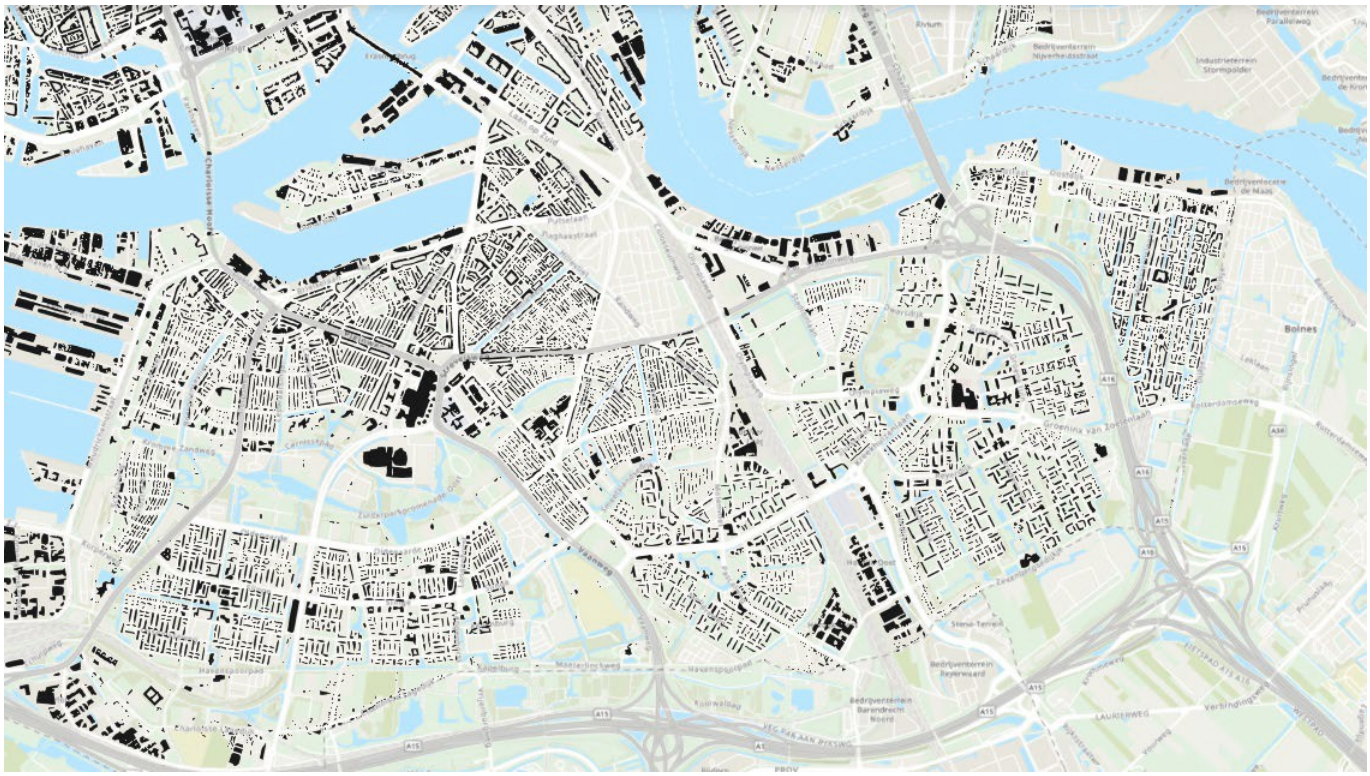
The Urban Neighborhood is located in the northern, more dense area of Rotterdam. The building footprint is most dense in the city center, as expected, but does branch out beyond this center in a ring like shape. The city center also has more large footprint buildings, with more courtyard apartment blocks in the surrounding neighborhoods.

Mid-urban Neighborhood

The Rotterdam Mid-urban Neighborhood was developed between 1920-1940's as a garden village for working class residents, most notably, workers of the port of Rotterdam. The garden style includes mostly rowhomes with individual back gardens and public park space. The homes are smaller in size, which many have been combined to accommodate larger families and residents' personal preferences. The garden structure has been maintained since construction, and many of the structures, over 300, have been designated as historic monuments of the garden city style. In recent years, the population of the Mid-urban Neighborhood has fluctuated from working class port employees, to a mixture of immigrants, and elderly Rotterdam residents. While many of the original structures have remained in the neighborhood, there has been some infill of newer rowhome style residences and civic uses such as libraries, hospitals, and schools (Rotterdam, n.d.).

The street structure of the neighborhood is more organic than other areas of the city, but with gridded streets within the organic layout of main corridors. The main use is residential with designated mixed-use corridors. Housing is mainly 1-2 story rowhomes, with some single-family and low-density apartment buildings dispersed throughout the area, as well as larger civic campuses such as hospitals. The influx of immigrant populations has created more "ethnic" shopping corridors, with stores that have specialty stores that cater towards North African, Middle Eastern, and Eastern European immigrants (De Nijl Architecten, 2009).

Figure 7: Rotterdam Mid-urban Neighborhood Figure Ground



(Source: ESRI)

The Mid-urban Neighborhood is located in the southern portion of Rotterdam , which is less dense in general when compared to the northern portion of the city. There are some large buildings due to port activity, near the channels. Generally, this area is a lot more residential in nature, with more single-family housing and "neighborhood" areas. Similar to residential neighborhoods in the north, many blocks contain center courtyards, as well as linear apartments in certain neighborhoods as well.

Food Access

In 2009, in response to citizen initiatives to promote the regionalization of food production and consumption, the Dutch Minister of Agriculture created a Policy Agenda for Sustainable Food Systems (Verburg, 2009), which embraced the concept of urban planning for the country (Wiliiwmen 2010, pg 40). The document's goal was to use urban farms as a way to reconnect modern city residents with their food.

Although this progression began with citizen initiatives, community members wanted to be "…able to enjoy food produced on healthy soil in their own town and region" (Willem van der Schans, 2010), the true push for more localized foods came from policy making to allow for more urban food growth. The key information in the policy agenda is the government's role in shifting from single uses in cities to more flexible and multi-use and farmland zones, allowing companies and residents to be able to garden for themselves or for growing and selling produce. Specifically, to the city of Rotterdam in the Netherlands, the local government also implemented planning for urban agriculture into their plans. "The municipality's primary role is to facilitate initiatives from

residents and businesses. This is being accomplished by making space in the city available, bringing people together, initiating research or participating in studies conducted by other parties, and building a network" (City of

Rotterdam). This example of a local government acknowledging its role in food systems planning and policy making is instrumental to other cities looking to create lasting change in food policy planning.

More precisely, food planning is specifically incorporated into neighborhood planning in Dutch cities and neighborhoods. As a governmental function, city planning in the Netherlands combines food access and transportation into its neighborhood planning processes providing residents with better access overall and the ability to walk, bike, or take transit to the grocery store allowing for healthier food and transportation options (Interviewee #3, personal communication, September, 10th, 2019).

Transportation

The main transportation service provider in Rotterdam is the Rotterdamse Elektrische Tram known as *RET*, which is translated as Rotterdam Electric Tram. The RET originally began in 1878 with horse drawn and steam powered trams, and the electric tram was established in 1905 (RET, 2018).

The transit system in Rotterdam consists of buses, trams, and a metro. The Metro has five lines and connects as far out of the city as to the Hague. The tram also has 8 lines, all of which converge at the city center. Bus routes connect other city districts, neighborhoods and metro areas with the city center. City taxis are also available, as well as water taxis, waterbuses and ferries, all which connect the port areas to the center. Bicycling is also very popular, and the City provides free bike parking and storage in multiple locations, and some included guarded parking with a small fee (Rotterdam Tourist Information, n.d.).

There is a national train system (NS International) as well, that connects cities in the Netherlands as well as provides high speed trains to Belgium, France, Germany and Switzerland. NS International is part of the Nederlandse Spoorwegen, the Dutch National Railway Operator (NS International, n.d.).

Figure 8: Rotterdam Tram map

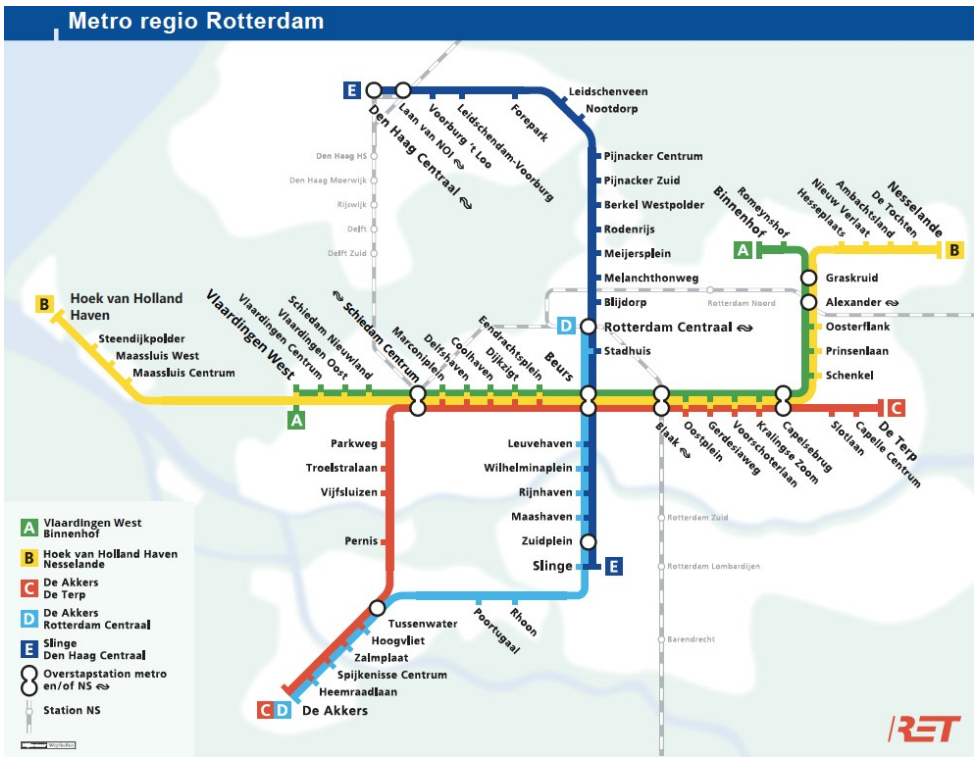


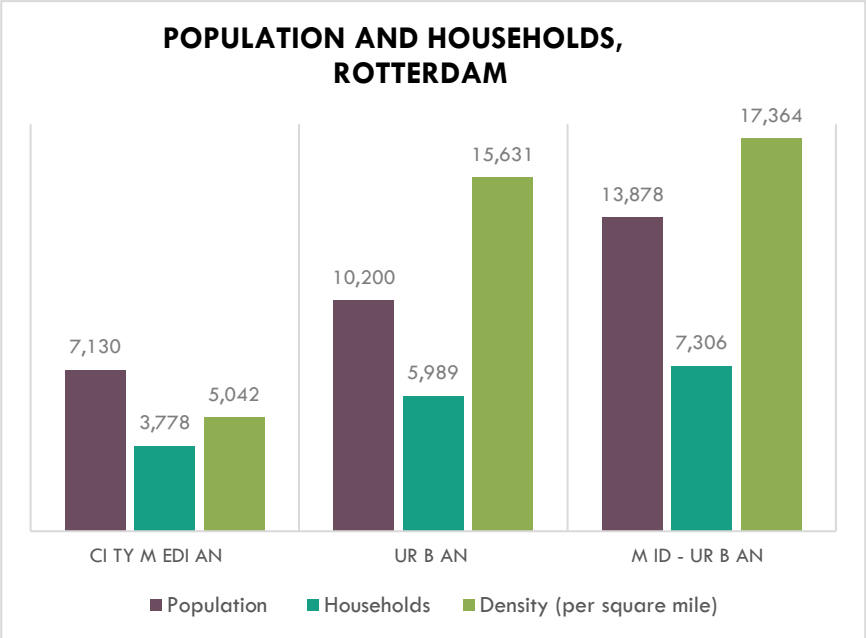
Figure 9: Rotterdam Metro map:

Demographics[6]

All demographic data was taken from the Dutch government database (Gementee Rotterdam, n.d.). It is all for the year 2017, unless otherwise noted.

Population

Figure 10: Rotterdam Population and Households



The total population of Rotterdam is 644,373 people as of January 1st, 2017. The neighborhood median is 7,428 people per neighborhood. The population of the Urban Neighborhood is 10,200 people and the population density is 15,631 people per square mile. The population of the Mid-urban Neighborhood is 13,878 people and the population the density is 17,364 people per square mile. Both neighborhoods have a higher population sizes than compared to the median neighborhood population of Rotterdam, with Mid-urban being almost double that of the median.

[6] Certain demographics in the Netherlands are not collected nor reported, such as race and ethnicity. To account for this, the demographic existing conditions for Rotterdam include other categories such as migrant background to provide this information. (http://nationaalkompas.nl/bevolking/etniciteit/wat-is-etniciteit/)

Both the neighborhoods researched have relatively high populations compared to the rest of Rotterdam neighborhoods. Some neighborhoods are smaller geographically as well. When calculating density, some neighborhoods also include the "water" area into square mileage, which can skew densities. As a port city, this is something to take into consideration. Regardless, both Urban and Mid-urban Neighborhoods have high populations and high densities. It is important to note that the Mid-urban has a higher population density than the Urban Neighborhood, and the assumption here is that it is due to households with high numbers of families, and a possibility of many single family households to be "doubling up" a phenomenon seen in urban areas where multiple households live together in a single family home, versus multi-family housing.

Students

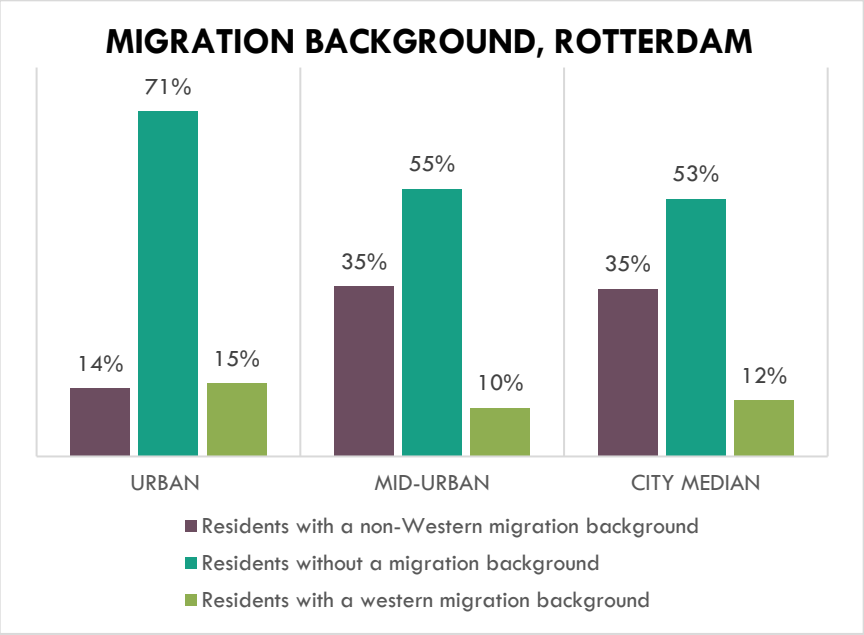
Table 2: Rotterdam Population of School-Aged Children

Neighborhood	Total Neighborhood Population	Population 5-17	Percent of Total
City Median	7,130	452	6.33%
Urban	10,200	922	9.04%
Mid-urban	13,878	1,954	14.08%

When it comes to populations of children and students, both neighborhoods have a higher amount than the median for all Rotterdam neighborhoods. The Mid-urban Neighborhood has more children comparatively than the Urban Neighborhood, with the total population of children being 14.1% and 9% consecutively.

Migration

Figure 11: Rotterdam Migration Background



Migration background information provides significant insight into the ethnic composition of the two different neighborhoods, and for Rotterdam as a whole.[7]

[7] *This data is for 2018, as previous years are not available in the data portal.*

Workforce

Table 3: Rotterdam Workforce Population,

Neighborhood	% Gross Participation in workforce
Rotterdam	73.70%
Urban	81.50%
Mid-urban	69.80%

The Urban Neighborhood's population workforce gross participation is 81.5% whereas the Mid-urban's is lower at 69.8%. The city median for gross workforce participation is 73.7%.

The percentage for all of Rotterdam's unemployment is 8.1%, which is the highest unemployment rate of all municipalities, with the median being at 4.8 percent in 2017.

Income

Figure 12: Rotterdam Single Households

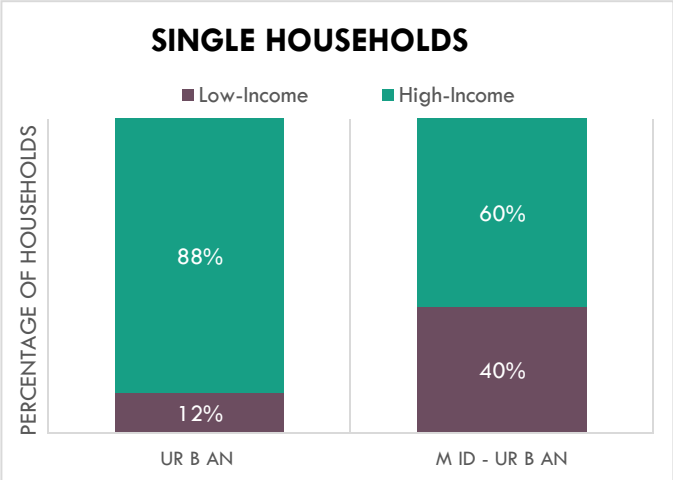


Figure 13: Rotterdam Couples without Children

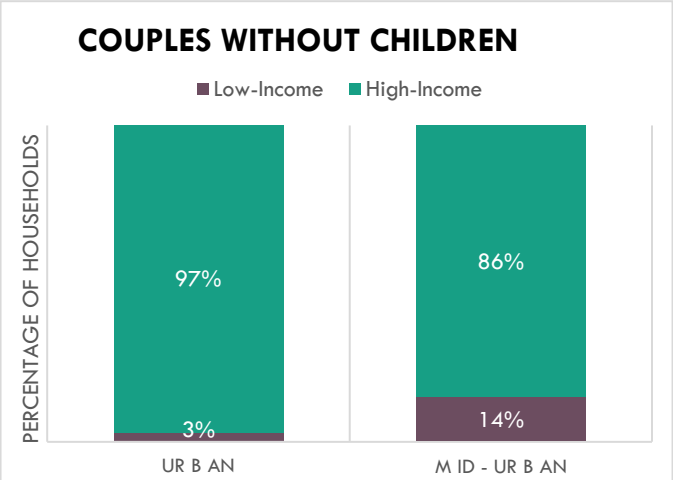


Figure 14: Rotterdam Couples with Children

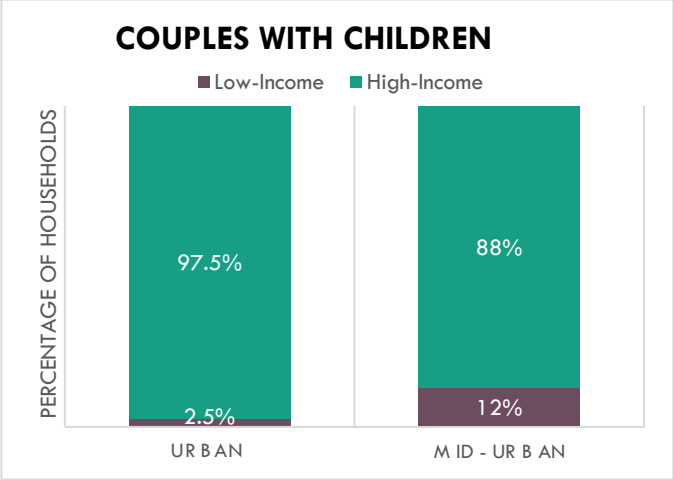
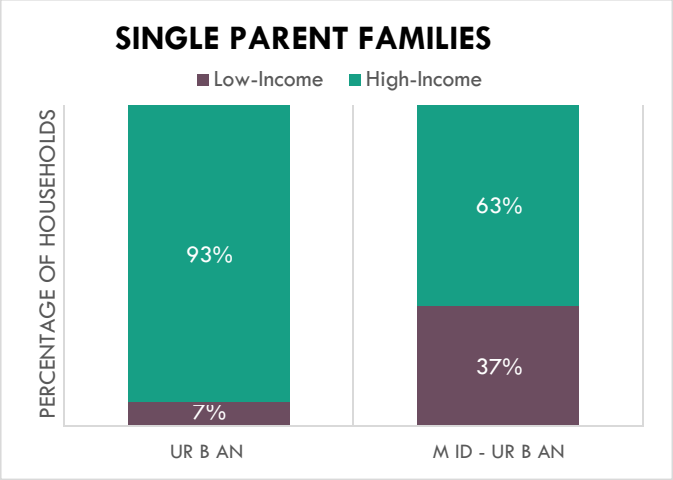


Figure 15: Rotterdam Single Parent Families



Income in Euro per resident was 6,033 (€) in 2017. This makes the median for Rotterdam as a household income of 24,132€ for a 4-person household. The above charts are shown as low a high comparison to median income. This shows the number of households above this income median, and the number of households below. Using the average

conversion rate of Euro to USD for 2017, this median household income for a family of four in Rotterdam was $28,985 for that year.

In Rotterdam, "…average household income is below the national average (€ 30,100 in 2005). When studied in detail, there is a noteworthy discrepancy in household earnings between ethnicities. On average, non-native households have 3,500 euro per year less to spend than native households (2005). In particular, Moroccan households have the lowest income." (City of Rotterdam Regional Steering Committee, 2009).

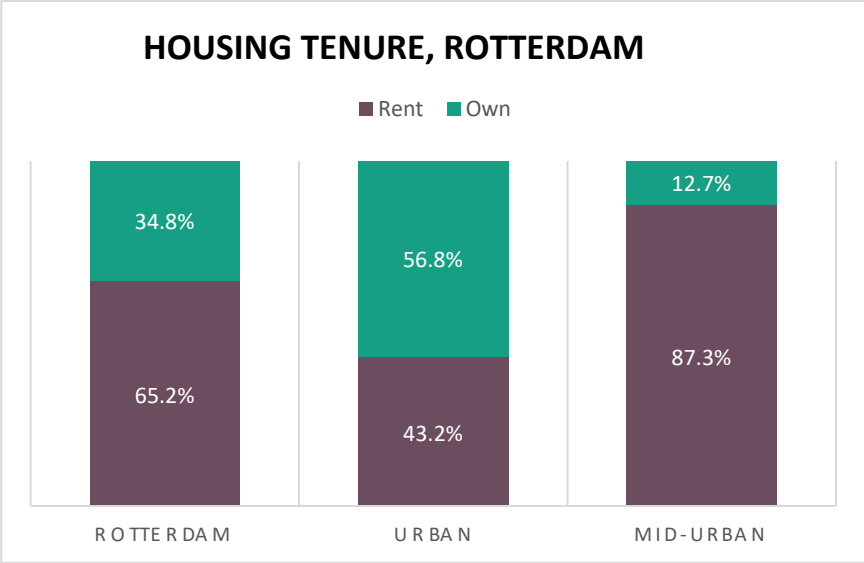
Income discrepancies are common in the city, especially between different racial, ethnic, and immigration statuses. "...There are relatively more non-western households living below the poverty line". (City of Rotterdam Regional Steering Committee, 2009).

The Urban Neighborhood sees much higher incomes for all household types, and the Mid-urban Neighborhood has a lot more households with lower incomes. The interesting household type in this instance are households with children, where the Mid-urban Neighborhood has a near split for high and low incomes. This similar split is seen for the Urban Neighborhood in the single household's category.

Overall, regardless of household "type", the share of households with low incomes in the Urban Neighborhood is 7.9 percent, and 28.3 percent for the Mid-urban Neighborhood. This is which is quite high, with almost thirty percent of all households in the neighborhood being below average income. To compare, the City median of low-income households is 20.3 percent.

Housing Tenure

Figure 16: Rotterdam Housing Tenure



Overall for the city of Rotterdam, two-thirds of all households rent as opposed to owning their home. For the Urban Neighborhood, this statistic is almost the opposite, with nearly two-thirds of households owning their home. The Mid-urban Neighborhood has an even lower percentage of home ownership than the city median, with only a little more than 10% of households owning, and almost 90% renting.

School System

Both the neighborhoods researched have higher numbers of schools that the median for other neighborhoods in the city. The Urban Neighborhood has a total of eight primary education schools, and the Mid-urban Neighborhoods has ten primary schools.

Table 4: Number of Schools in Rotterdam

Neighborhood	**Number of Schools**
Rotterdam	4
Median Urban	8
Mid-urban	10

Choice[8] has long been embedded into the culture of the Netherlands since school choice has been in place since 1917. The makeup of schools in the Netherlands is roughly ⅔ faith-based (Catholic or Protestant) and only ⅓ traditional public, or another type of philosophical school. All of the schools are state funded per pupil.

Similar to programs in the United States, Rotterdam has recently instituted a program called "Traffic Safe Schools" in which it provides schools and staff with the resources and training to help children get to school safety. One of its main objectives is that "Children have the right to a safe, as independently as possible participation in the movement". The Programs main approach relies on the education of children and teachers in road safety and traffic education (Regional Traffic Support Office South-Holland, n.d.).

Denver/USA

Urban Morphology

Denver History

First settled by Native American tribes, such as the Cheyenne, Arapahoe, Shoshoni, and Ute, the city now known as Denver was first settled by American pioneers after the discovery of gold in the region in 1858. Originally, the area was split into three separate settlements, Auraria on the west side of Cherry Creek, Denver City on the east side of Cherry Creek, and the Highlands on top of the northern hills. The three towns became incorporated into one in 1860, taking the name of the Kansas Territorial Governor James Denver ("Historic Resources of Downtown Denver | History Colorado," n.d.). Even after gold mines ran dry, Denver continued to grow as more minerals were found throughout the mountains of Colorado and as Denver became connected to transcontinental railroads. Industry was primarily agriculture and mining, with oil and gas fueling the development of the downtown's central business district and large skyscrapers. ("Early Denver History | VISIT DENVER," n.d.). As with the development of most American cities, post-WWII suburban sprawl focused around the automobile grew Denver into a mid-sized metropolitan area, including white-flight and a de-investment of the downtown core. By the latter half of the 20th century Denver's economy started diversifying, and by the 2010's Denver saw a huge influx of population growth and revitalization of the downtown core. With new development, many low-income and diverse neighborhood have felt the effect of gentrification as many have returned to the central neighborhoods that were once described as "blighted".

[8] Choice data and home/school location per pupil is not readily available data online for the Netherlands. This is a future recommendation to seek contacts with this data availability.

Figure 17: Historic Denver

A historic photograph of 1890s Denver (Denver Public Library/W.H. Jackson sample album/R7003009825, courtesty of Denverite) (Kenney, 2018)

Figure 18: Modern Denver

Current day Denver. (Visit Denver, n.d.)

Urban Neighborhood

The Denver Urban Neighborhood was originally settled as an agricultural area until incorporated into Denver in 1894. Pre-WWII the area was home to servants (often segregated minorities) and construction workers of nearby high-income areas, as well as garbage dumps. The neighborhood was also prone to consistent flooding until a dam was built to control the nearby river. Post war, the area was developed into a shopping district, with the sporadic

development of retail within the area. In recent years, neighborhood has seen development of larger apartment and office buildings, along with surrounding multi-family residential. The area has left its humble roots and become higher end in both the types of amenities and retail offered, as well as the price of residences in the area.

The neighborhood is built on a grid structure except for the shopping mall which follows the local natural geography. The southern section of the neighborhood is mixed-use residential, office, and retail with the northern part of the neighborhood comprising of a mixture of lower density multi-family units, townhomes, and single-family homes interspersed throughout. The neighborhood has maintained its alley structure, and multimodal emphasis on its street networks. While the area was rapidly changing between the 1950's to 1980's, in recent decades the neighborhood has been very stable and only recently has seen more, taller mixed-use residential construction of 6 stories or more ("[redacted for confidentiality]," 2018).

Figure 19: Denver Urban Neighborhood Figure Ground

(Source: New York Times)

The southern portion of the city also has pockets of density, along the highway, along retail districts, and closer towards the city center. Generally, the rest of this area is lower density single family housing with multi-family scattered around.

Mid-urban Neighborhood

Established as one of Denver's original settlements, the Denver Mid-urban Neighborhood developed as a residential area with pockets of employment and amenities with the help of Denver's historic streetcar network. While originally settled by British and German immigrants, the neighborhood later became home to Italian, Irish, and Hispanic populations ("[redacted for confidentiality]," 2014). Since the beginning of the 21st century, the area has become less of a residential area for working class populations, and more of a gentrified area serving more higher income singles and families. The neighborhood touted itself as a refuge from immoral values and advertised its pure air as a haven from the surrounding industrial city. This has changed the landscape of the neighborhood in multiple ways, including residential infill in vacant lots, the demolition of older housing stock to make way for newer and more modern architecture, and the development of "slot" homes, or townhomes that are positioned opposite of the street

axis to allow for more density on plots. This increase in investment in the area has caused displacement of vulnerable households, pushing them further away from Denver's core, as well as a weakening of its cultural heritage of the 20th century ("[redacted for confidentiality]," n.d.).

The Denver Mid-urban Neighborhood is designed in a grid street structure, with alleyways and main building faces along north-south streets, and alley access along east-west streets. The land use is predominately residential with retail corridors along certain corridors dispersed throughout the neighborhood. Amenities are on a neighborhood scale, including parks and other human services. The area is considered a historic district and shows many examples of historic architecture styles (e.g. Denver Foursquare, Victorian, and Craftsman) of the late 19th and 20th centuries ("[redacted for confidentiality] | History Colorado," n.d.). With the recent influx of new development, there is a juxtaposition of modern architecture sits along with historic buildings throughout the area. The area still remains an equal mix of single family, duplex, and rowhomes with an average height of one to three stories.

Figure 20: Denver Mid-urban Neighborhood Figure Ground

(Source: New York Times)

The Mid-urban Neighborhood is situated in the Northern portion of the city. This area, aside from the city center shown in the above figure ground image, has a decent amount of density, especially along the corridors as seem here. Large building footprint are seen in the center, and to the northeast, shows industrial warehouse and the Coliseum.

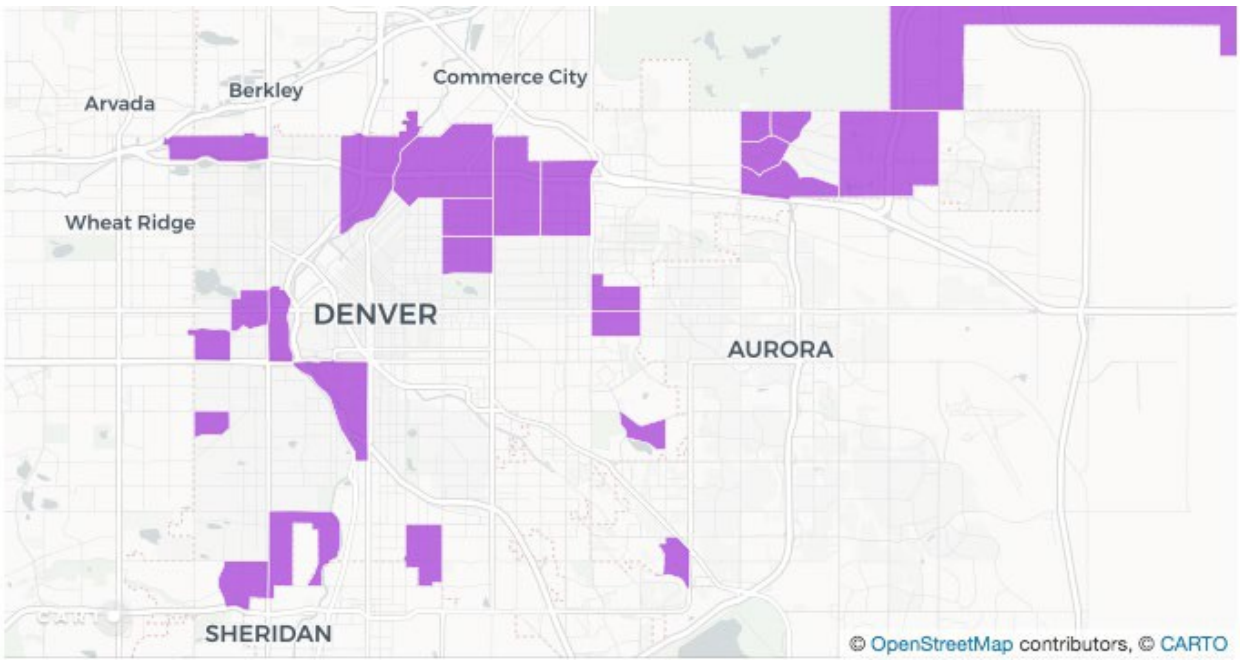
Food Access

A report on food access in Colorado claims that: "while seldom experienced by suburbanites who wander through shiny, well-stocked supermarkets, profound barriers to obtaining healthy food often exist for both inner-city and rural residents. Beyond incomes and the lack of grocery outlets, transportation to shopping locations can be an expensive, logistical hardship for many disadvantaged households. High food prices and transportation costs cut dramatically into a family's food budget and quality of life" (Colorado Health Foundation, 2009). Many lower incomes families depend on irregular and non-reliable buses and taxicabs or ride share companies to reach grocery

stores. These trends are national, where the "…number of supermarkets in the lowest-income neighborhoods is almost 30 percent less than the number of stores in the highest-income neighborhoods. Therefore, faced with a lengthy trek for nutritious food, many residents of food deserts instead rely on "fringe" retailers (convenience stores, liquor stores, gas stations and drug stores) to provide food items." (Colorado Health Foundation, 2009) This results in national gaps and overall equity issues, as well as health implications like poor health.

In Denver, where many lower income Urban Neighborhoods lack equitable access to fresh grocery stores and healthy foods. Census tracks with low access, meaning household that are more than 1 mile from a supermarket or large grocery store in urban areas as define by the USDA, are prominent in Denver neighborhoods, especially those with lower income and high Hispanic neighborhoods (Dean, 2016).

Figure 21: Denver Food Deserts



Denverite.com (https://denverite.com/2016/10/19/denver-food-deserts/)

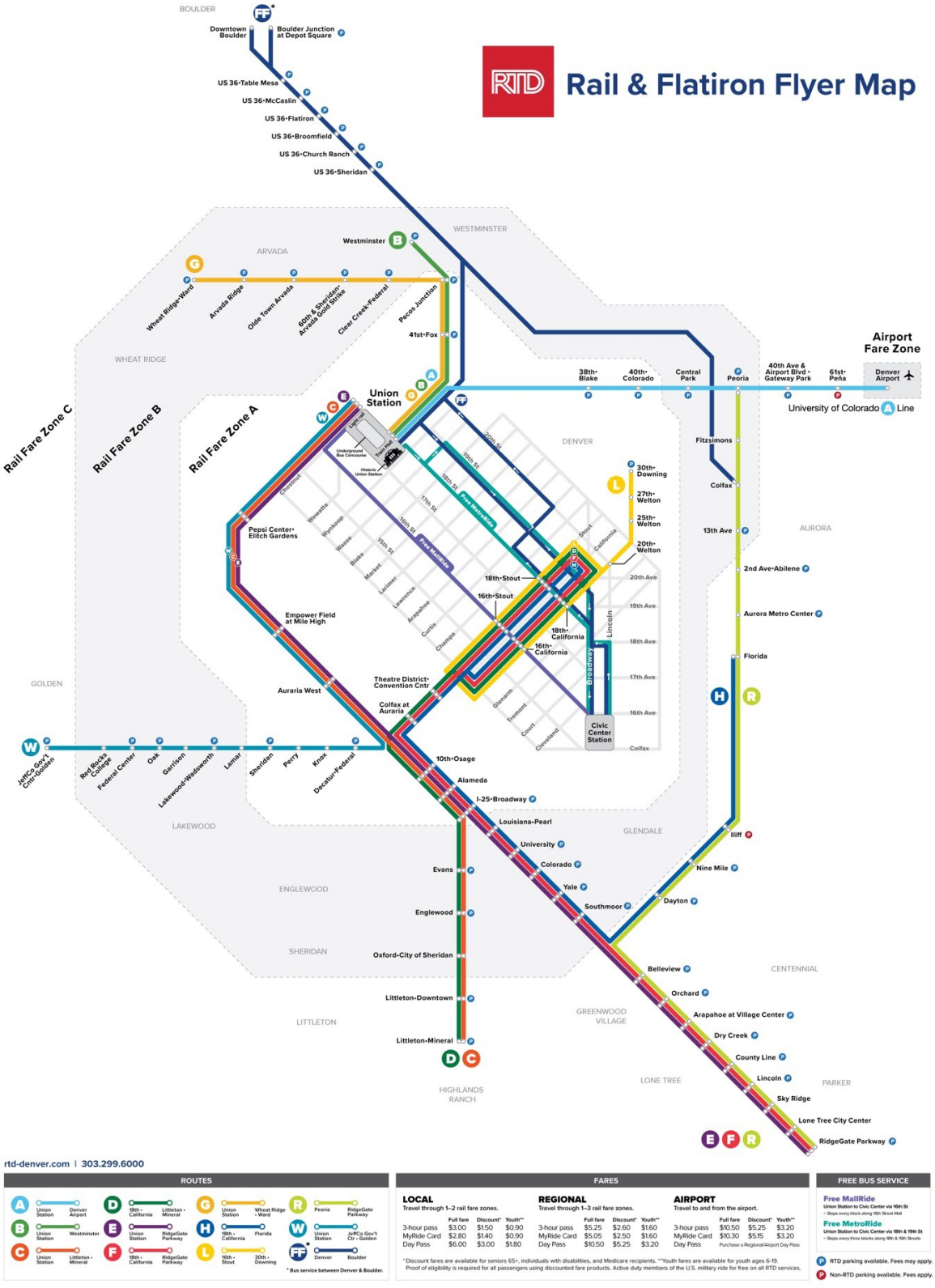
The City and County of Denver has recently begun implementing food policies in order to combat some of these issues. They have created multiple strategic government initiatives, including a comprehensive 2030 vision plan. The vision is, "A food system that helps create and sustain a more inclusive, healthy, vibrant, and resilient Denver" and focuses partially on equitable access to nutritious and affordable food for all (Denver Food Vision, 2017).

Transportation

Denver's public transportation consists of light rail, commuter rail, and buses. It is serviced by the city's Regional Transportation District, or RTD. There are lines on the light rail and commuter rail system, including regional lines. There are 11 lines total. Most bus services are in the metro Denver region, but some connect to outside municipalities like Boulder, Fort Collins, and the mountain regions within the "Bustang" services. There are 9,000 bus stops in Denver, and RTD buses operate within eight counties in the region. (RTD, n.d.).

Taxis and carshares, airport and ski resort shuttles, scooters, and bicycles are other popular public transportation methods in the City that are used by some portions of the populations, especially younger generations.

Figure 22: Denver Rail Map

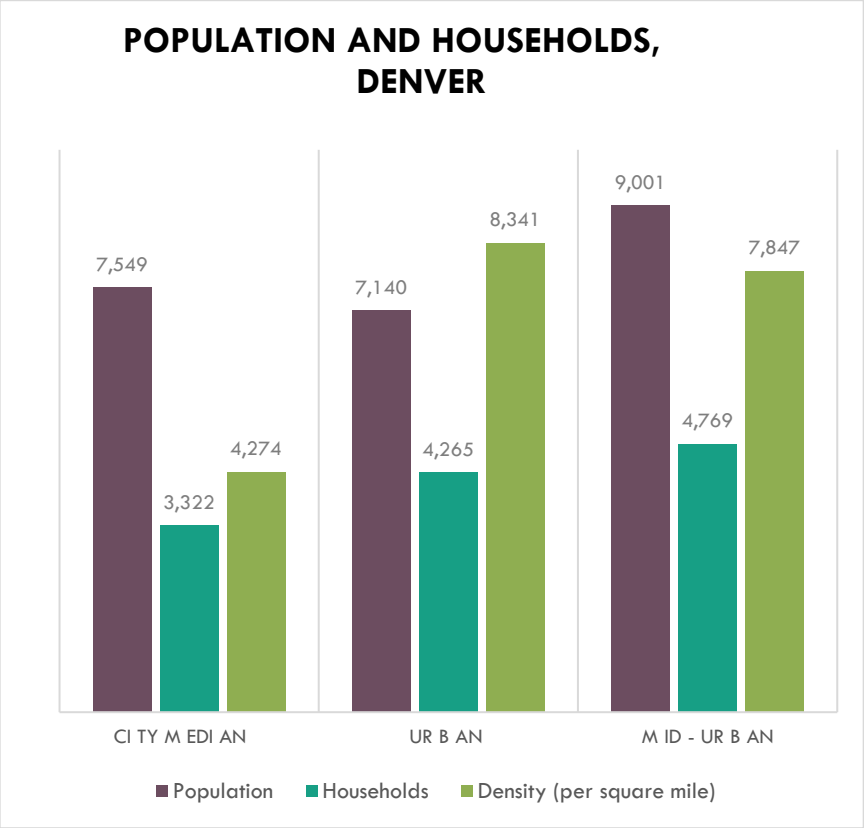


Demographics

All demographic data was taken from Denver Metro Data from the Shift Research Lab ("Map | Community Facts," n.d.) and the United States Census Bureau ("American FactFinder—Community Facts," n.d.). It is all for the year 2017, unless otherwise noted.

Population

Figure 23: Denver Population and Households



The total population of Rotterdam is 678,467 people as of 2017. The median neighborhood population is 7,549 people per neighborhood. The population of the Urban Neighborhood is 7,140 people and the population density is 8,341people per square mile. The population of the Mid-urban Neighborhood is 9,001 people and the population the density is 7,847 people per square mile.

While the Urban Neighborhood has less people than the city median neighborhood or the Mid-urban Neighborhood, it also has the lowest people per household (1.7) as compared to the Denver median (2.3) or the Mid-urban Neighborhood (1.9). The Urban Neighborhood also is denser than the Mid-urban Neighborhood, with both neighborhoods being almost twice as dense as the Denver median.

Students

Table 5: Denver Population of School-Aged Children

Neighborhood	Total Neighborhood Population	Population 5-17	Percent of Total
City Median	7,549	869	14%
Urban	7,140	453	6.34%
Mid-urban	9,001	892	9.91%

Students in school are comprised of children from ages 5-17. Denver neighborhoods have an average of 14 percent of the population as school-aged children. The Urban Neighborhood is lower than this average, with only 6.3 percent of the neighborhood population between the ages of 5-17; the Mid-urban Neighborhood is between these two figures, with almost 10 percent of the neighborhood population falling between the ages of 5-17.

Race

Figure 24: Denver Population by Race

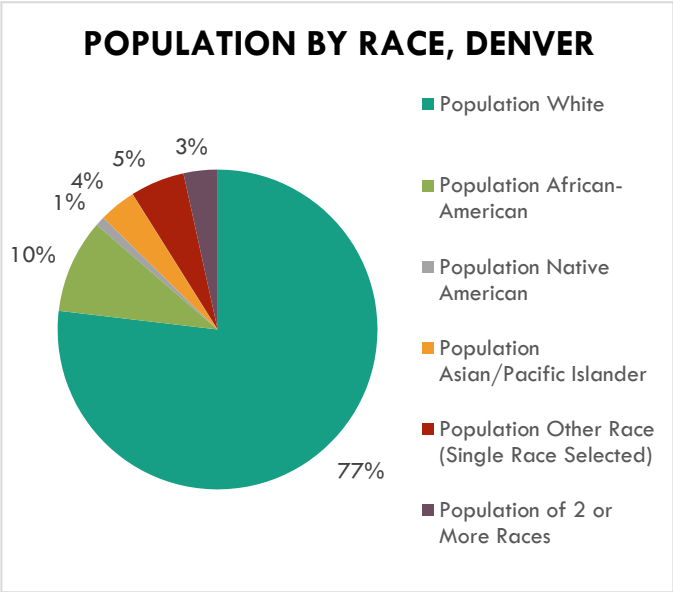


Figure 25: Denver Urban Neighborhood Population by Race

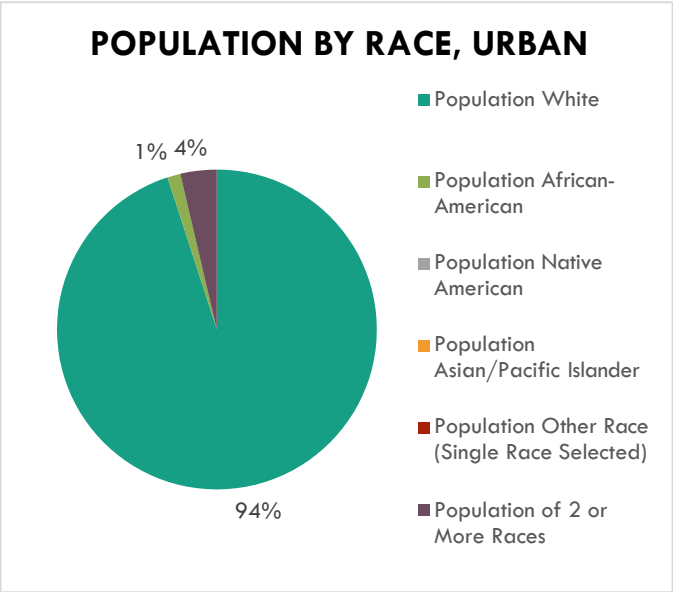
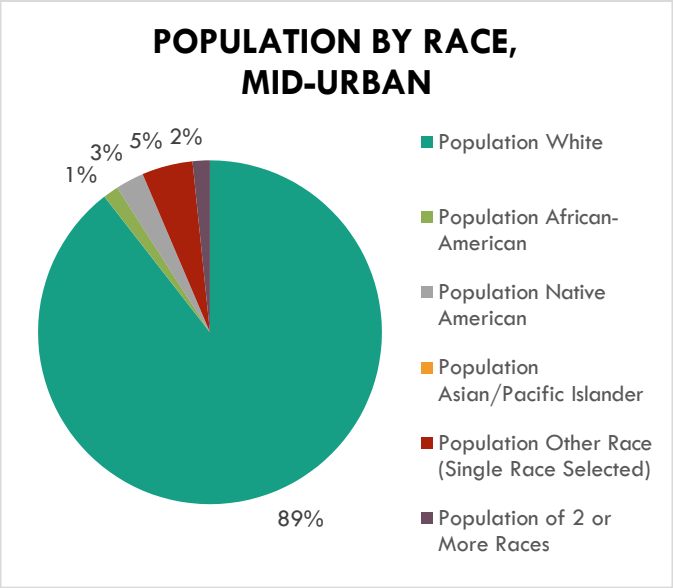


Figure 26: Denver Mid-urban Neighborhood Population by Race

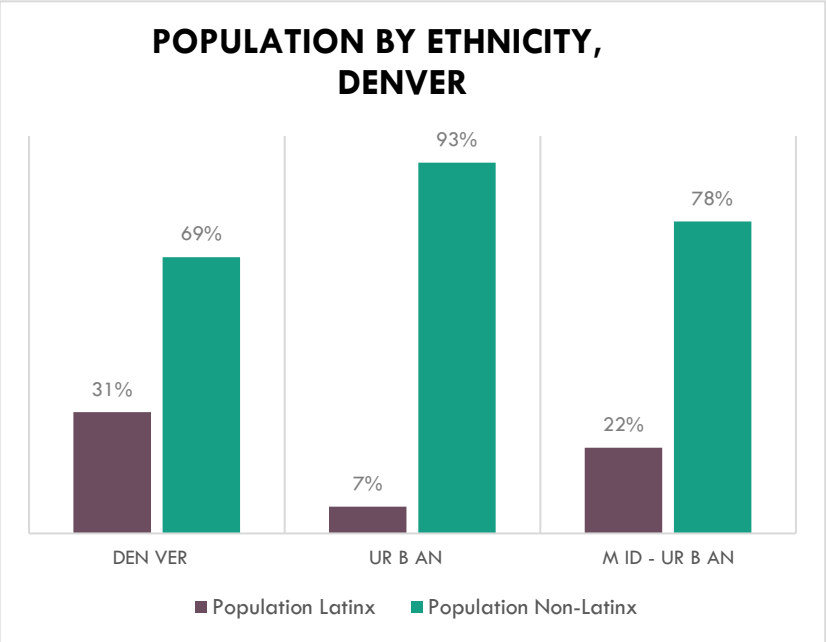


While the majority of Denver residents are white, both the Urban and Mid-urban Neighborhoods have a higher percentage of white residents than the City of Denver. The Urban Neighborhood has the least diversity, with only 5 percent of the total population as something other than white. The Mid-urban Neighborhood has 11 percent of its population as something other than white, with the majority of minorities identifying as "other".

Due to historical segregation, redlining, and ethnic enclaves that shaped the city during the 20th century, many of Denver's neighborhoods were homogeneous. The Urban Neighborhood was developed near other white-dominated neighborhoods and is reflected in their racial makeup. The Mid-urban Neighborhood was settled by European minorities during the early 1900's and later settled by Latinx immigrants in the latter half of the century.

Ethnicity

Figure 27: Denver Population by Ethnicity



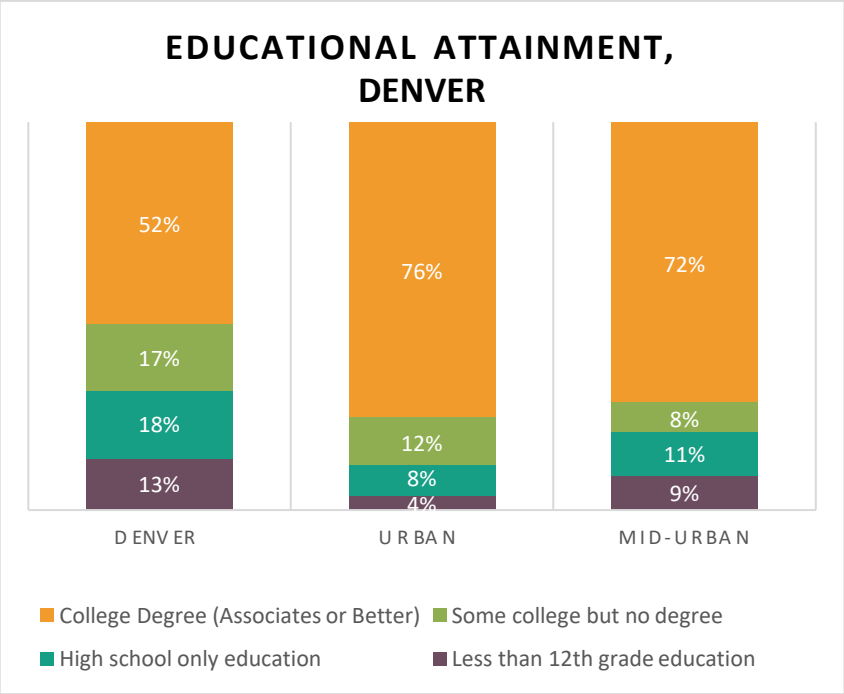
While both neighborhoods have a lower percentage of Latinx populations than the City of Denver overall, the Mid-urban Neighborhood still has a higher percentage than the Urban Neighborhood of Latinx residents. This trend has been seen greatly in the Mid-urban Neighborhood which was more historically Latinx.

The percentage of Latinx residents in this neighborhood was 66.2% in 2000 and 37.25% in 2010. 2017 shows a percentage of 22%. This group of residents has been pushed out of the past few decades due to rising housing costs and infill development spurred by gentrification, to surrounding suburbs of the city.

The populations of white residents have also been increasing in the last two decades. Historically, in the year 2000, 54.3% of the residents in this neighborhood were white, 77.8% of residents were white in 2010, and 89% of residents were white in 2017; showing a consistent increase of white residents over time.

Educational Attainment

Figure 28: Denver Educational Attainment



Both the Urban and Mid-urban Neighborhoods show higher overall educational attainment than the city overall, although the Mid-urban is slightly lower. There is also a higher percentage of residents in the Mid-urban Neighborhood that have less than a high school diploma.

The Mid-urban Neighborhood is interesting because the percentages can be explained in part due to gentrification. The neighborhood makeup is changing, and with that brings a mix of highly educated adults, while there is still a decently high amount of less educated people, especially when compared to the wealthier, Urban Neighborhood that has high amounts of college educated adults.

Income

Figure 29: Denver Median Household Income

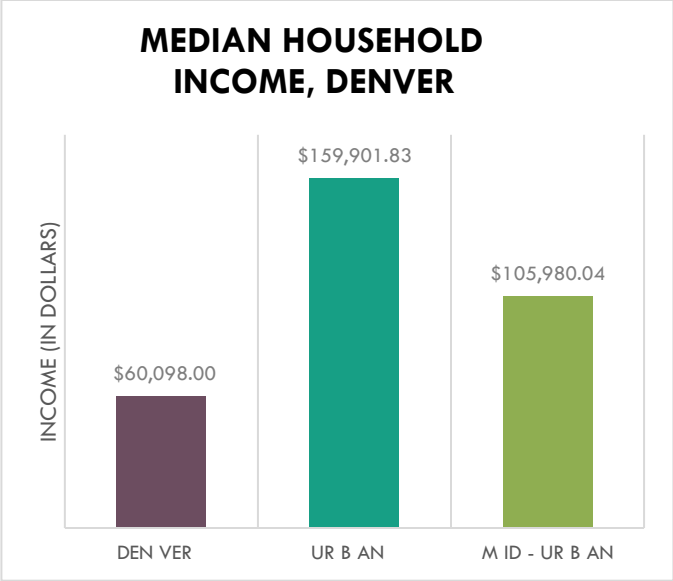
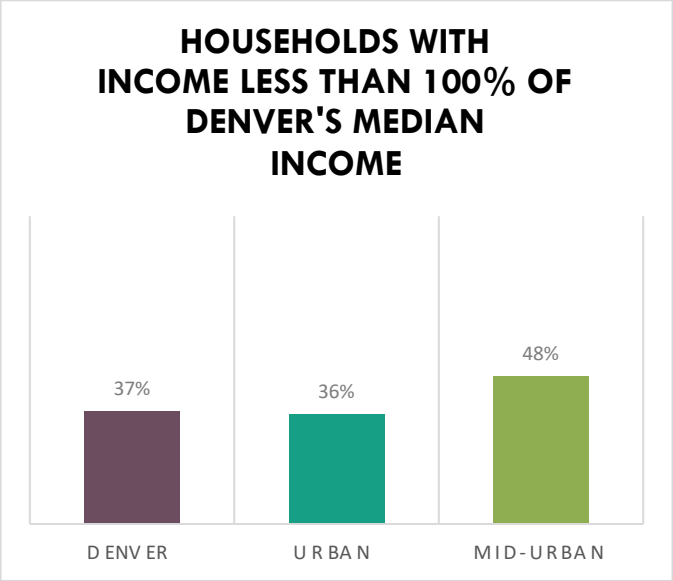


Figure 30: Denver Households with Income less than 100% of Denver Median



This chart displays the median income dollar amount for the Urban and Mid-urban Neighborhood, compared to the medians for all neighborhoods in the City, which is $60,000 in the year 2017.

As predicted, the Urban Neighborhood highly exceeds the city median income, but as does the Mid-urban Neighborhood. The Urban is one of the wealthiest of all neighborhoods and is below the city median for households in the "low" category. The Mid-urban Neighborhood has 48% of households that are below the city average, but Surrounding neighborhoods in Denver follow a similar trend to the Mid-urban Neighborhood. They have higher incomes by dollar amount than the city median, but *also* have a higher percent of low-income households. This is interesting because Denver has such a wide variance of incomes, that the median incomes amount can be fairly high, but when looking at percentage of low-income households, this provides a better picture of neighborhood household incomes. Gentrification affects these values as well, by skewing low income neighborhood median value, while there is still a high percentage of low-income households. Denver households overall are seeing less percentage of low-income families, because many are being pushed out into the suburbs and surrounding municipalities.

Historically, 2010 60% of households were less than Denver's median income, and the Urban Neighborhood had more low-income households than it does now, with 48.1% low income households in 2010.

Table 6: Denver Historic Income

	Denver	Urban	Mid-Urban
2000	$ 56,965.90	$ 137,987.56	$ 57,329.90
2010	$ 52,601.65	$ 124,898.88	$ 64,971.57
2017	$ 60,098.00	$ 159,901.83	$ 105,980.04

Housing Tenure

Figure 31: Denver Housing Tenure

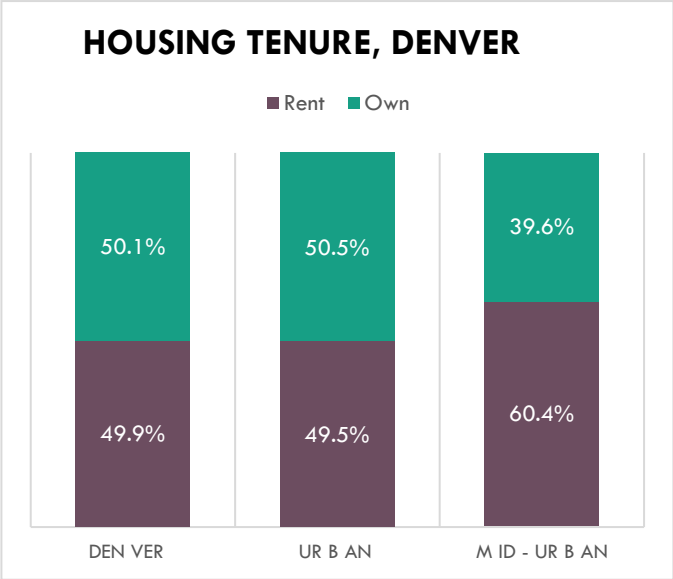
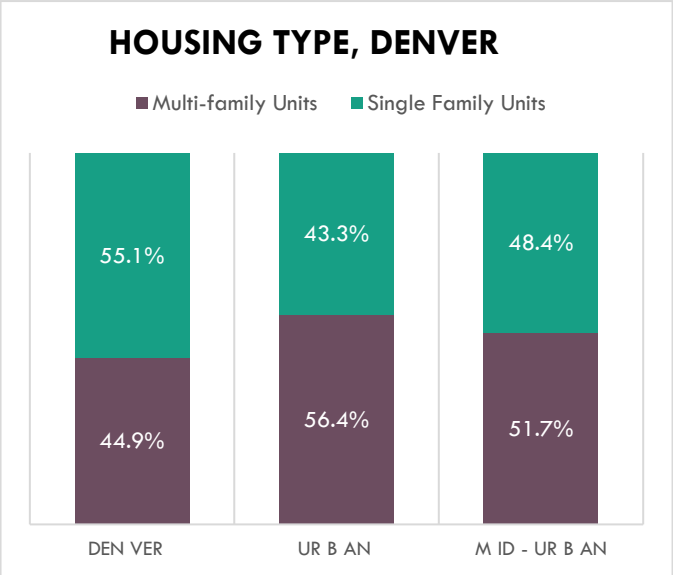


Figure 32: Denver Housing Types



In terms of housing tenure, the Urban Neighborhood and the city median are very similar. These both have about a half split of homeownership to renting. Compared to the rest of the Nation, Denver has fairly low homeownership rates. In 2017, 63.9 percent of housing units were owner occupied in all of the United States (United States Census Bureau, 2019). The Mid-urban Neighborhood has even lower amounts of homeownership, with about 60% rental units and 40% homeownership.

Housing types in Denver overall are slightly more single-family units than multi-family units. Both Urban and Mid-urban Neighborhoods see less single-family units than all of Denver, but the Mid-urban has more which correlates with the general urban form. The Mid-urban Neighborhood has 48% of its housing as multi-family, whereas the Urban Neighborhood has more multi-family due to its denser nature.

School System

Denver Public Schools (DPS) is the school district for the City and County of Denver. The district services early childhood education (ECE) through 12th grade and provides various types of schooling, including traditional public schools, magnet, dual-language, charter, and online schools. Enrollment processes vary by school, and while some have a traditional boundary encompassing the school, others are choice-only or are part of an enrollment-zone. The choice process for DPS includes an application and ranking of preferred schools.

Enrollment Processes – Urban Neighborhood

The Urban School is a traditional public school with a neighborhood enrollment zone as part of Denver Public Schools (DPS). This school provides guaranteed spots for grades kindergarten through fifth grade for students living within the school's boundary ("Denver Public Schools—School Finder," n.d.). This region of DPS has seen rising housing costs and out-migration of residents. There is continual construction of multifamily residential units, but new construction is geared towards Millennials and empty-nesters due to their size ("Planning and Analysis | Denver Public Schools," n.d.).

Enrollment Processes – Mid-urban Neighborhood

The Mid-urban School and its surrounding schools has experienced rapid housing cost increases and shifting population statistics, causing decline in student populations ("Planning and Analysis | Denver Public Schools," n.d.). Enrollment at the Mid-urban School is two-fold because it is a K-8 school. For grades ECE-5 there is not an enrollment zone like traditional elementary schools but is completely choice. For 6-8 the school is part of an enrollment zone, which guarantees students within the geographical area a seat at one of several schools, regardless of their residence location ("Denver Public Schools—School Finder," n.d.).

School Statistics

Table 7: Denver School Sizes

	Total Number of Students	Average Students per Grade
Urban	325	46
Mid-urban	446	45

Table 8: Denver School Choice Statistics

	Number of Students Accepted	Number of Students Waitlisted	Percent of Choice Student	Percent of Students Waitlisted
Urban	93	232	29%	71%
Mid-urban	102	156	23%	60%

Table 9: Denver English Language Learners

	Student Count	Percentage of Students
Urban	11	4%
Mid-urban	284	56%

Table 10: Denver Race and Ethnicity in Schools

	Hispanic	White	African American	Asian / Pacific Islander	American Indian	Multiple Races	Percentage Minority Students
Urban	12.4%	72.7%	3.4%	3.7%	0.3%	7.5%	28%
Mid-urban	89.5%	7.6%	0.2%	0.0%	0.7%	2.0%	92%

The Mid-urban School has a higher enrollment due having K-8 as opposed to K-5th grades. While both schools had a high percentage of students wanting to "choice" in, the Urban School had a higher percentage with over 70 percent of students who applied waitlisted. Each school has a passing school performance rating, with the Urban School having an SPF (school performance framework) as "distinguished", and the Mid-urban School as "meets expectations". Additionally, the Mid-urban school is more diverse and has a much higher percentage of English Language Learners as compared to the Urban School.

Safe Routes to School

Similar to Rotterdam's "Traffic Safe Schools" Program, the United States has a program that aims to "…promote(s) walking and bicycling to school through infrastructure improvements, enforcement, tools, safety education, and incentives to encourage walking and bicycling to school" called Safe Routes to School (SRTS) (U.S. Department of Transportation, 2015.). Specific to Colorado, this program is administered through grants and in conjunction with the Colorado Department of Transportation. According to the SRTS Manager for Colorado, "…For the twelfth straight year, the Colorado Department of Transportation has provided the project grants. There continues to be strong interest in getting more students walking and biking to and from school, teaching children pedestrian and bicycling safety, encouraging healthy living, and improving the built environment to support active transportation" (Colorado Department of Transportation, 2018). This is a program that is widely utilized in the state and in Denver schools if selected for the grant.

Free and Reduced

Table 11: Denver FRL Statistics

Neighborhood	Percent FRL Range
Denver	75 - 100%
Urban	0 - 25%
Mid-urban	75 - 100%

Part of the existing conditions for this research, and for selecting schools to study was looking at the free and reduced lunch (FRL) percentages. In order to protect anonymity, our research will not provide specific numbers and percentages of FRL, but rather the FRL ranges.

Out of 200 schools in Denver, the Urban Neighborhood school was in the top quartile of FRL percentages, with an extremely low percent of students with free and/or reduced lunches, with a 0-25% FRL range. The second, Mid-urban Neighborhood school is in the fourth quartile of FRL in Denver, with a range of 75-100% FRL. The overall city median of percent FRLs is 81.7%.

05

Research Findings

Research Findings

All research findings are derived from the methodologies as described previously. The primary data collected is organized by city (Rotterdam and Denver) and will be compared in the next section. The primary research includes:

1. Observations of parents dropping off and picking up their children at the schools in each of the four study neighborhoods
2. Short surveys of parents in each study neighborhood collected through three methods (intercept/on-street verbal surveys, paper surveys handed out on the street, and online website surveys)
3. Extended interviews with a subset of parents who took the survey agree to a long form interviewed
4. Interviews about school travel with urban planning professionals, school administrators, and teachers in each city
5. Primary data collection of the urban form in each neighborhood through on-site observation of the urban form and transportation system infrastructure

Rotterdam

School Commuting Counts

Urban Neighborhood

Table 12: Rotterdam Urban School Commuting Counts

Total Counts	
Day 1 AM	364
Day 2 AM	509
Average AM	437
Day 1 PM	299
Day 2 PM	334
Average PM	317

From primary research we observed a maximum of 509 students at the school in the Urban Neighborhood. This may be slightly high, as there were multiple primary schools nearby. The average count for students at this school is 377. This will be used as the assumptive student population, as Rotterdam does not track this type of information.

More students were typically counted in the mornings than in the afternoon, which may be due to afterschool programs, early parent pickups, or sports/extra-curriculars that may begin at different times.

Table 13: Rotterdam Urban School Commuting Counts by Mode

	Walking			Biking			Car		
AM	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	12.3%	18.7%	**30.9%**	31.8%	27.4%	**59.2%**	-	9.9%	**9.9%**
AM Average	54	82	**135**	139	120	259	40	43	**43**
	Walking			**Biking**			**Car**		
PM	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	10.9%	12.8%	**23.7%**	35.9%	32.5%	**68.4%**	-	7.9%	**7.9%**
PM Average	35	41	**75**	114	103	217	16	25	**25**
	Walking			**Biking**			**Car**		
TOTAL	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	11.7%	16.2%	**27.9%**	33.5%	29.5%	**63.1%**	-	9.0%	**9.0%**
Bell Time Average	44	61	**105**	126	111	**238**	28	34	**34**

The majority of students in the Urban Neighborhood School bike to their school, with more students biking in the afternoon than in the morning. Biking either alone or accompanied with a parent have similar counts. The second highest mode type was walking, and most students walked with an adult, however, the Urban School had a higher share of student independence with about 45% of students either walking or biking alone on their school commute. There are more families that drive in the morning than in the afternoons, but both driving counts are low.

Table 14: Children per Vehicle

	# of Children per Vehicle
AM	1.08
PM	1.61
Overall	1.23

Typically, there are 1.2 students per car. This shows some carpooling and/or siblings, but overall most students are driven on their own. There are more children that carpool in the afternoons, which may account for certain coordination between parents for child pickups.

Mid-urban Neighborhood

Table 15: Rotterdam Mid-urban School Commuting Counts

Total Counts	
Day 1 AM	453
Day 2 AM	458
Average AM	456
Day 1 PM	319
Day 2 PM	369
Average PM	344

From our primary research collection, we observed a maximum of 458 students at the school in the Mid-urban Neighborhood. The average count for students at this school 401; again, will be used as the assumptive student population, as Rotterdam does not track this type of information.

More students were typically counted in the mornings than in the afternoon, same as the Urban Neighborhood school. This may be due to afterschool programs, early parent pickups, or sports/extra-curriculars that may begin at different times.

Table 16: Rotterdam Mid-Urban School Commuting Counts by Mode

	Walking			Biking			Car		
AM	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	17.2%	40.7%	**58.0%**	10.4%	5.0%	**15.5%**	-	26.6%	**26.6%**
AM Average	79	186	**264**	48	23	**71**	76	121	**121**

	Walking			Biking			Car		
PM	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	17.0%	40.3%	**57.3%**	12.8%	6.5%	**19.3%**	-	23.4%	**23.4%**
PM Average	59	139	**197**	44	23	**67**	54	81	**81**

	Walking			Biking			Car		
TOTAL	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	17.1%	40.5%	**57.7%**	11.4%	5.7%	**17.1%**	-	25.2%	**25.2%**
Bell Time Average	69	162	**231**	46	23	**69**	65	101	**101**

The majority of students at the Mid-urban School in Rotterdam traveled to school by foot and were mostly escorted by an adult. Cars were the second most popular commute mode, followed by biking, which was the lowest commute mode; this contrasts with the Urban School where biking was the most popular commuting mode. Most students that did bike were older and biked to school on their own rather than accompanied by an adult.

The morning versus afternoons did not have many discrepancies in the actual commute mode. Most students that were dropped off by car were also picked up by car, most that walked and biked in the morning also walked and biked in the afternoons). Although, there were fewer actual numbers of students counted in the afternoons, as explained previously.

Table 17: Children per Vehicle

	# of Children per Vehicle
AM	1.59
PM	1.49
OVERALL	1.55

Typically, there are 1.5 students per car. This shows some carpooling and siblings, but overall most students are driven on their own. There are more children that carpool in the mornings, which may account for certain after school activities.

Parent Surveys & Interviews

Survey Results

The following analysis of the surveys is broken into most relevant questions in terms of our study and relevant results. For Rotterdam, interviews were also taken from families that were not in our area of study, and these are displayed under the "other neighborhoods" column, and are incorporated into the findings as they still provide insight to the general choice and transportation patterns in the city as a whole.[9]

Figure 33: Rotterdam Survey – School Neighborhood

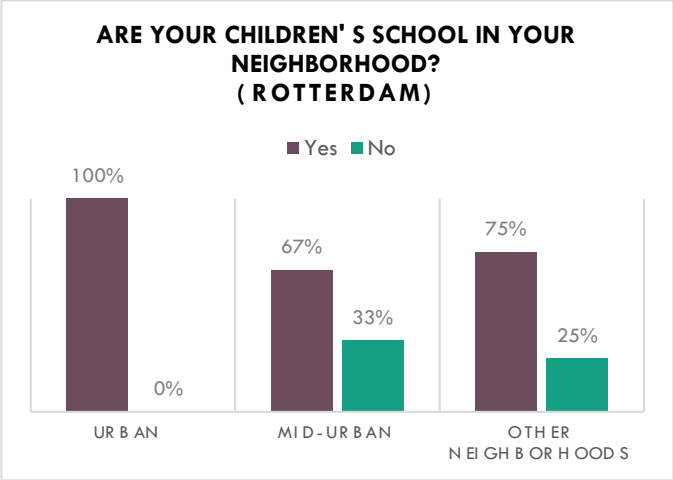


Figure 34: Rotterdam Survey – Mode of Transportation

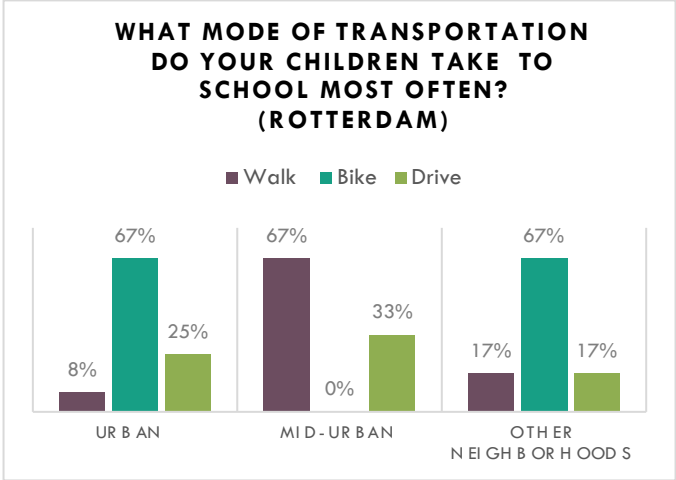


Figure 35: Rotterdam Survey – School Commute Time

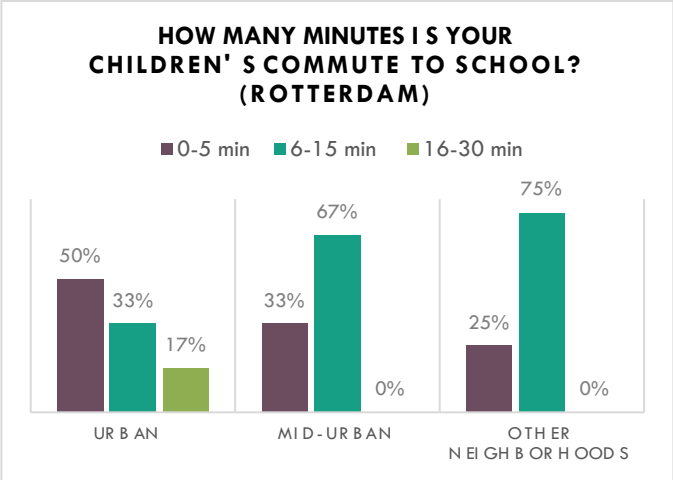


Figure 36: Rotterdam Survey – School Choice

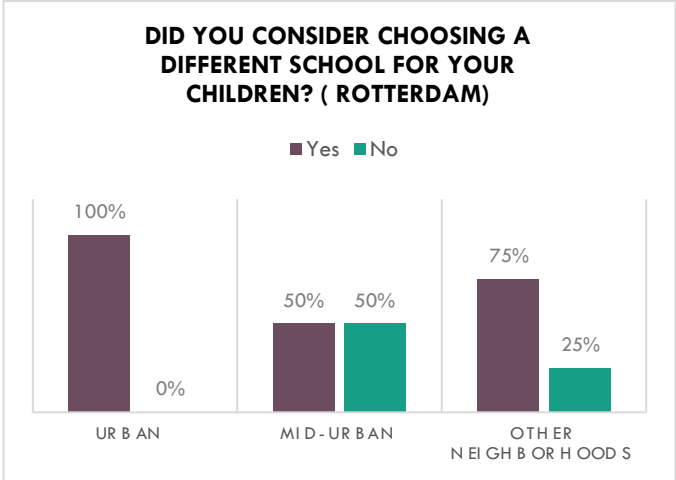
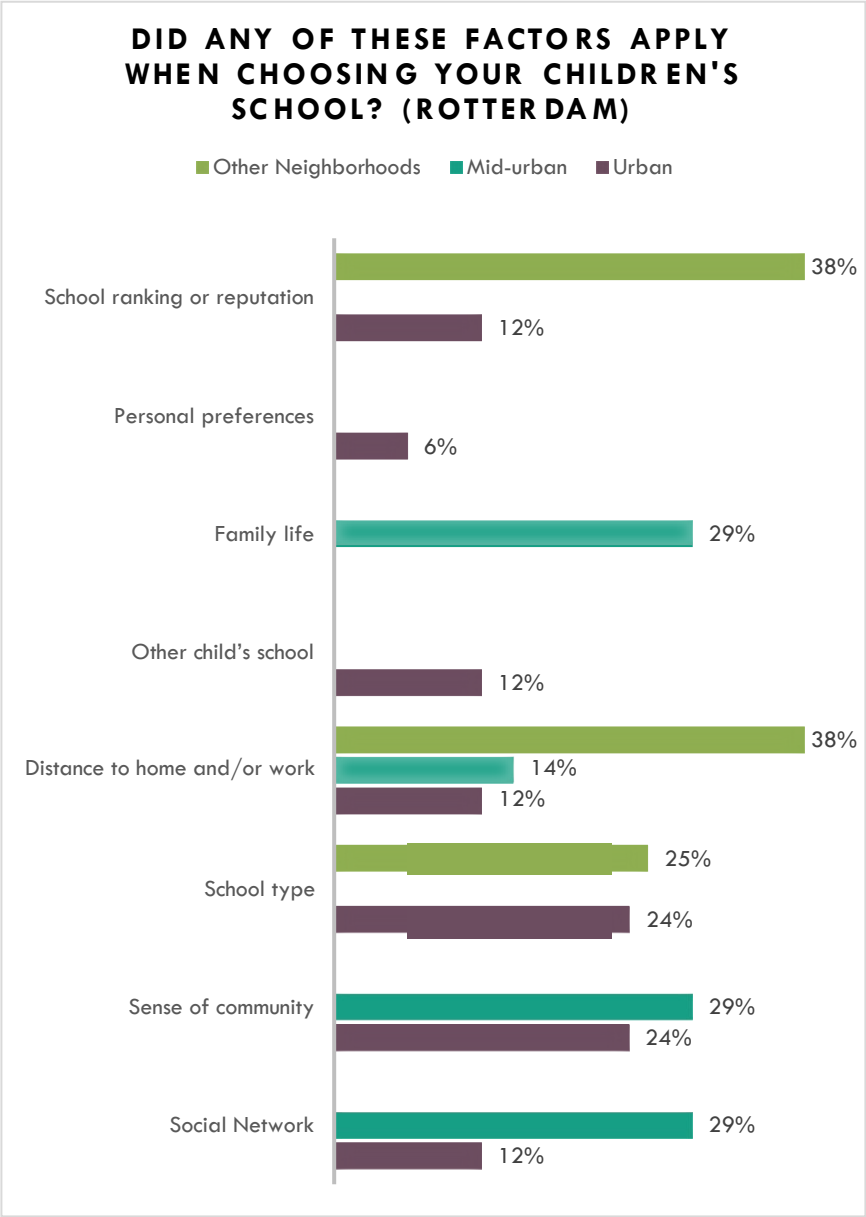


Figure 37: Rotterdam Survey – School Choice Factors



The majority of children's schools are in the same neighborhood as their house, especially for families in the Urban Neighborhood. This may be due to housing choices and/or school choices being chosen upon in conjunction with the other. Families tend to care about time spent together and free time, therefore will choose housing next to the school they like, or vice versa.

In addition to questions about school travel, surveys also questioned parents about their errand routines. For the Urban Neighborhood, parents indicated that they do not trip chain school commutes with errand shopping; the Mid-urban Neighborhood parents did indicate that they do trip chain with school drop-off/pick-ups.

Both neighborhoods answered that they grocery shop in their neighborhood. Parents in both neighborhoods shop at chain supermarkets and local or specialty markets. There was also no distinguishable difference between neighborhoods when it came to grocery shopping frequency (split between multiple times per week or daily). The Urban Neighborhood indicated that they bike or drive, with the Mid-urban Neighborhood walks or drives to the grocery store.

Anecdotes[10]

Table 18: Rotterdam Survey – Anecdote Themes

Theme	
Biking/Walking	7%
Child's Independence	1%
Cost	5%
Culture of school	17%
Demographics	3%
Driving	7%
Ease/Comfort	11%
Extracurriculars	1%
Grocery Habits	13%
Health	3%
Home or School Location	9%
Parent Job	3%
Public Transit	0%
Safety	0%
School Competition	8%
School Ranking	6%
Sibling/Family aspect	3%
Timeliness	1%

Along with answering survey questions, many parents provided anecdotal information. Most parents/guardians in Rotterdam discussed school culture, which was the theme we saw the most. Teaching styles, knowing the principal or teachers, school philosophy, and overall school culture were themes that were repeated by many people interviewed.

Other common themes included competition between schools reasoning as to why the specific school was chosen, ease and comfort (for example, how biking can be quicker than driving and is more enjoyable), as well as home and school location. Many parents and families chose housing depending on the school choice.

[10] See Appendix E

Professional Interviews

These professional interviews included school administrators, teachers, and design and planning professionals. They are not named to protect anonymity. The following "blurbs" provide some of the most important insights we gained from speaking to them:

Interview #1

- This interviewee made an important point of how it is difficult in the Netherlands for both parents to work full time, as school hours are limited. Most schools end at noon on Wednesdays, and some Friday's as well. It was stated by the interviewee that this has effects on the economy, and that 70% of women work part time because of these school schedules. There are also issues of daycare programs in the Netherlands, as many do not provide adequate and affordable daycares, and regardless most of them are located away from the regular schools, and the young children do not have a good way to get to the daycares without an adult escort.
- This interviewee also discussed an important aspect in Dutch culture which is the governmental programs of integration. These integration programs for immigrants can aid them in multiple aspects of assimilation, including biking. This interviewee believes that the Dutch government waited too long to begin these programs, as many older immigrants do not have these skills that are being taught today.
- Many parents balance their decisions for school choice on both the quality of the schools as well as the religion/philosophy of the school. There is a small amount of orthodox schools that are religious, but those are more common in the Dutch "Bible Belt" (located in the middle of the country).
- Distance to home is also an important factor of choice. Parents want to have time to play withchildren, have friends that live close by. Many families hesitate to send children far away because of the extra time it takes to get them to school and because of the traffic.

Interview #2

- This interviewee claims that the two neighborhoods (Urban and Mid-urban) researched in Rotterdam are "worlds apart" due to their political, social, incomes, and urban form aspects. This person also provided insight into the planning process in the Netherlands; The city overall does not have zoning laws, but the city plans on a neighborhood level or even smaller- up to a single address. There is a new city-wide vision plan for 2050, and all new neighborhood plans will have to adhere to this.
- Transportation options do not really affect school choice, the importance is how safe and how direct the route. People want their kids to be safe though – multimodal transportation helps with family transportation. With that said, schools must also be as cyclable as possible, if people can't bike a school will not open there
- Biking in this city was really a grassroot movement from the 1970s to make the city multimodal (especially bicycle) friendly.
- When the city plans a new neighborhood - all regulations that people need to adhere to, supermarket is one of the demands. Food planning is part of the planning done by municipalities.
- When it comes to groceries, overall groceries in Rotterdam are less expensive and there are smaller price differences when it comes to food than in the US– less of a contrast between families of different socio-economic levels. E.g. it is not cheaper to go to McDonald's in Rotterdam.
- Culturally, Rotterdammers would not eat out as much but that is changing (with globalization) – and it is changing the way people are grocery shopping as well.

Interview #3

- Generally, planning in the Netherlands is a high-quality process, and there are many policies that get implemented including the addition of eco and green spaces, access to biking and transit, as well as policies on active possibilities for children. Planning for automobiles comes in later and is not the main forethought.
- As a parent, this interviewee has seen how full schools get, and at times families take what they can get and go where the children get in. Some lotteries have up to 70 children on their list. Location does not really matter; students go to schools all over the city from where they live.
- This interviewee has not heard the term "food desert" before. This shows how not prevalent these issues are in European cities but are more of a phenomenon in the United States.

Interview #4

- This interviewee provided great insight as a parent and professional. This family's transportation patterns are typically to drive, as the children's school is on the way for the parent (who works in the city center). It affects their family schedule to bike to school, and takes more time, and is also the opposite way from the parents' work location. The parent would have to pass by home to go to work after dropping the children off at school, so it is overall easier to drive.
- This family's choice criteria included the size of the school (not to be too big, like a "factory"), a mix of social-economics and not just affluent families. Choice is really a personal matter and differs for each family. It depends on religion, educational type etc.
- Parents start to "train" students at a young age to cross streets safely, so that they can get to school independently. Children start going to school alone from around 8-12 years old, depending on their maturity levels.

Interview #5

- From the perspective as a parent, this interviewee explained how there are perceptions of spaces and how living in certain areas can "feel further", to get children to schools. Perceived barriers exist, such as large geographic areas, such as transit stations, can seem like a barrier, dividing one area from another and creating travel and transportation barriers from a psychological basis.
- This interviewee has studied the Mid-urban Neighborhood we are researching and provided insight on the housing stock there; including factors of social housing, income-based housing, and how people get wealthier but stay in the housing. This housing was originally built for laborers that worked in the harbor, and residents there are now are resisting government interference and designating these houses as monuments and protected cityscapes (which is about 120 houses in this area. They all still greatly follow the original garden city values.

Urban Form Analysis

Mode counts

Figure 38: Rotterdam Urban Form Local Mode Counts

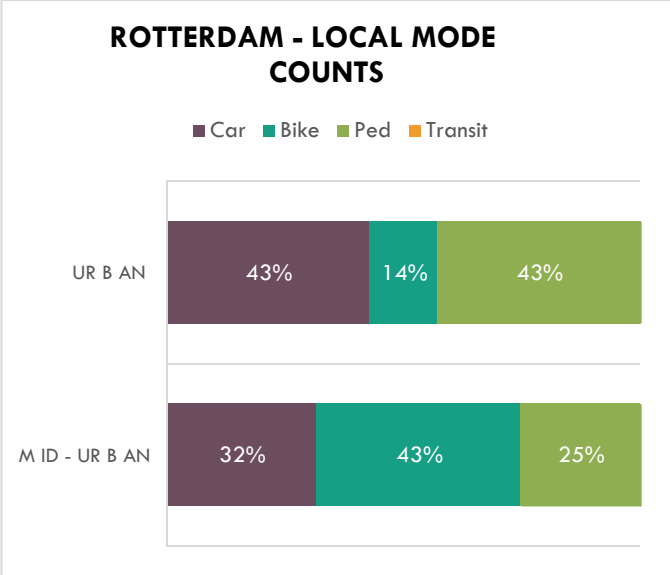


Figure 39: Rotterdam Urban Form Collector Mode Counts

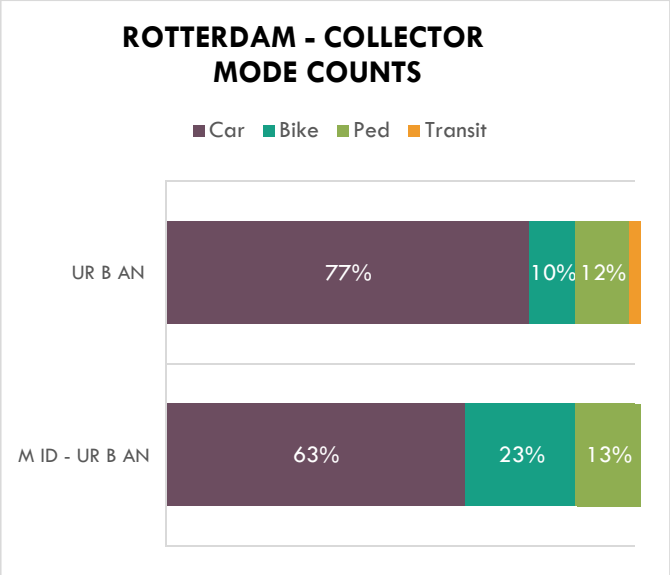
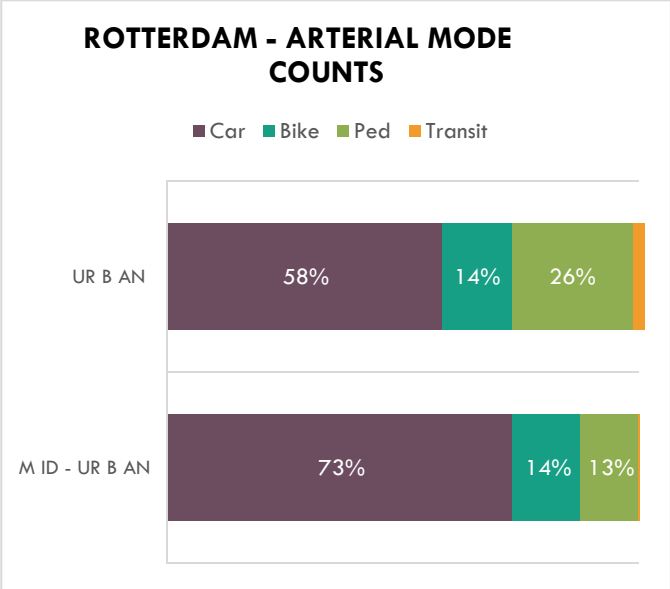


Figure 40: Rotterdam Urban Form Arterial Mode Counts

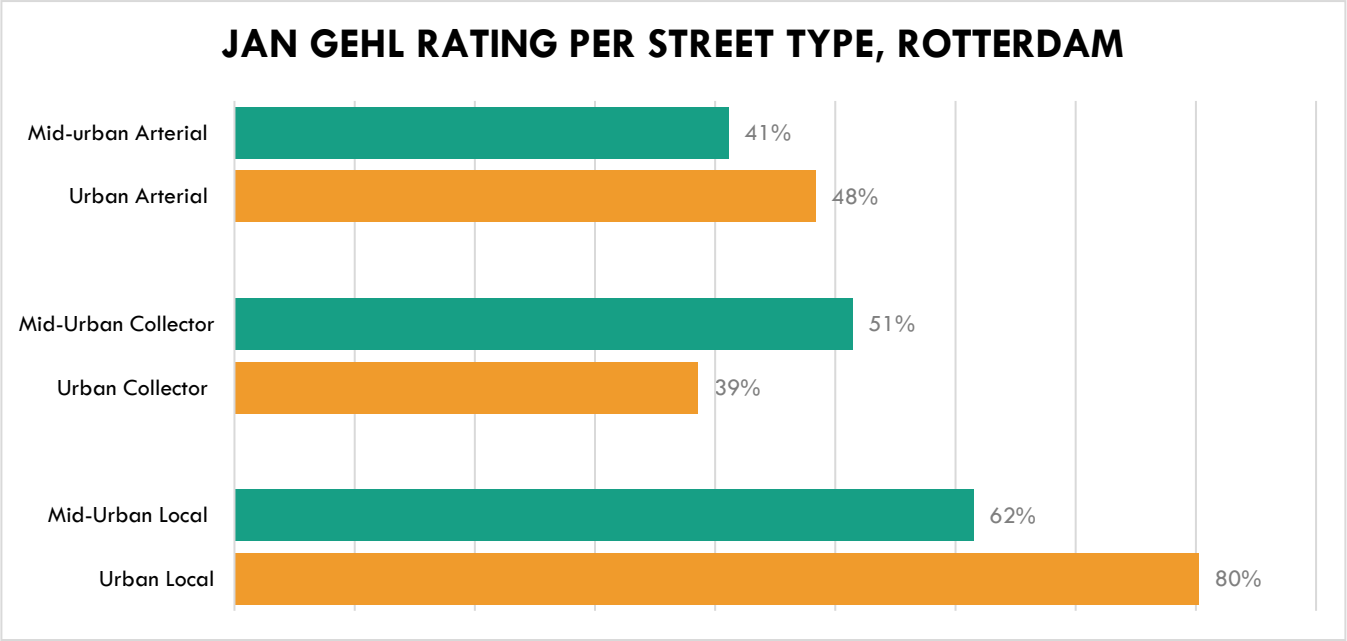


In Rotterdam, local streets are well designed and generally safe for pedestrian and bicyclists. The Urban Neighborhood streets typically had more cars, except for the arterials. There is a large portion of bicyclists in the Mid-urban Neighborhood compared to the Urban on both locals and collector streets. This may be due to the urban form which provides more protection and nicer street design for multimodal forms of transportation.

The highest percentage of pedestrians was along the Urban local and arterial. This shows that pedestrian activity in Rotterdam is higher in more dense areas, due to home and work locations, as well as other routine destinations. The Mid-urban Local street is also the only street to have more bicyclists than cars. The Urban Local also has a 50-50 mix of car and pedestrian traffic.

Jan Gehl

Figure 41: Rotterdam Jan Gehl Ratings



Overall, Rotterdam has nice, multi-modal streets that are seemingly safe and accessible for all types of users. Most streets have protected sidewalks, and most sidewalks were large. There is nice glazing, canopy, and mixed uses. The Jan Gehl rating for Rotterdam looks at street quality and comfort of areas, not at efficiency or pedestrian/bicycle safety, which Rotterdam would score very high on. The Collectors and Arterials both had decent scores, but need to be regarded in which this portion of the research examines it in. When it came to comfort, view-sheds, and human scaled designs, some of these Dutch streets were too large, and had buildings that were too dense and/or brutalist leading to lower scores for the Jan Gehl portion of the study.

The following infographic provides more visual insight to these scores, by displaying specific amenities and quality of the infrastructure.

Urban Form Inventory

The following urban form infographic provides more visual insight to these scores by displaying specific amenities and quality of the infrastructure. It is organized to providing a sliding scale view on “good” and “bad” amenities within the urban form of both neighborhoods in Denver. Physical amenities, street types, and infrastructure need to be considered in part with the Jan Gehl ratings, as both factors make up the livability, walkability, and overall access on specific streets.

ROTTERDAM URBAN FORM INVENTORY

GOOD

URBAN ARTERIAL

This arterial has protection for all modes - landscaped center street median, on-street parking, protected & colored bike lane, bicycle parking, and buffered sidewalk with flex space for nearby retail. This street is the definition of multimodal.

URBAN LOCAL

Abundant bicycle facilities including bike parking and bike lockers, at public places like schools and restaurants, are highly utilized.

URBAN COLLECTOR

A buffered two-way cycle track and street markings allows for comfortable bicycle & pedestrian movement, separate from car traffic.

MID-URBAN COLLECTOR

Pedestrian protection with landscaped buffers and center median refuges; however, this example lacks ADA curb cuts.

MID-URBAN COLLECTOR

While the pedestrian crossing is clear with striping, the sidewalk and street joints have gaps that create hazards.

MID-URBAN LOCAL

Sidewalks are missing accessible curb cuts, and links to the rest of the pedestrian network. Historic pavers add character but can pose accessibility issues if not maintained properly.

MID-URBAN LOCAL

Sidewalks are inaccessible for those using mobility devices or strollers. Obstacles in the sidewalk also do not meet accessibility

BAD

Denver

School Commuting Counts

Urban Neighborhood

Table 19: Denver Urban School Commuting Counts

Total Counts	
Day 1 AM	333
Day 2 AM	365
Average AM	349
Day 1 PM	213
Day 2 PM	214
Average PM	214

From collecting primary research, we observed a maximum of 365 students at the school in the Urban Neighborhood in Denver. The average count for students at this school is 282. The official enrollment population at the Urban School is 325 students. The higher number of counted students may be due to younger/older siblings and researcher margin of error.

Many more students were counted in the mornings than in the afternoons, which may be due to afterschool programs, early parent pickups, or sports/extra-curriculars that may begin at different times. This is consistent with the schools in Rotterdam as well.

Table 20: Denver Urban School Commuting Counts by Mode

	Walking			**Biking**			**Car**		
AM	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	6.8%	19.6%	**26.4%**	0.7%	1.3%	**2.0%**	-	71.6%	**71.6%**
AM Average	19	55	**74**	2	4	**6**	135	199	**199**
	Walking			**Biking**			**Car**		
PM	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	15.3%	14.9%	**30.2%**	0.0%	0.7%	**0.7%**	-	69.0%	**69.0%**
PM Average	22	21	**43**	0	1	**1**	73	97	**97**
	Walking			**Biking**			**Car**		
TOTAL	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	9.7%	18.0%	**27.7%**	0.5%	1.1%	**1.6%**	-	70.7%	**70.7%**
Bell Time Average	20	38	**58**	1	2	**3**	104	148	**148**

Most students at the Urban School in Denver travel to school by car, about 70% of all students counted. The afternoons had less student pickups (69%) than student drop-offs in the mornings (71%).

Many families came to play at the park after school, which explains the discrepancies between number of children counted in the mornings versus the afternoons (a difference of about 100 students).

A similar, but smaller trend is seen for biking. More families biked into school in the mornings than in the afternoons, and this may be due to afterschool programs where parents pick their children up and take them to their extracurriculars activity by car, due to comfort and ease, or time limitations. Overall, a large amount of walking was seen by students and families at this school, and this can be attributed to the safety and urban form of the area, as well as culture and families with more disposable incomes may have more time to walk that those with lower incomes.

One interesting travel pattern was seen here; there are many groups of students that are walked by one or two adults. These are self-initiated programs by parent groups such called "walking school buses". Groups as large as 10 students were seen in the morning and afternoons being escorted by one or two adults.

Table 21: Children per Vehicle

	# of Children per Vehicle
AM	1.48
PM	1.33
OVERALL	1.43

Typically, there are 1.4 students per car. There are more carpool trips in the morning than in the afternoons.

Mid-urban Neighborhood

Table 22: Denver Mid-urban School Commuting Counts

Total Counts	
Day 1 AM	276
Day 2 AM	294
Average AM	285
Day 1 PM	167
Day 2 PM	174
Average PM	171

From collecting primary research, we observed a maximum of 285 students at the school in the Mid-urban Neighborhood. This may be slightly high, as there were primary schools nearby. The official enrollment of the Mid-Urban school is 446 students. The lower number of counted students may be due to before- and after-school programs in which students do not leave the school grounds.

More students were typically counted in the mornings than in the afternoon, which may be due to afterschool programs, early parent pickups, or sports/extra-curriculars that may or may not begin at different times. This is also consistent with all other schools observed.

Table 23: Denver Mid-urban School Commuting Counts by Mode

	Walking			Biking			Car		
AM	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	7.2%	23.7%	**30.9%**	0.9%	1.4%	**2.3%**	-	66.8%	**66.8%**
AM Average	21	68	**88**	3	4	**7**	131	191	**191**
	Walking			**Biking**			**Car**		
PM	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	18.8%	29.3%	**48.1%**	1.8%	0.9%	**2.6%**	-	49.3%	**49.3%**
PM Average	32	50	**82**	3	2	**5**	59	84	**84**
	Walking			**Biking**			**Car**		
TOTAL	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# cars	# kids	**Total**
Percent of total:	11.5%	25.8%	**37.3%**	1.2%	1.2%	**2.4%**	-	60.3%	**60.3%**
Bell Time Average	26	59	**85**	3	3	**6**	95	137	**137**

The majority of students at the Mid-urban School in Denver, traveled to school by car. The mornings had much more student drop offs (67%) than student pickups (49%) in the afternoons, and this may be due to parental work schedules, aftercare programs or after school activities. This may also be due to the weather, as afternoons are typically warmer to walk or bike home than in the mornings when it is much cooler.

A higher number of students walked home in the afternoons, about 48%. There were typically escorted by an adult, which may lead insight into the safety of the routes home, as well as the overall independence of students, which is insightful as this school has students up to eighth grade.

Only a handful of students did bike to and from school, on average about 2 percent of students. Half biked to/from school with a parent, and half biked to/from school alone.

Table 24: Children per Vehicle

	# of Children per Vehicle
AM	1.45
PM	1.42
OVERALL	1.44

Typically, there are 1.4 students per car. The differences between morning and afternoon carpool and/or sibling trips are minimal.

Figure 43: Denver Survey – School Neighborhood

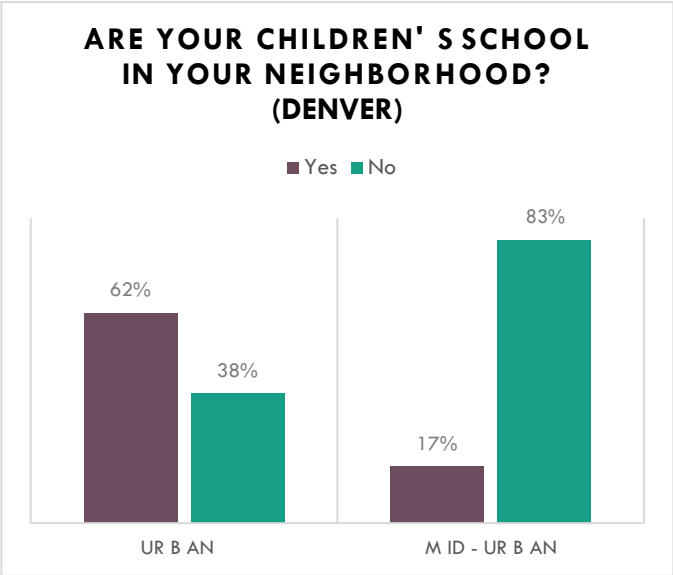


Figure 44: Denver Survey – Mode of Transportation

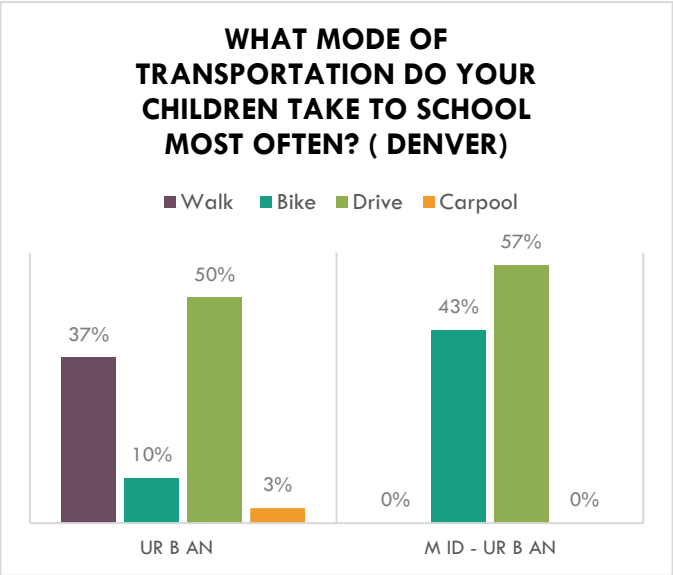


Figure 45: Denver Survey – School Commute Time

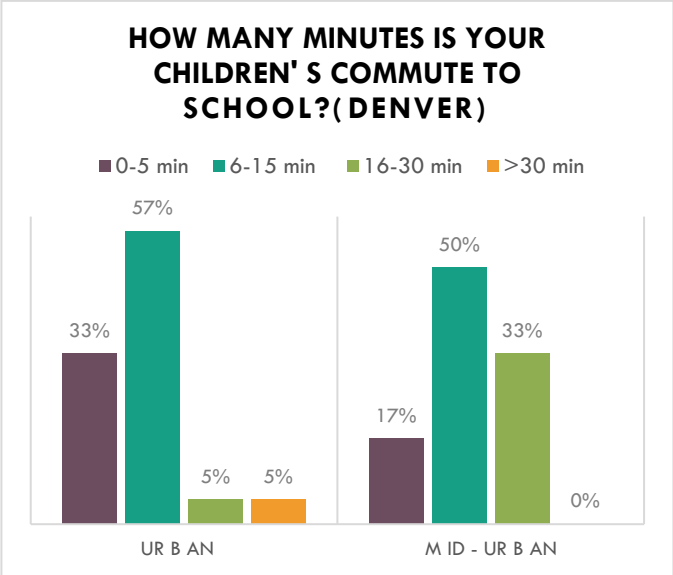


Figure 46: Denver Survey – School Choice

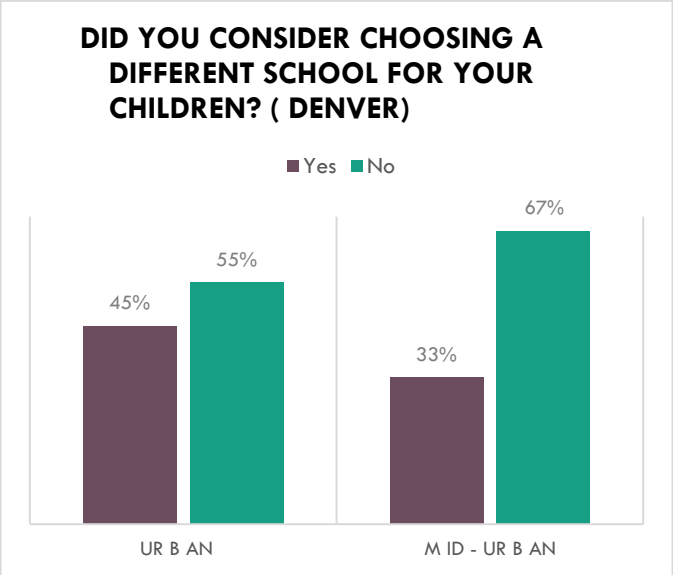
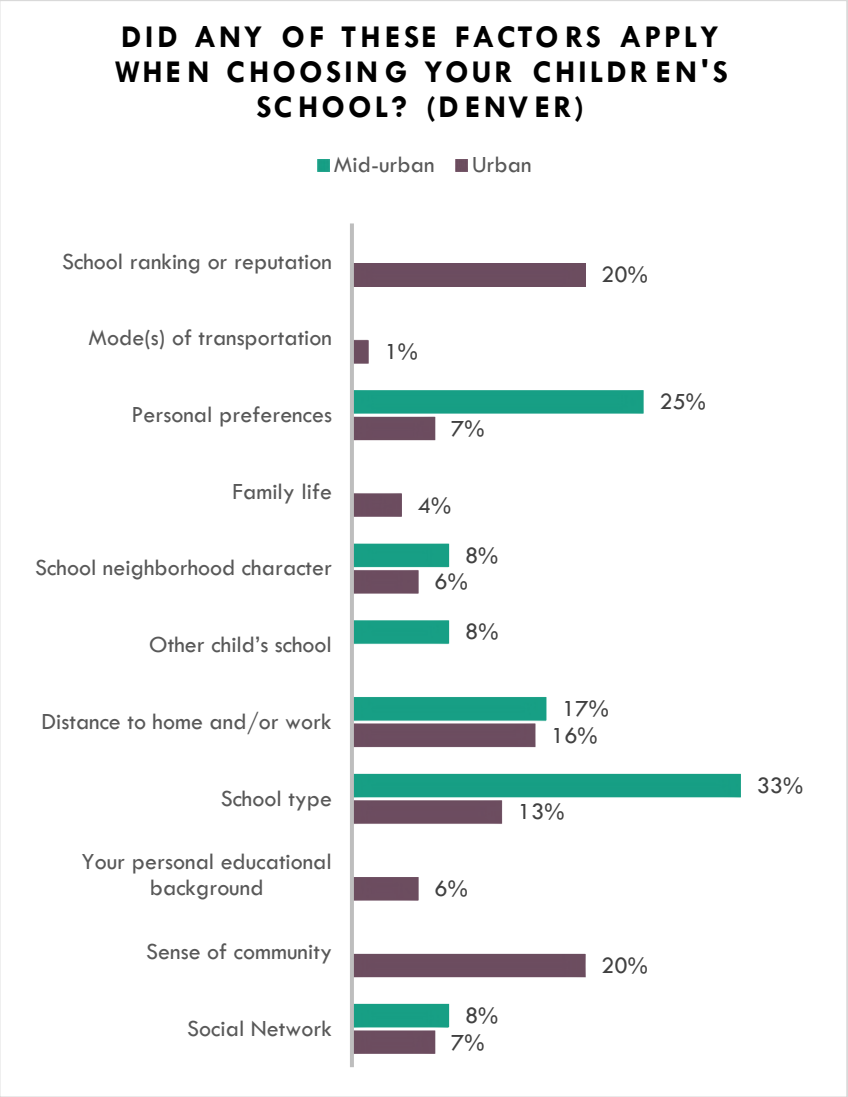


Figure 47: Denver Survey – School Choice Factors



The Mid-urban Neighborhood had a higher percentage of students outside of the neighborhood. Surveys indicated that over half of students are driven to school, with about one-third of Urban students walking, and Mid-Urban students biking. Mid-urban students travel further to school which reinforces that they are living outside of the neighborhood. Parents from both neighborhoods indicated many reasons to why they chose their child's specific school.

As mentioned above, surveys questioned parents about their errand routines. For Denver, both the Urban and Mid-urban Neighborhoods indicated that they do not trip chain with school commutes and errand shopping. Both neighborhoods answered that they grocery shop within their neighborhoods as well.

Most Urban Neighborhood parents shop at chain supermarkets with some shopping at local shops, specialty, stores and wholesale outlets. The Mid-urban Neighborhood had a bigger split of chain supermarkets and local and ethnic markets. Additionally, both neighborhoods drive to the grocery store.

Anecdotes[11]

Table 25: Denver Survey – Anecdote Themes

Theme	
Biking/Walking	8%
Child's Independence	0%
Cost	0%
Culture of school	8%
Demographics	4%
Driving	21%
Ease/Comfort	4%
Extracurriculars	4%
Grocery Habits	0%
Health	0%
Home or School Location	8%
Parent Job	13%
Public Transit	13%
Safety	4%
School Competition	0%
School Ranking	8%
Sibling/Family aspect	0%
Timeliness	4%

The themes from the Denver parent survey anecdotes vary widely from parent to parent, and there is no consistent theme that stood out as one that was repeated often. Some surveyors focused on providing more stories and providing more information on the school ranking and culture, and some focused on explaining why they choose their typical transit mode. Many parents explained that they would drive less if there were more options for public transit or if they lived closer. Most did discuss driving patterns.

Families did express some of their patterns for choice, including housing location, or the ways they found to send children to the schools they wanted, such as methods of grandfathering or using a friend's address.

One parent mentioned safety and pedestrian safety, and others mentioned timeliness and ease/comfort for the family and the parent.[1]

[11] See Appendix E for full list of anecdotes.

Professional Interviews

The following professional interviews include ones with school administrators, teachers, and design and planning professionals. They are not named in order to protect anonymity. The following "blurbs" provide some of the most important insights we gained from speaking to these professionals, both as parents and experts within their fields.

Interview #1

- Originally this interviewee had "choiced" their child into a school further away because they offered before school programs. It was hard because they had to drive their child to school, then drive back home to take transit to work. The interviewee finally worked a deal with the school to park in their lot and take transit from the school.
- This interviewee lost assistance for before-school program and did not get into their first-choice school. They decided to go to neighborhood school within walking distance to be more conducive to the parent schedule, even though their child liked the first school. Their child, a 9-year-old, walks to and from school every day. They go to the nearby Boys and Girls Club after school and parent picks up after work.
- Their current school does not have a lot of resources or money coming into it. There is not a strong science program, so trying the parents are trying to teach on their own. They would go to another school with more resources if could get they in, but it also would be hard to juggle with work schedule, but their current school is also very convenient. The family would move to a better neighborhood, but "have never had that luxury" as they currently live in in public housing.
- "The built environment is huge, if [their] school was two blocks the other direction over [an arterial] I would not feel the same way [in letting him walk to school without supervision]."

Interview #2

- This interviewee discussed how people's interactions with the urban form changes drastically as they have children and begin creating families. As people have children, they start to interact with the built environment differently, and those that are able-bodied may begin to realize the importance of accessibility, curb cutouts, sidewalk quality, and the difficulty of navigating obstacles such as stairs. This, at first, is from stroller use, and then to other inaccessibility's from monitoring a toddler learning to walk.
- Some of the goals that this interviewee is working on includes moving more people without larger roads and looking at efficiency of moving people safely.
- This interviewee also discussed with us some of the nuisances of physically working on sidewalk and creating better sidewalks quality in cities. Sidewalks are complicated and complex, there are many issues with easements, ownership (public versus private properties) and some of these maintenances are expensive and timely projects. Improvement programs, bonds, project prioritization, staff bandwidth, partnerships, and budgeting are all factors and solutions to these types of projects.
- "To be lucky enough to walk or bike to school - it's like you won the lottery"
- This interviewee brought up the idea of "Free Range Kids" and the insurgence of parenting culture to minimize all risk and protect children, as well as receive no criticism. This has led to a decline of child independence as compared to European cultures.
- The public's perspective was also mentioned, and the current friction in Denver between new and old residents, especially with the recent population growth.

Interview #3

- This interviewee discussed with us the ways that schools within that specific district receive buses, and how this complex busing system works. This complex system of buses and student transportation is quite complicated. For example, not all magnet schools receive buses. Some schools are in specific programs, where transportation is provided by the district for a whole area. Shuttle services, transportation zones and public bus programs are all other ways that the district provides services to students. It is important to note that school choice students are not provided with a bus service, but students within their home school boundary are provided buses if their home is more than a mile walk for elementary and middle, or 2.5 mile walk for high school students.
- The interviewee also discussed a common headache for the district administration which is bell times. Coordinating district wide buses, for schools that start and end at different times is problematic for transportation coordination. A study done by MIT was discussed as an example, that investigated inequities and how these intersected with bell times. The study aimed to find the "perfect" bell time but was unsuccessful as there are too many individual schools and parents' factors, which is the same situation since in one of our research cities.
- Children's transportation to school (besides yellow school bus) is "out of DPS parameters" so they do not focus on active transportation; the district had a SRTS part-time coordinator, but the position lost its grant funding.

Interview #4

- This interviewee feels privileged that they live within walking distance to their children's school.
- Their family has a first day tradition of walking to school. Parents have their coffee mugs and slippers on as they walk their children through the neighborhood. However, this is treated as special occasion for many.
- The interviewee usually drives their children to school and daycare because they trip chain on their way to work. If the interviewee is not working that day, then the family will ride their bikes as "treat".
- The interviewee has not thought of when their children will be old enough or responsible/mature enough to walk alone, but maybe by middle school they will be of age.

Interview #5

- "Most of our students go to school by taking the school bus, but there are also a number of students from the neighboring area who can walk/bicycle/get a ride from parents. The students in the neighborhood tend to be upper-middle class and white, and the students who take the bus are mostly Latino and lower income. One obvious pattern I noticed in how location and transportation impacts students and families is in their attendance. Students who miss the bus for whatever reason are far less likely to get to school than students who live close enough to get a ride or walk. This was particularly noticeable on days when the weather was bad. If students miss the bus, there often times is not a parent with reliable transportation available to take them, and even if there were a direct and accessible route, many parents do not feel comfortable with their middle school students taking public transportation. The walk is about an hour long and crosses several large intersections and major streets (Federal, Evans, Broadway.) Even so, students would sometimes walk to school if they had missed the bus and would arrive at least 1.5 hours late. Attendance is one of the biggest indicators of academic success for students, so missing school due to transportation/location is a big deal."

Urban Form Analysis

Mode counts

Figure 48: Denver Urban Form Local Mode Counts

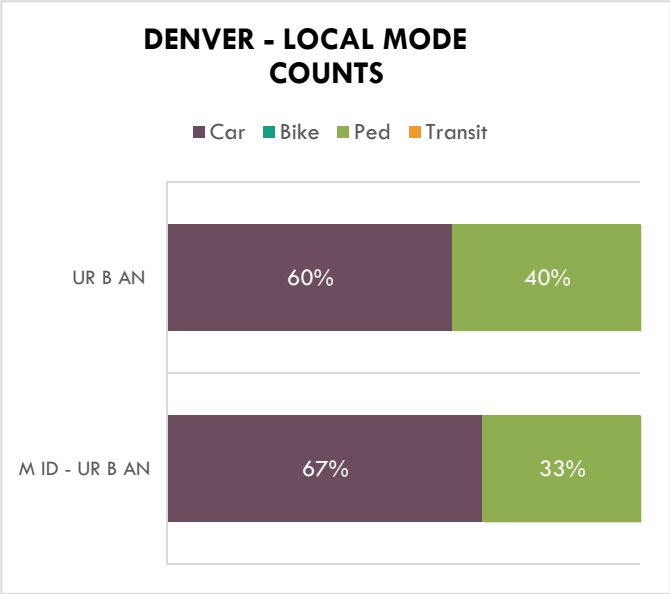


Figure 49: Denver Urban Form Collector Mode Counts

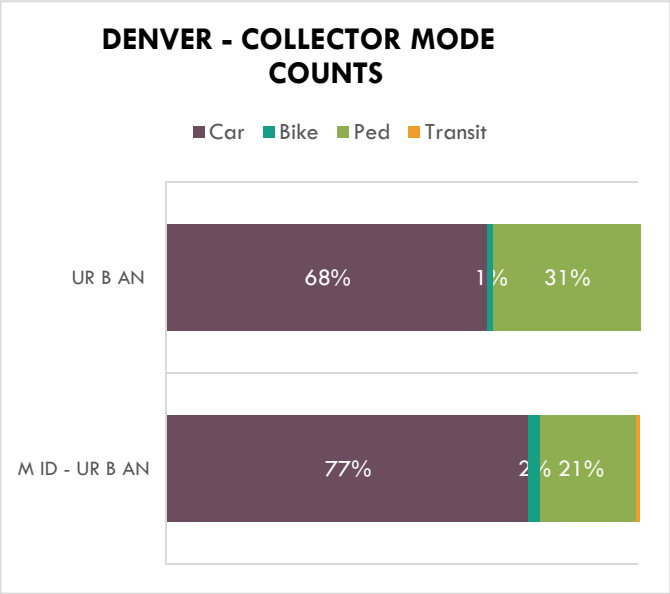
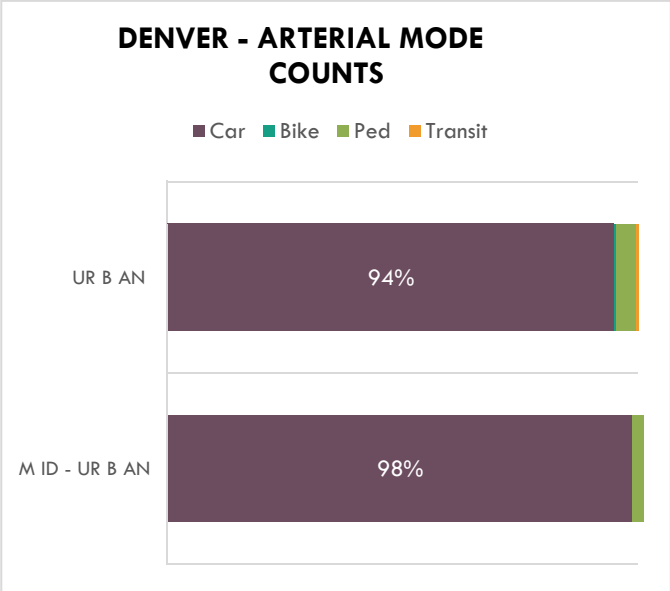


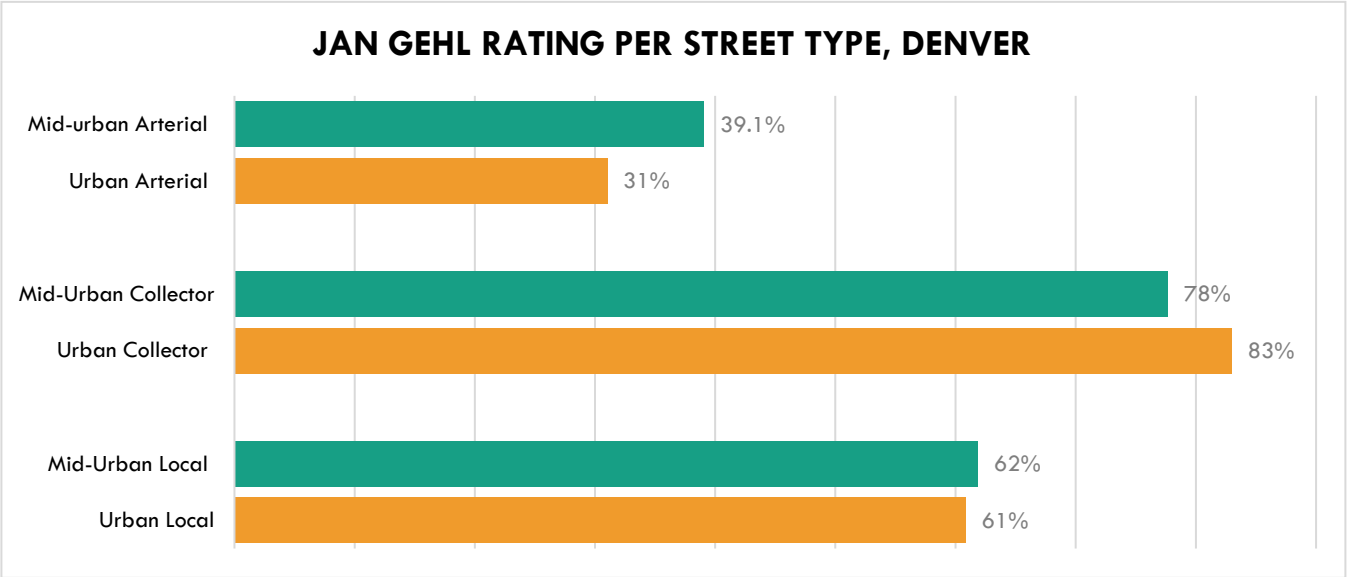
Figure 50: Denver Urban Form Arterial Mode Counts



In Denver, the majority of all trips were by car, followed by pedestrian traffic. The local streets for both Neighborhoods showed the largest amounts of pedestrians which is as predicated. All local streets showed decently high amounts of pedestrians, at 31% for the Urban and 21% for the Mid-Urban. This also makes sense as the Mid-urban has less dense neighborhood forms and can be less walkable or provides less destinations to walk to.

Jan Gehl Rating

Figure 51: Denver Jan Gehl Ratings



Generally, Denver's streets tend to be more auto oriented and less pedestrian and bike focused. The Urban Neighborhood studied here has much higher quality local and collector streets due to the shopping and businesses nearby. Shop owners and improvement districts, high property taxes, and art districts help these streets have higher quality amenities like lighting, seating, and sidewalk quality. Even though the local and collector streets are high quality and show good ratings on the Jan Gehl scales, the arterials show to be more "typical". Extremely auto-oriented, high speeds, and unsafe to non-existent pedestrian amenities are seen, but more so in the Urban Neighborhood which is much higher income than the Mid-urban Neighborhood. Collectors and Locals for both are nice streets and places, but both areas' Arterials are problematic, although the Mid-urban arterials are safer and better spaces than the Urban, higher income Arterials.

Urban Form Inventory

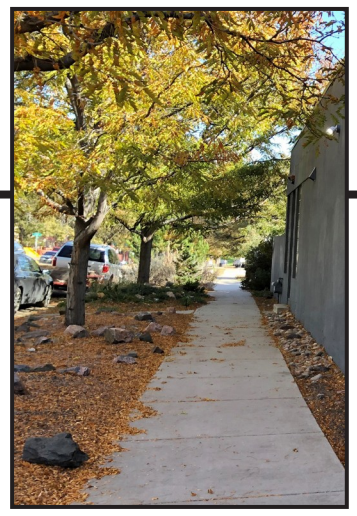
The following urban form infographic provides more visual insight to these scores by displaying specific amenities and quality of the infrastructure. It is organized to providing a sliding scale view on "good" and "bad" amenities within the urban form of both neighborhoods in Denver. Physical amenities, street types, and infrastructure need to be considered in part with the Jan Gehl ratings, as both factors make up the livability, walkability, and overall access on specific streets.

DENVER URBAN FORM INVENTORY

GOOD

URBAN & MID-URBAN COLLECTOR

Mixed-use residential and retail streets provide ample bicycle parking and other amenities, such as benches for multi-modal users.

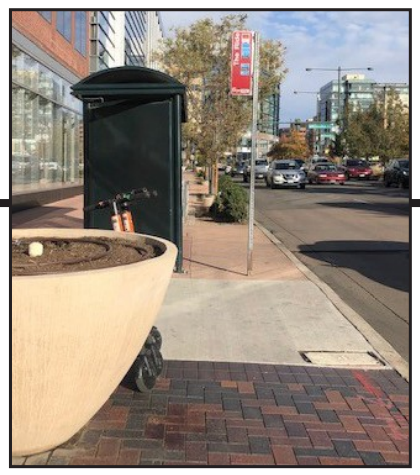


URBAN LOCAL

Ample sidewalk width with no obstacles, as well as mature shade trees provide an inviting pedestrian experience.

MID-URBAN ARTERIAL

Shade trees, landscaped median, buffered sidewalk, and street lighting provide adequate facilities for both cars and pedestrians.



URBAN ARTERIAL

Transit shelter, street trees, and planter bollards provide protection and amenities to people along this street.

MID-URBAN ARTERIAL

The sidewalk width is ADA accessible, but there is a lack of protection from car traffic along the street.

URBAN LOCAL

Uneven sidewalk pavement is uncomfortable and/or unaccessible to those using mobility devices or strollers

URBAN ARTERIAL

Poor sidewalk quality in Denver, even in high-income areas. Focus is on auto not the pedestrian.

BAD

06

Discussion of Findings

Discussion of Findings

The following section provides an overall comparison of the two cities, and the four neighborhoods. We also include speculations that may include some inferences and assumptions as to why we believe some of the results occurred. Comparatively, the cities and neighborhoods have both have strong similarities and differences. Qualitatively, they are fairly similar, but vastly different in facilities and infrastructure.

School Mode Counts Compared

Table 26: School Mode Counts Compared

	Walking			Biking			Driving	
	Alone	W/adult	**Total**	Alone	W/adult	**Total**	# kids	**Totals**
Rotterdam Urban	11.7%	16.2%	**27.9%**	33.5%	29.5%	**63.1%**	9.0%	**9.0%**
Denver Urban	9.7%	18.0%	**27.7%**	0.5%	1.1%	**1.6%**	70.7%	**70.7%**
Rotterdam Mid-urban	17.1%	40.5%	**57.7%**	11.4%	5.7%	**17.1%**	25.2%	**25.2%**
Denver Mid-Urban	11.5%	25.8%	**37.3%**	1.2%	1.2%	**2.4%**	60.3%	**60.3%**

The Urban Neighborhoods in both cities showed a decent amount of walking, which surprised us, as we were expecting little to none in Denver. Although, children in Rotterdam did have higher amounts of independence when it came to walking to and from school. Both neighborhoods in Rotterdam had very high amounts of biking, which is a testament to the country's culture, urban form, and specifically to the Urban Neighborhood, parent schedule and flexibility to be able to escort the children via bicycle. Regardless of urban form, parents in Denver tend to drive their children more than any other mode, also an indication to the auto-oriented city makeup and overall car culture in the city.

Urban Neighborhoods

The Urban Neighborhood in Denver actually had more driving than the Mid-urban. This may be due to social status, or due to comfort and ease for families. One parent in an interview mentioned that their family tries to walk everyday but gets lazy after the first day or two and then drives. In the United States, driving and car ownership is valued and can be deemed as more elite than walking/biking/taking public transit, and Americans tend to enjoy cars and own luxury vehicles. In Rotterdam, this neighborhood had the highest amount of biking of all, with over half the student trips being on a bicycle. This is again, cultural, but may also be attributed to urban form, as there was a nearby cycle track that many parents utilized. It was a common observation in this neighborhood as well to see many parents bike with multiple children's seats on their bikes, including bucket bikes that fit up to four children in the front.

Mid-urban Neighborhoods

There is a fairly high number of walking families and students in Denver. This may be due to working class parents, where the children may need to walk themselves to school, or be escorted by neighbors, or grandparents, which was an observation we had. The Mid-urban Denver children showed less independence; this may be due to further walking distances and unsafe crossings at arterials and collectors from adjacent neighborhoods. This school also has

high school choice, which may account for further walking distances. Denver's Mid-urban had higher rates of biking than the Urban Neighborhood. In Rotterdam, children at the Mid-urban school showed higher rates of independence. Rotterdam, mid-urban More kids biked alone and had high independence. This can be attributed to cultural factors, as parents teach kids bike safety from a young age, as we learned in interviews. This neighborhood is also highly residential, and it seems that many students walked short distances from the nearby single-family houses. Rotterdam's Mid-urban had more driving than Rotterdam's Urban, almost triple, but this neighborhood still showed more pedestrians.

Overall Rotterdam is multi-modal and safely supports biking and walking, as Denver does not as much; although, the Mid-urban Neighborhood in Denver did have more walking, but this is most likely *not* attributed to urban form but rather to income and cultural values. The overall urban form of Rotterdam demonstrated separated modal facilities, whereas Denver does not. This is truly validated by *how* students and families get to school; people in Rotterdam feel comfortable walking and biking, and in Denver, these families and students that are walking might not have another choice of transportation.

Parent Survey Data Compared

Rotterdam Urban:

Parents mainly choose according to sense of community, type, distance to home/work, school reputation, and social network. 100% of families looked at other schools, which shows that they are more engaged in the processes of choice and choosing schools. The surveys showed that all schools were in the neighborhood for the parents we asked.

Rotterdam Mid-urban:

Parents mainly hose due to family life, sense of community and social network. There was about a half and half split for parents that looked at other schools, 50% just chose a specific school without "shopping" for others. One third of the schools are not in the neighborhood. This might have some insight as to how full schools in the area get, but there needs to be more research on this. Overall, the families in the Mid-urban Neighborhood had longer commutes, that the Urban ones, but the majority was still only 6-15 minutes.

Denver Urban:

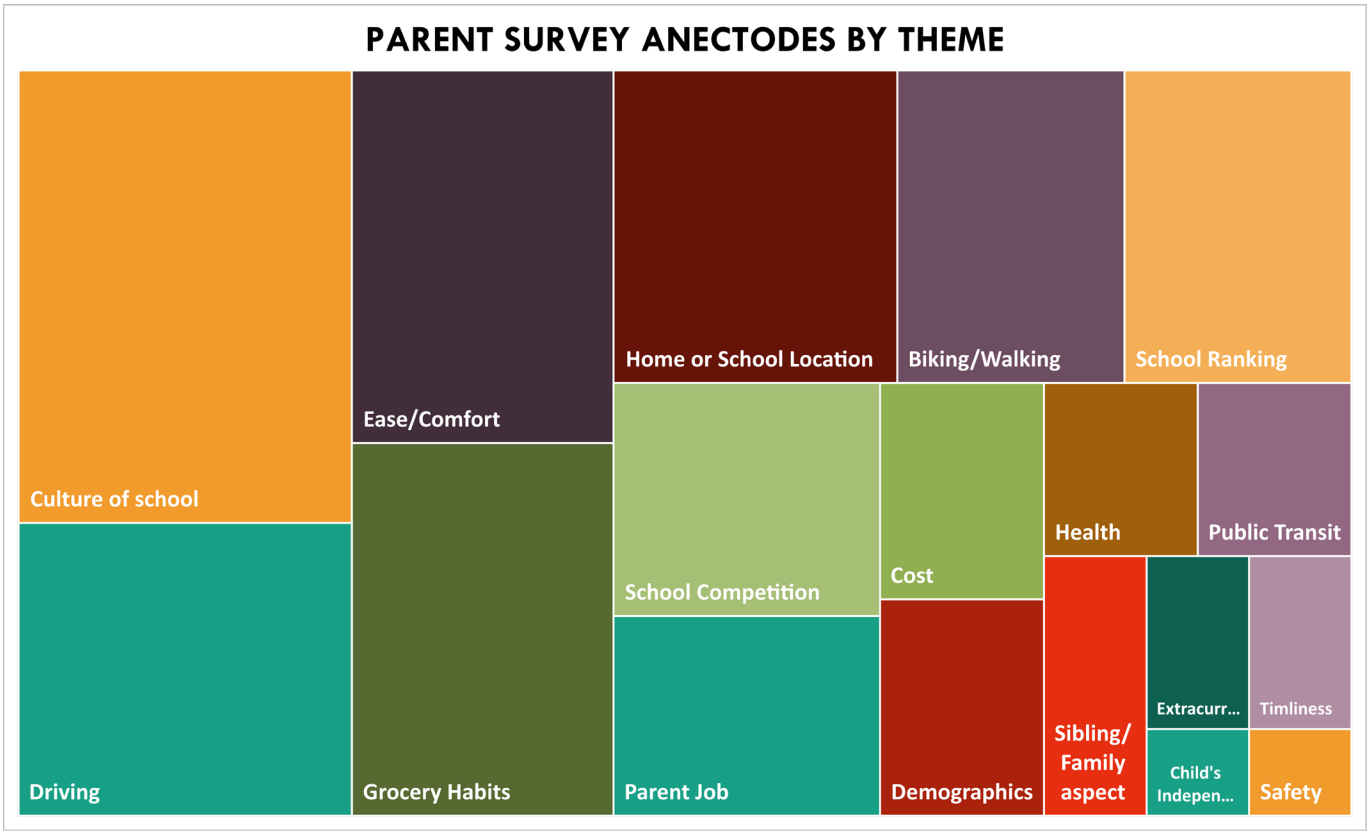
Half of the parents in this neighborhood looked at different schools, which also shows that that are somewhat engaged in the choice process, or that some may have just had their minds set on the specific school. A third of the families' schools are outside of the neighborhood they live in. Only about 10% of families have a commute longer than 16 minutes. These families chose based on community, and distance to home (many claimed this school is "the best" and chose housing in accordance to school).

Denver Mid-urban:

Over ¾ of the students that go to the school in this neighborhood are from outside neighborhood. Two thirds of families did not look at other schools, but this may be to the fact that the school is essentially all choice, or there is a possibility that many families may have already had this school in mind. A third of the families have a 16-30-minute commute, which is quite high. Many families commute to this school from outside neighborhoods and suburbs. Parents mainly chose schools based on the school type, personal preferences, and distance to work and home.

Parent Anecdotes Compared

Figure 53: Parent Survey Anecdotes by Theme



When completing surveys, some parents or guardians provided anecdotal information, which were also recorded along with survey answers. The above graphics shows the amount certain topics were mentioned. These comments ranged in popularity and repetition, ranging from seventeen people mentioning school culture, and only one mentioning safety.

Many discussed ease and comfort, the location of their home or school, and discussed driving and parent work locations. Many parents, especially in Denver, would drive less and take active transit if it took less time to do so. Many parents in Rotterdam chose schools due to the school's culture and teaching philosophy.

A few discussions that specifically stood out was one parent in Denver that explained how they utilized another households' address in order to get their children to that specific school, as it was a sought-after school with large waiting lists.

Some that also stood out was parents in both Rotterdam and Denver that specifically sought out schools there were more diverse and less homogenous in order for their kids to go to schools that were more dissimilar.

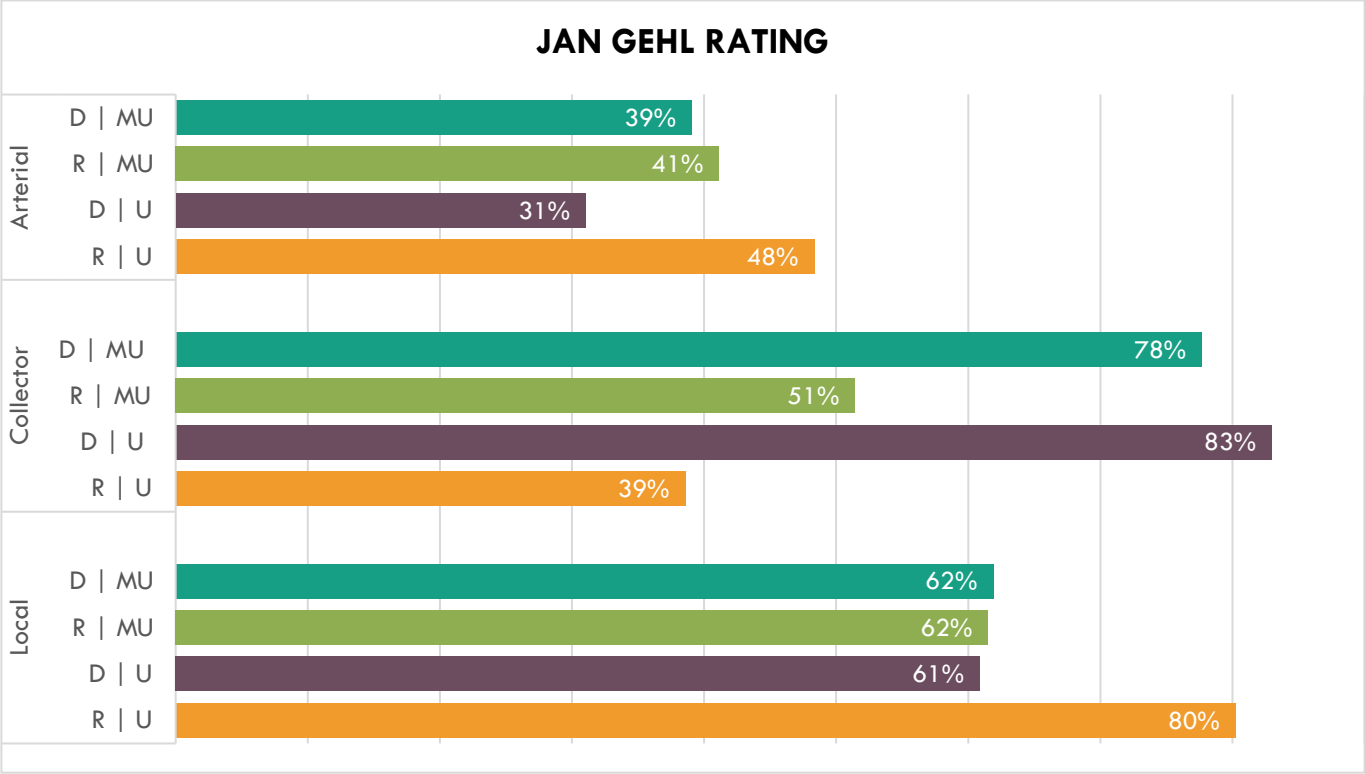
These anecdotes are important because many parents want to mention important key informational pieces in addition to filling out the survey. These are points that may seem most pressing important or may be key pieces that they want to elaborate on.[12]

[12] A list of anecdotes can be found in Appendix E.

Comparison of Urban Form

The following chart provides a qualitative comparison for streets by type in both Urban and Mid-urban Neighborhoods for both cities.

Figure 54: Jan Gehl Ratings Compared



In order to compare Rotterdam and Denver's Urban and Mid-urban Neighborhoods, the above combined Jan Gehl chart displays street types and neighborhood types side by side. The different colors show each neighborhood.

The top-rated streets for both cities are Denver's Urban Collector, Rotterdam's Urban Local, and Denver's Mid-urban Collector.

The local streets for both neighborhoods and both cities are almost exactly the same rating, and generally the highest rated and most consistent. Collectors typically included a mix of residential housing and retail commercial, and these were the highest rated in Denver. This may be in part due to specific improvement district, or increased taxes from sales tax. Arterials in both cities serve the same purpose: moving people efficiently. Rotterdam moved more people in more types of ways, whereas Denver mainly moved people by car. Regardless, these are busy streets, with a public realm that is not lively from the sense of socialization and relaxation.

Generally, the streets in Rotterdam are better, but the collectors there were low, this is due to this efficiency piece, lack of sitting areas, and general feel. The Denver average for all street types is 58.9%, and for Rotterdam is 53.55%. The Jan Gehl method provides insight into how "enjoyable" a place is, but is less focused on efficiency, protection and separation of transportation methods etc. which Rotterdam scores very highly on.

Comparison of Urban Form

The following and secondary urban form comparison provides a comparative view of more quantitative aspects of these neighborhoods' infrastructure, amenities and public realm. Referring back to the Urban Form infographics for Denver and Rotterdam (Figures 42 and 52) the following section seeks to compare the two cities' urban form infrastructure. [13]

Rotterdam:

Overall, Rotterdam has more multi-modal infrastructure. This includes separated bikes lanes, large protected sidewalks, *some* benching and seating, a mature tree canopy, safe streets, lively public realms, and adequate space for *all* transit types including driving lanes, parking, bike lanes. Culturally, it seems as though there is a respect for multi-modal transportation by the public and professionals. Bikers and pedestrians regularly receive right of way from drivers of vehicles, whereas in Denver, cars tend to always have priority, and even in spaces that have proper infrastructure, walkers and bikers still feel unsafe.

Accessibility in Rotterdam is lacking. Due to old streets, poor pavements, poor curb cutouts, obstacles, and overall quality sidewalks are difficult to traverse at time and there are poor curb cutouts at crossings. Regardless of this, drivers are more careful, and sidewalks have more protection and separation from these vehicles.

Mid-urban in Rotterdam, less activated less people out. Trying to get interviews was a struggle as there were less people about. The urban in Rotterdam had more activation comparable to both neighborhoods in Denver, as there are people around.

Overall, in Rotterdam there were few places where it felt "bad" to be a pedestrian. Mostly everywhere in Rotterdam was walkable and it felt safe and comfortable. As researchers we solely walked and took transit in this city, which was all possible. In Denver, most research was done by driving to the destination, parking, and then doing analysis on foot. Some buildings and blocks in Rotterdam were not "human scale" as the blocks are extremely long, with buildings that take up the entire block. Even though these were only 4-5 stories, they were a bit overwhelming in size at times.

Denver:

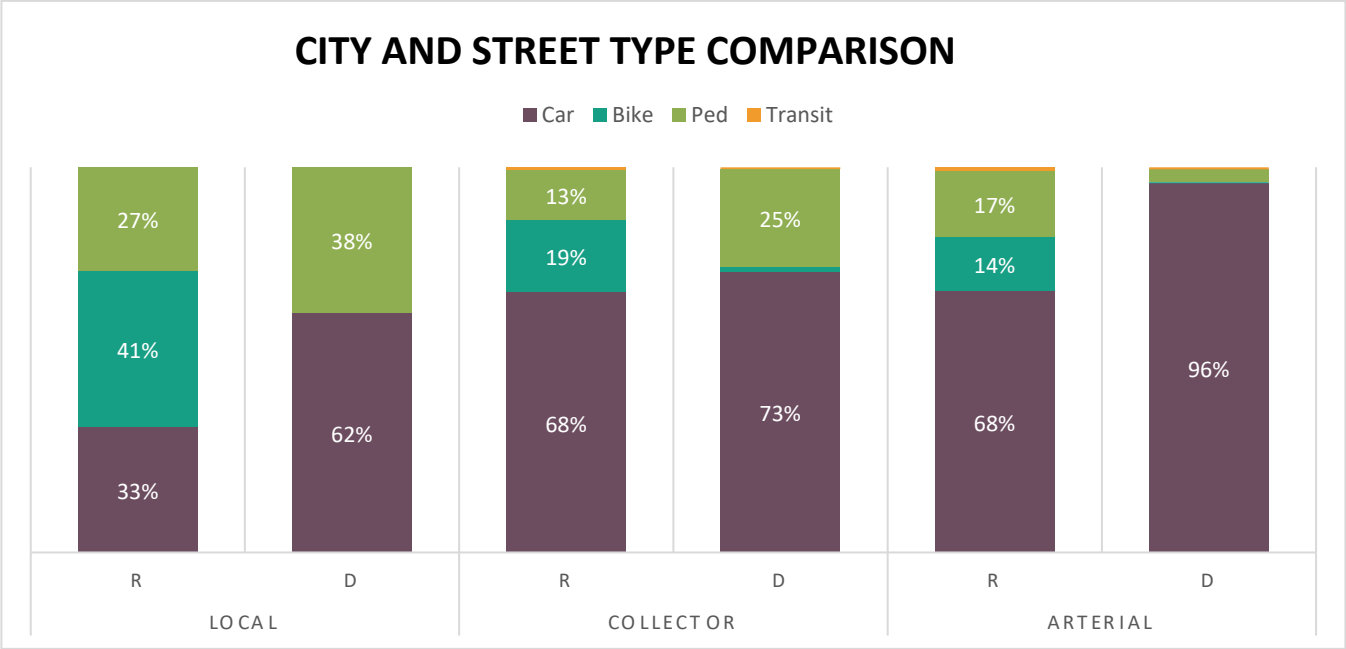
In Denver, there are overall more pedestrian amenities (although not along arterials but almost everywhere else we observed), such as benching, seating, retaining walls, large planters etc. These provide spaces for people to sit and relax, surfaces to lean on, and provide for spaces for people to converse and "hang out". There is less multi-modal infrastructure overall as well. Protected bike lanes are less common in Denver as well and can be seen as a "luxury". Sidewalk widths are much smaller when compared to Rotterdam as well and are much less protected. Typically, there is only a small landscape buffer, versus full protection as seen in Rotterdam with parked cars, trees, bollards etc. It is important here to note ADA and how prevalent these accessibilities are in the United States, and this is seen in Denver as well. Most streets that were walkable (unlike Arterials) had proper curb cuts, smoother services overall, and had fewer obstacles generally.

The areas that are not for pedestrians are nearly impossible to traverse, and there as an able bodied person, whereas *all* streets in Rotterdam were walkable and able to get from point A to Point B, even if these places lacked some of Jan Gehl's amenities such as benches, non-human scaled building and block sizes were very large.

[13] See Appendix F for complete urban form matrix

Comparison of Mode Counts

Figure 55: City Mode Comparison



By comparing mode counts for each city's street type, we are able to gain insight on differences between the European city model, makeup, as well as cultural aspects to human transportation patterns. Denver has a lot more auto-use than Rotterdam in general, on all street types. The Locals and Collectors have a decent number of pedestrians for Denver, and there is little overall bike use.

Rotterdam's urban form for all street types generally supports active and multi-modal transportation much more so than Denver's. Rotterdam's Local streets had more biking than driving, and the Arterials also showed a surprisingly high amount of biking. This could be due to the high quality and amount of multi-modal infrastructure including protected bike lanes, two-way cycle tracks, and readily available secure bike parking, and safe street crossings.

Denver's Local streets showed a high amount of pedestrian use, which can be attributed to retail and mixed-use destinations. Denver's Collectors had a good amount of walking as well, which can be attributed to this as well.

Rotterdam's Local streets actually had auto uses as the lowest use, which was not seen anywhere in Denver, as auto use was the highest for all streets.

In both cities, Arterials showed high amounts of driving, but Denver's was significantly more than Rotterdam's which provides insight that if the infrastructure for alternative transportation methods exists, people will use it; as Denver's Arterials currently do not have multi-modal infrastructure. Arterials in Denver, even in Urban areas, see "strip mall" type developments that are extremely auto oriented. These are still designed to accompany the largest number of cars- these types of designs tend to be problematic to other users such as walkers and bikers.

Final Matrix

The following matrix provides a broad overview and distillation of all of the research collected in this project. It is a high-level view of all of the factors that we have researched and collected data on, providing insight into both neighborhoods side by side on how mode counts, student travel behaviors, burdens, and context play a role in family travel. This chart is a final comparison of distilled findings for both neighborhoods in both cities, and provides a high level view in order to display similarities and differences.

Figure 56: Final Matrix Comparison

CONTEXT			STUDENT BEHAVIOR			OTHER FACTORS			
Jan Gehl Rating	**Street Mode Counts**	**Location**	**Percent School Choice**	**Mode of Travel**	**Was It a Burden?**	**Child Independence**	**Trip Chaining****	**Multimodal Infrastructure**	**Notes**
57%	**Local**- 43% cars & 43% pedestrians **Collector - 77% cars** **Arterial- 58% cars**	**Rotterdam Urban**	0%*	**Walk**- 28% **Bike**- 63% **By Car**- 9%	No, most trips were less than 5 minutes	High	No	High	High social capital, school location near large bike highway.
61%	**Local**- 60% cars **Collector**- 68% cars **Arterial**- 94% cars	**Denver Urban**	29%	**Walk**- 20% **Bike**- 1% **By Car**- 78%	No, half of all trips were less than 5 minutes	Low	No	Medium	Branded kiss and ride, para-professionals, walking school buses, high social capital and access to parents and nannies.
51%	**Local**- 43% bikes **Collector** - 63% cars **Arterial**- 73% cars	**Rotterdam Mid-urban**	67%*	**Walk**- 58% **Bike**-17% **By Car**- 25%	Somewhat, most trips were up to 15 minutes.	Medium	Yes	Medium - High	Many pedestrians walk from nearby housing areas, but there were also many that drove their children.
62%	**Local**- 67% cars **Collector**- 77% cars **Arterial**- 98% cars	**Denver Mid-urban**	23%	**Walk**- 37% **Bike**- 2.5% **By Car**- 60%	Somewhat, most trips were up to 15 minutes.	Medium	No	Medium - Low	Disorganized drop offs, working class families,

*Note: % school choice for Rotterdam is displayed according to primary data, and for Denver is displayed according to secondary school district data. The Rotterdam percentages reflect parental answers to surveys collected, as the data is not readily availble to the public regarding school choice patterns.

**Note: Trip chaining is when parents combine children's school pickup and/or drop off trips with grocery/errand trips

07

Conclusion & Recommendations

Conclusion and Reccomendations

Key Takeaways

- **Children in Rotterdam bike much more than in Denver, in both neighborhoods**. This can be attributed mainly to cultural behaviors, and partially to the urban form and multi-modal infrastructure. The modal infrastructure in Rotterdam utilized buffers and barriers to protect modes from one another, creating a safe environment all modes.

- **Collector streets in both cities are of very high quality**. This can be attributed to mixed-use development, 24-hour streets, and business improvement or other special districts, that are able to fund and provide services for creating high quality streets that score highly on Jan Gehl ratings. This includes providing amenities for pedestrians and bicyclists, as well as having a mix of retail, residential, and office space.

- **Parents care about school culture and school ratings**. In Denver, parents tend to care more about ratings and test scores, whereas in Rotterdam, more focus is placed on teaching styles and philosophy. Some parents in both Mid-urban Neighborhoods did explain that their choice for picking that school was to place their children in a more diverse, and economically mixed school than the neighborhood they live. This showed that while families did choose where to live based on nearby schools, they were not bound to attending the closest school if it compromised school ranking and/or student culture.

- **In Denver, socio-cultural economics are highly predicative of potential travel patterns.** Availability to a car, parent work schedules, ability to choose housing after picking a school, are all speculations we have that help explain why some of the higher income, Urban Neighborhood families had reasoning to pick and choose between these factors. However, in the United States, car culture is still dominant, especially for middle to high income families who can afford the costs associated with owning a vehicle, which may explain why such a high percentage of the school commute mode share in the Denver Urban Neighborhood was driving.

- **Economic factors play into school choice decisions, outside of the effect of urban form.** Due to other factors than a neighborhood's urban form, such as school start and end times, half-days once per week, before- and after-school care programs and cost, and school policies surrounding unattended children on school properties also play into parents' school choice decisions. This is regardless if the neighborhood's urban form allows for safe walking or biking. One professional interviewee explained that over 70% of women in Rotterdam do not work full-time due to half-days every Wednesday and sometimes Fridays as well. Many parents in both Denver neighborhoods also explained the burden of school bell times on their work schedules. Parents also explained that while they would like to utilize choice options to enroll into a different school, the burden of taking their child as opposed to them walking on their own is not conducive to their work schedule. Other families explained that while they are withing walking distance of their child's school, they trip-chain dropping off their child on their way to work, thus forcing them to drive instead of walk or bike.

- **Cultural factors also play a part in travel behaviors.** For example, immigrant populations in Rotterdam do not feel as comfortable biking, as it is not usually a cultural norm in their native country. While there have been integration programs that teach skills such as biking laws and regulations, many times this is still a barrier. This may conclude that due to a higher non-Western immigration population, biking at the Mid-urban School was less as compared to the Urban School. Additionally, child independence may also affect school choice decisions based on if a parent allows their child to travel alone or if they accompany them.

- **While school choice was created as an instrument to enact more equity among families, it has not succeeded for all socio-economic statuses.** School choice was developed as a way for families who were not able to utilize choice in their residential location, to attend better and/or different types schools. However, as this research and previous research has shown, choice is not equitable across all socio-economic levels. While Rotterdam's robust multi-modal infrastructure may allow for families to use active transportation to travel further to non-neighborhood schools, there is a need for more research onto this question to how urban form is a component of school choice decisions.

Limitations

The limitations of this project varied and are explained as follows:

- **Time and budget constraints.** The European research portion of this project was limited to 9 days, 3 of which the researchers were unable to perform interviews and human observations, as limitations with EU regulations caused a delay in approval. Budgeting also created a constraint, as time in Europe was limited to less than 2 weeks.

- **Weather delays and seasonal differences.** Different weather in Denver and Rotterdam can, and may have, caused discrepancies in research numbers for mode counts. This data would be more accurate if completed during the same season, as mode counts vary as weather varies.

- **EU and GDPR regulations.** Differing regulations allowed for varying amounts of surveying and data collection, as well as different utilizations of internet resources. For example, methods such as online surveys were available for participants to use in the US, but not in Europe. This may have caused an increase in the amount of surveys possible in Denver.

- **Access to interviewees.** Parent schedules and time constraints made it difficult to interview and survey some parents, especially in lower income neighborhoods. Researchers predicted that this is due to work and family schedules, and parents are less available, and have less time to stay and discuss with students throughout the work week and workday.

- **Urban Form ratings**. The Jan Gehl ratings for different streets in both cities are observations of personal feeling, emotion, and overall comfort in the area. These do not reflect public amenities, amounts of people moved whether by multi-modal or by vehicle, safety from automobiles etc. It is important to look at the data collected holistically, as just viewing Jan Gehl ratings on their own does not provide overall context, but instead, Jan Gehl, mode counts, and infrastructure provide better insights onto how the urban form can hinder or benefit students from getting to school.

- **Comfort factor**. Rotterdam's streets overall received a *slightly lower* rating than Denver's, as a total city average. This is due to our perceptions of space and being automatically less comfortable in a new city in a foreign country. Rotterdam also generally has older streets and pavements, which many issues seen here were with accessibility. Because both researchers have spent more time in Denver, inherent bias may have occurred during the Jan Gehl exercises.

Conclusion

This project explored whether or not school choice is used by more families due the availability of transportation options and the quality of the surrounding urban form, and whether or not this urban form influences mobility for families utilizing school choice. This study also aimed to test assumptions of European city models on whether denser urban forms provide better accessibility, mobility, and overall provide a decrease in school travel times via the presence of robust transportation systems and safe, high quality trip routes.

It was found that urban form and the quality of the multi-modal infrastructure *does* in fact affect the mode in which families choose to travel. The urban form also provides for decreased travel times and promotes greater shares of walking and biking. As for the question of utilization of school choice, many families participated in choice options, but there is a need for more research to see if this is directly a result of the urban form, or rather one of cultural and socio-economic patterns. Researchers found that while urban form affected school commute modes, the families' specific choices of schools are multi-faceted– including school rankings, school philosophy, and distance to home and/or work. Additionally, cultural behaviors also affected children's abilities to walk or bike to school, including; biking culture and knowledge of rules and regulations, perception of safety, and overall child independence differences between the United States and the Netherlands.

Equity, among many other factors, plays into the results of this research. This includes urban form equity and the presence of multi-modal infrastructure across neighborhoods of varying income levels. As well as school choice equity in the ways that parents can afford to spend more time and money traveling to further schools, whereas lower-income families may not have that luxury. And lastly, cultural equity, such as having the skills to use multi-modal transportation (i.e. knowing how to follow biking laws, having access to nearby transit and knowing how to navigate the system, feeling safe while walking on the sidewalk, or child independence in a given culture).

School Choice was a concept that was created to allow for greater equity among different socio-economic levels. However, if the urban form is not conducive to walking, biking, or taking transit then families must rely on a vehicle to access a choice school; if the time it takes to travel to a choice school conflicts with a parent's work schedule which the family relies on to live, then choice may not be possible; and if a parent may be able to send their child to a school further from their home but feels uncomfortable biking, but cannot afford a vehicle or has no access to transit then they are not able to use their power of choice. In order for this policy to work, it's the role of planners to ensure that this policy is equitable as it was intended to be, including providing the neighborhood design and infrastructure that does not act as a barrier to choice, but instead allows parents that option.

We generally recommend further research into this topic on how these different systems intertwine and work either in conjunction of one another or in conflict. Our recommendation also includes to explore further how cultural and socio-economic factors affect travel patterns, and to then syndicate this with urban form and the availability of multiple transportation as well as well as the quality of said multi-modal infrastructure. We also recommend for researchers to gain more information on equity related burdens that families face, either utilizing choice or not. This can provide more information into whether the concept of school choice is meeting its original intentions. Once there is a sufficient amount of research onto the topic, policy recommendations can be made to help municipalities, as well as school districts, to be able to plan and coordinate better for student travel and to be able to have more insight into overall family travel behaviors. Travel burdens are typically placed more so on families that are already inconvenienced due to socio-economic factors, and by providing policy initiatives and more equitable transportation options, improved school policies can be created and implemented in order to help families and students obtain better and safer access to their chosen schools.

08

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Works Cited:

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Appendix A

Surveys

Protocol #: 19-1117
Project Title: Rotterdam and Denver Comparative Research on School Choice and Transportation
Principal Investigator: Kenna A Davis
Version Date: 10.26.2019

School Choice and Transportation Survey

Hello! Welcome to our survey. This should take about 5 minutes to complete. If you are uncomfortable answering any of the following questions, please leave it blank. Please only answer one survey per household. This survey is completely anonymous, and has no corresponding identifiable data. Thank you!

◯ By checking this box, I consent to participate in this study. I know that my answers will be stored for data analysis, but no personally identifiable information will be collected. I know that I can stop taking this survey at any time or skip any question that I feel uncomfortable answering. I understand there are minimal to no risks with participating in this study since the information I provide is anonymous. If I have questions I can contact the University of Colorado Denver Institutional Review Board (+1 (303) 724-1055) or the principle investigator, Kenna Davis (+1 (720) 560-4211).

School Information

1. In which Denver neighborhood does your family current live?

_____

2. How many children do you have?
   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ◯ 5 or more

3. Which neighborhood is your child(ren)'s school in? (Please list all if there are multiple)

_____

_____

4. What type(s) of school(s) do your child(ren) attend? If multiple children, please write corresponding number of children beside each school type.
   - ___ Public
   - ___ Charter
   - ___ Magnet
   - ___ Non-secular private
   - ___ Secular private
   - ___ Other _____

5. Are your child(ren)'s schools in your neighborhood?
   - ◯ Yes
   - ◯ No
   - ◯ Yes for at least one of my children

6. Do you accompany your child(ren) on their route(s) to school? (if multiple children, select all that apply)
   - ◯ Yes/always
   - ◯ Somewhat/often
   - ◯ Occasionally
   - ◯ No/never

7. What mode(s) of transportation do your child(ren) take to school most often? (if multiple children, select all that apply)
   - ◯ School bus
   - ◯ Public bus
   - ◯ Light Rail
   - ◯ Walk
   - ◯ Bike
   - ◯ Drive
   - ◯ Carpool (with other students/parents)
   - ◯ Multiple modes (please explain)

     _____

8. Typically, how many minutes is your children's commute to school? Please list all if varying for each child.

_____

9. Did you consider choosing a different school for your child(ren)?
   - ◯ Yes
   - ◯ No
   - ◯ Other _____

10. Did any of these factors apply when choosing your child(ren)'s school(s)? Check all that apply.
    - ◯ Social Network
    - ◯ Sense of community
    - ◯ Your personal educational background (edu attainment, what schools you and/or your partner attended)
    - ◯ School type (public, charter, magnet, non-secular private, secular private)
    - ◯ Distance to home and/or work
    - ◯ Other child's school
    - ◯ School neighborhood character
    - ◯ Family life
    - ◯ Personal preferences
    - ◯ Mode(s) of transportation
    - ◯ School ranking or reputation
    - ◯ Other _____

11. Are you generally satisfied with your children's school(s)?

_____

_____

Food Accessibility

1. When does your family grocery shop and/or complete other errand shopping?
   - ◯ Weekends
   - ◯ While child(ren) are at school
   - ◯ After school with my child(ren)
   - ◯ Afternoon/evenings without children
   - ◯ Other _____

2. Is there a grocery store near your home?
   - ◯ Yes (5-10 minute walk)
   - ◯ Somewhat (11-20 minute walk)
   - ◯ Not really (21-30+ minute walk)

3. Does your family grocery shop in your neighborhood?
   - ◯ Yes, almost always
   - ◯ Sometimes - we occasionally shop in our neighborhood, but mainly somewhere else
   - ◯ No, we shop somewhere else

4. What types of stores do you shop at? Select all that apply.
   - ◯ Convenience store/gas station
   - ◯ Local market
   - ◯ Separate stores for each type of item (i.e. deli, bakery, fruit/vegetable stand)
   - ◯ Chain supermarket (i.e. King Soopers)
   - ◯ Farmer's markets
   - ◯ Specialty/International ethnic stores
   - ◯ Specialty organic stores
   - ◯ Food bank/pantry
   - ◯ Wholesale/club (i.e. Costco)

5. How often do you grocery shop per week?
   - ◯ Daily
   - ◯ Multiple times per week
   - ◯ Once per week
   - ◯ Less than once per week

6. What mode of transportation do you use to travel to the store?
   - ◯ Public bus
   - ◯ Light Rail
   - ◯ Walk
   - ◯ Bike
   - ◯ Drive
   - ◯ Multiple modes (please explain)

     _____

7. Does your family combine errand trips (grocery, post office, retail shopping, bank, etc.) with picking up your child(ren) from school?
   - ◯ Yes - most all errands are combined with school pickups
   - ◯ No - we do these at different times and days
   - ◯ Sometimes

Demographics

1. What is your age?
   - ◯ 18 to 24 years
   - ◯ 25 to 34 years
   - ◯ 35 to 44 years
   - ◯ 45 to 54 years
   - ◯ 55 to 64 years
   - ◯ Age 65 or older

2. What is the highest degree or level of education you have completed?
   - ◯ Less than high school
   - ◯ High School
   - ◯ Some college, no degree
   - ◯ Associate's degree
   - ◯ Bachelor's degree or higher

3. What is your gender?
   - ◯ Female
   - ◯ Male
   - ◯ Other

4. What is your martial status?
   - ◯ Single (never married)
   - ◯ Married
   - ◯ Divorced
   - ◯ Widowed

5. What is your ethnicity/race?
   - ◯ African/Black
   - ◯ Asian
   - ◯ Hispanic/Latino
   - ◯ Native American or Alaska Native
   - ◯ Pacific Islander
   - ◯ White
   - ◯ Other race

6. What was your total household income before taxes during the past 12 months?
   - ◯ Less than $25,000
   - ◯ $25,000 to $34,999
   - ◯ $35,000 to $49,999
   - ◯ $50,000 to $74,999
   - ◯ $100,000 to $149,000
   - ◯ $150,000 or more

7. How many hours per week do you usually work at your job?
   - ◯ More than 40 hours per week
   - ◯ 20 to 40 hours per week
   - ◯ Less than 20 hours per week
   - ◯ I am not currently employed
   - ◯ I am retired

8. Do you work from home?
   - ◯ Yes
   - ◯ No
   - ◯ Sometimes

9. In which type of housing do you currently live?
   - ◯ Detached Home (Single-family, private yard)
   - ◯ Rowhome
   - ◯ Apartment building with 5 or more units
   - ◯ Apartment building with 10 or more units
   - ◯ Other _____

10. Which of the following best describes your current housing situation?
    - ◯ Homeowner
    - ◯ Renter
    - ◯ Living with others but not paying rent or mortgage
    - ◯ Living with others and assisting with paying rent or mortgage

Elección de escuela y encuesta de transporte

¡Hola! Bienvenido a nuestra encuesta. Esto debería tardar unos 5 minutos en completarse. Si no se siente cómodo respondiendo a alguna de las siguientes preguntas, déjelo en blanco. Solo responda una encuesta por hogar. Esta encuesta es completamente anónima y no tiene datos identificables correspondientes. ¡Gracias!

◯ Al marcar esta casilla, doy mi consentimiento para participar en este estudio. Sé que mis respuestas se almacenarán para el análisis de datos, pero no se recopilará información de identificación personal. Sé que puedo dejar de responder esta encuesta en cualquier momento u omitir cualquier pregunta que me incomode responder. Entiendo que participar en este estudio no implica ningún riesgo, ya que la información que proporciono es anónima. Si tengo preguntas, puedo contactar a la Junta de Revisión Institucional de Denver de la Universidad de Colorado (303-724-1055) o al investigador principal, Kenna Davis (720-560-4211).

Información de la Escuela

1. ¿En qué vecindario de Denver vive su familia?

_____

2. ¿Cuántos hijos tiene?
   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ◯ 5+

3. ¿En qué vecindario está la escuela de su(s) hijo(s)? (Por favor mencione todos si hay múltiples).

_____
_____

4. ¿A qué tipo(s) de escuela(s) asisten sus hijos? Si hay varios niños, escriba el número correspondiente de niños al lado de cada tipo de escuela.
   - ___ Pública
   - ___ Autónoma
   - ___ Imán “Magnet”
   - ___ Privada no secular
   - ___ Privada secular
   - ___ Otra _____

5. ¿Las escuelas de su(s) hijo(s) están en su vecindario?
   - ◯ Si
   - ◯ No
   - ◯ Sí al menos para uno de mis hijos

6. ¿Acompaña a su(s) hijo(s) en su(s) ruta(s) a la escuela? (si hay varios hijos, seleccione todos los que correspondan).
   - ◯ Sí/siempre
   - ◯ A veces/a menudo
   - ◯ Ocasionalmente
   - ◯ No/nunca

7. ¿Qué modo(s) de transporte usan sus hijos con más frecuencia para ir a la escuela con? (si hay varios hijos, seleccione todos los que correspondan).
   - ◯ Autobús escolar
   - ◯ Autobús público
   - ◯ Tren ligero
   - ◯ Caminar
   - ◯ Bicicleta
   - ◯ Conducir
   - ◯ Viaje Compartido (con otros estudiantes/padres)
   - ◯ Múltiples modos (por favor explique)

     _____

8. Por lo general, ¿cuántos minutos pasan sus hijos en camino a la escuela? Mencione todos si varían para cada niño.

_____

9. ¿Consideró elegir una escuela diferente para su(s) hijo(s)?
   - ◯ Si
   - ◯ No
   - ◯ Otro _____

10. ¿Tomo en cuenta alguno de estos factores al elegir la(s) escuela(s) de su(s) hijo(s)? Marque todo lo que corresponda.
    - ◯ Redes Sociales
    - ◯ Sentido de comunidad
    - ◯ Su formación educativa personal (nivel educativo, a qué escuelas asistieron usted y/o su pareja)
    - ◯ Tipo de escuela (pública, autónoma, imán “magnet”, privada no secular, privada secular)
    - ◯ Distancia a casa y/o trabajo
    - ◯ La escuela de otro niño
    - ◯ Carácter del vecindario escolar
    - ◯ Vida familiar
    - ◯ Preferencias personales
    - ◯ Modo(s) de transporte
    - ◯ Clasificación o reputación de la escuela
    - ◯ Otro _____

11. ¿Está generalmente satisfecho con la(s) escuela(s) de sus hijos?

_____
_____

Accesibilidad a los alimentos

1. ¿Cuándo es que su familia hace compras y/o mandados?Weekends
   - ◯ Fines de Semana
   - ◯ Mientras los niños están en la escuela
   - ◯ Después de la escuela con mi(s) hijo(s)
   - ◯ Tardes/noches sin niños
   - ◯ Otro _____

2. ¿Hay una tienda de alimentos cerca de su casa?
   - ◯ Sí (5-10 minutos a pie)
   - ◯ Mas o menos (11-20 minutos a pie)
   - ◯ Realmente no (21-30 minutos a pie))

3. ¿Su familia compra en su vecindario?
   - ◯ Sí, casi siempre
   - ◯ A veces, ocasionalmente compramos en nuestro vecindario, pero principalmente en otro lugar
   - ◯ No, compramos en otro lugar

4. ¿En qué tipo de tiendas compra? Seleccione todas las que correspondan.
   - ◯ Tienda de conveniencia/gasolinera
   - ◯ Mercado local
   - ◯ Tiendas separadas para cada tipo de artículo (es decir, delicatesen, panadería, puesto de frutas/verduras)
   - ◯ Cadena de supermercados (ej. King Soopers)
   - ◯ Mercados de agricultores
   - ◯ Tiendas especializadas/étnicas internacionales
   - ◯ Tiendas especializadas orgánicas
   - ◯ Banco de alimentos/despensa
   - ◯ Mayorista/club (ej. Costco)

5. ¿Con qué frecuencia va de compras por semana?
   - ◯ Diario
   - ◯ Múltiples veces por semana
   - ◯ Una vez por semana
   - ◯ Menos de una vez por semana

6. ¿Qué medio de transporte utiliza para viajar a la tienda?
   - ◯ Autobús público
   - ◯ Tren ligeroil
   - ◯ Caminar
   - ◯ Bicicleta
   - ◯ Conducir
   - ◯ Múltiples modos (por favor explique)

     _____

7. ¿Combina su familia viajes de mandados al (supermercado, mandados, banco, etc.) con recoger a sus hijos de la escuela?
   - ◯ Sí, la mayoría de los mandados se combinan con recogidas escolares
   - ◯ No, lo hacemos en diferentes momentos y días
   - ◯ A veces

Demografía

1. ¿Cuál es su edad?
   - ◯ 18 a 24 años
   - ◯ 25 a 34 años
   - ◯ 35 a 44 años
   - ◯ 45 a 54 años
   - ◯ 55 a 64 años
   - ◯ 65 años o más

2. ¿Cuál es el grado o nivel de educación más alto que ha completado?
   - ◯ Menos que la secundaria
   - ◯ Escuela secundaria
   - ◯ Algunos estudios universitarios, sin título
   - ◯ Título de asociado
   - ◯ Licenciatura o superior

3. ¿Cuál es su género?
   - ◯ Femenina
   - ◯ Masculino
   - ◯ Otro

4. ¿Cuál es su estado civil?
   - ◯ Soltero (nunca casado)
   - ◯ Casado
   - ◯ Divorciado
   - ◯ Viudo

5. ¿Cuál es su origen étnico/raza?
   - ◯ Africano/Africano Americano
   - ◯ Asiático
   - ◯ Hispano/Latino
   - ◯ Nativos Americanos o Nativos de Alaska
   - ◯ Isleño del Pacífico
   - ◯ Blanco
   - ◯ Otra raza

6. ¿Cuál fue el ingreso total de su hogar antes de impuestos durante los últimos 12 meses?
   - ◯ Menos de $25,000
   - ◯ $25,000 a $34,999
   - ◯ $35,000 a $49,999
   - ◯ $50,000 a $74,999
   - ◯ $100,000 a $149,000
   - ◯ $150,000+

7. ¿Cuántas horas por semana normalmente trabaja en su trabajo?
   - ◯ Más de 40 horas por semana
   - ◯ 20 a 40 horas por semana
   - ◯ Menos de 20 horas por semana
   - ◯ Actualmente no estoy empleado
   - ◯ Retirado

8. ¿Trabaja desde casa?
   - ◯ Si
   - ◯ No
   - ◯ A veces

9. ¿En qué tipo de vivienda vive actualmente?
   - ◯ Casa independiente (unifamiliar, patio privado)
   - ◯ Fila de casas
   - ◯ Edificio de apartamentos con 5 o más unidades
   - ◯ Edificio de apartamentos con 10 o más unidades
   - ◯ Otro _____

10. ¿Cuál de las siguientes opciones describe mejor su situación actual de vivienda?
    - ◯ Propietario
    - ◯ Inquilino
    - ◯ Vivir con otros, pero no pagar renta o hipoteca
    - ◯ Vivir con otros y ayudar a pagar el alquiler o la hipoteca

Appendix B

Interview Questions

Interview Questions

All interviews will be semi-structured, with room for the researcher to expand on certain topics as deemed relevant during the interview. Questions are focused on three topic areas:

1. School choice policies
2. Urban form and transportation patterns
3. Food access and quality

Interviews will be divided into three sets depending on interviewee. These categories include:

1. Urban planning, urban design, architecture or other design-related professionals
2. School administrators, teachers, or other school-related staff
3. Parents

To begin interviewing we will introduce ourselves briefly, explain what our main abstract and research design is, and explain how our interviewees will be kept confidential and that none of the answered questions have any associating identifiers. The specific interview questions will then be selected according to the person we are speaking with, and their role in our research.

Parents

1. How many children in K-12 schools do you have?
2. How many minutes is your children's commute to school?
3. By what mode of transportation do your children take to school?
4. Did you consider choosing another school for your children?
5. Did any of these factors apply when choosing your child's school?
   - Social Network
   - Sense of community
   - Your personal educational background (educational attainment, what schools you and/or your partner attended)
   - School type (public, charter, magnet, non-secular private, secular private)
   - Distance to home and/or work
   - Other child's school
   - School neighborhood/neighborhood character
   - Family life
   - Personal preferences
6. Do you feel that your children's school(s) are successful? Did this factor into why you chose this particular school?
7. Where do you do your grocery shopping/other errand shopping?
8. How far away do you live and how does the neighborhood differ from the school's neighborhood?
   - Urban form - different types of housing, transportation, amenities?
9. Has school choice had impact on your family's life? (Commute, community, school quality, etc.)

10. Where do you do your grocery shopping/other errand shopping?
11. Has school choice had an impact on where you do errand shopping? Change locations?

Note: Other questions may be formulated to allow for the person to explain further on their specialty and insights from personal and children's' experiences.

Design Professionals - Interview Questions

1. How do you think the urban form affects family travel patterns?
2. Do you think families' travel behaviors have changed due to school choice and/or other factors?
3. Have planning/design efforts in Rotterdam for multi-modal transportation options influenced school choices?
4. How has food access and food system planning affected family transportation patterns?
5. Are food deserts an issue within the city and what types of planning and/or design efforts been enacted to counter this phenomenon?
6. Do you feel from a city design perspective that school choice has impacted the overall transportation system and/or neighborhood characters of the city?

School Administrators, Staff, and Teachers - Interview Questions

1. Does your school have any travel research on children's school commutes or other trips?
2. Has there been any attempt to collect travel diaries from students or parents?
3. Does travel vary now with the influence of school choice policies?
4. Do parents consider travel as a part of their school choice decisions?
5. Is there a presence of food deserts in specific neighborhoods?
6. Is this an issue within American cities?
7. Do planning efforts strive to plan for a complete neighborhood or think of specific amenities catered towards parents/families?

Appendix C

Urban Form Collection

Modal Infrastructure

Transit

- # of stops _____
- # of lines _____
- Types _____
- Quality _____

_____

Auto

- # of lanes _____
- Speed _____
- Classifications _____
- Parking _____
- Traffic mitigation _____

Bike

- Type of facility _____
- Bike parking _____
- Width _____

Ped

- Sidewalks _____

_____

- Accessibility _____

_____

- Width _____
- Protection _____

_____

- Ped Amenities _____

_____

- Crossings _____

_____

- Signals _____

_____

- Ped refugees _____

_____

- Bump outs _____

_____

Built Environment

- Glazing _____
- Ground Floor _____

_____

- Aesthetics _____

_____

- # of stories _____
- Uses _____

_____

- Block Sizes _____
- Setbacks _____

_____

- Parking styles _____
- Alleys _____

_____

- Lighting _____
- Landscaping _____

_____

- Planters _____

Mode Counts

Car
Ped
Bike
Transit

Appendix D

Jan Gehl

Urban Form

Location _____ Date _____ Weather _____

Good Quality = 11-15 Average Quality = 6-11 Poor Quality = 1-5

PROTECTION	**Protection against traffic & accidents – feeling safe** Protection for pedestrians Eliminating fear of traffic	**Protection against crime & violence – feeling secure** Lively public realm Eyes on the street Overlapping function day and night Good lighting	**Protection against unpleasant sensory experiences** Wind/rain/snow Cold/heat Dust, noise and glare Pollution
COMFORT	**Opportunities for Walking** Room for walking Interesting facades No obstacles Accessibility for everyone Good surfaces	**Opportunities to stand/stay** Edge effect/attractive zones for standing /staying Supports for standing Facades with good details that invite staying	**Opportunities to sit** Zones for sitting Utilizing advantages; view, sun and people Good places to sit Benches for resting
	Opportunities to see Reasonable viewing distances Unhindered views Interesting views Lighting (when dark)	**Opportunities to talk and listen** Low noise levels Street furniture that provides “talkscapes”	**Opportunities for play and exercise (recreation)** Physical activity, exercise Play and entertainment In summer and winter By day and night
DELIGHT	**Human scale** Buildings and spaces designed to human scale	**Opportunities to enjoy the positive aspects of climate** Sun/shade Heat/coolness Shelter from wind/breeze	**Positive sensory experience** Good design and detailing Good materials Trees, plants and water Fine views
PLACE	**Part of complete neighborhood network/surrounding city** Connected to pedestrian flows, destinations, functions and other public spaces Easily accessible	**Part of public space hierarchy** Strong identity Understanding of character – local, district or city Reflect indented use	**Sense of place** Relation to context of the city Respect for historic aspects Genius loci (neighborhood center or node)

Appendix E

Parent Survey Anecdotes

City	Parent Anectode	Theme
Denver	Walking school bus – participates 2x a week, they are parent initiated	Biking/walking,Culture of School
Denver	One family was specifically interested in the multi-cultural aspect of the school in the Mid-urban neighborhood, and as a white family wanted their children to go to a more diverse school than most others in the area/city	Demographics,Culture of School
Denver	Mother takes son to school every day and then the father picks the child up some days a week, it disrupts the fathers work schedule to do the school pickups.	Driving,Parent Work
Denver	Family takes public transit on weekends to union station, other downtown destinations. They would take transit to school if there were better options – Choiced into the school so no yellow school bus is provided.	Driving,Public Transit,Extracurriculars
Denver	One family commutes from a nearby suburb (Parker), and used to live in the Urban neighborhood, and wanted the child to stay at that particular school.	Driving,School Ranking,Parent Work
Denver	This family lives in a surrounding suburb and used a friend's address in the city to get into the district and then used school of choice for that particular school.	Home/School Location
Denver	This parent is an environmentalist and would like to take transit more, but it is too time consuming. Wou ld take transit to job in the city center if not for children.	Public Transit,Parent Work,Driving
Denver	Wants more crosswalks along certain arterials, the family can only cross at one intersection	Safety,Biking/walking,Ease/Comfort
Denver	Moved to Denver recently, chose housing location because of the school due to its good reputation	School Ranking,Home/School Location
Denver	Saves this family an hour to drive versus take light rail. Allows for more time to spend with the children doing other things than taking transit.	Timeliness,Public Transit,Driving
Rotterdam	Families tend to search for a mirror of society in their schools, and look for diverse schools that	Culture of School,Demographics
Rotterdam	Went to the same elementary school as their child, grew up in the same neighborhood.	Culture of School,Sibling/Family Aspect
Rotterdam	Family is moving soon to be closer to school, to be able to walk	Biking/walking
Rotterdam	Bikes with buckets are "typically" Dutch	Biking/walking
Rotterdam	Lives in neighborhood and bikes or walks, except in bad weather then this person drives.	Biking/walking,Driving,Home/School Location,Ease/Comfort
Rotterdam	Children would be more independent and walk alone if the school was closer	Children Independence
Rotterdam	Rotterdam is "odd" because city center is too expensive, so people are forced to leave – used to be low income but now becoming popular	Cost,Demographics,Home/School Location
Rotterdam	Parking is hard and expensive in the city center for the parent at work	Cost,Driving,Parent Work
Rotterdam	Shop at cheaper store for most things, and then go to the fancier albert heijn for other items	Cost,Grocery Habits
Rotterdam	Some schools teach good social skills	Culture of School

Rotterdam	Some schools have 3 age groups together and segregate children by skills	Culture of School
Rotterdam	Didn't like the Montessori school because it was lacking in what they promised	Culture of School
Rotterdam	School has students with different backgrounds (diverse) - important to parents; neighborhood is segregated, so are schools	Culture of School
Rotterdam	Choose schools depending on its "feeling" and other people/students in the school	Culture of School
Rotterdam	Likes schools that promote positivity/self esteem	Culture of School
Rotterdam	School choice was dependent on knowing/liking the principal	Culture of School
Rotterdam	Chose the school because the student liked it	Culture of School
Rotterdam	Schools aren't actually religious besides celebrating holidays, I.e. Christmas	Culture of School
Rotterdam	School choice depends on mainly the system and not the distance	Culture of School,Home/School Location
Rotterdam	School was chosen because child was bored at the other school, needed a higher standard and to be challenged more	Culture of School,School Ranking
Rotterdam	The North is mainly made up of student housing and is mainly white, middle class; the South is "up and coming"	Demographics
Rotterdam	Family only drives to the store when it's a big trip	Driving,Ease/Comfort,Grocery Habits
Rotterdam	Drives to the store on own, prior to picking up child (after work)	Driving,Parent Work
Rotterdam	Parking/drop off at school is difficult	Ease/Comfort
Rotterdam	Bikes with baskets don't fit on bike racks	Ease/Comfort,Biking/walking
Rotterdam	Drive when it is raining	Ease/Comfort,Driving,Biking/walking
Rotterdam	It is difficult to grocery shop with all the children	Ease/Comfort,Grocery Habits
Rotterdam	Family goes to the store when it works for the mother	Ease/Comfort,Grocery Habits
Rotterdam	Buys groceries online to be delivered	Ease/Comfort,Grocery Habits
Rotterdam	Student is an athlete that goes to a special school that gives time for training	Extracurriculars
Rotterdam	Shops at neighborhood grocery stores	Grocery Habits
Rotterdam	Plan grocery trips and days in advance	Grocery Habits
Rotterdam	Family shops all together	Grocery Habits
Rotterdam	Albert Heijn is a big chain but expensive, people get used to it and spend the extra money to shop there	Grocery Habits,Cost
Rotterdam	Current neighborhood does not have any good grocery stores, only a food bank	Grocery Habits,Health
Rotterdam	Lungs feel better out of the city	Health
Rotterdam	Rotterdam has one of the worst air quality in the world	Health
Rotterdam	Parents chose the school because of the community and the parents/families there	Home/School Location

Rotterdam	Chose school first and then moved closed due to the distance	Home/School Location,Ease/Comfort
Rotterdam	Family is moving to a new neighborhood, there they will be able to walk to the store	Home/School Location,Grocery Habits
Rotterdam	Process for school choice is very confusing and competitive, people travel from the South of Rotterdam to norther schools	Home/School Location,School Competition
Rotterdam	Takes child to school by car when working after, but when not working they go by bike.	Parent Work,Driving,Biking/walking
Rotterdam	A lot of other schools are full	School Competition
Rotterdam	Chose 4 schools, applied to all, but only got accepted to one	School Competition
Rotterdam	Choice was between two schools	School Competition
Rotterdam	Before children are 2 years old, they are put onto waiting lists (for popular schools) - certain distances to schools get priority	School Competition
Rotterdam	School choice was between 3 schools	School Competition
Rotterdam	Used to have limits based on kilometers when choosing schools, but that is no longer allowed nor the case.	School Competition,Home/School Location
Rotterdam	School was chosen due to being one of the best neighborhoods in Rotterdam	School Ranking
Rotterdam	Schools are ranked as good based on test scores – scores get you into secondary levels	School Ranking
Rotterdam	Chosen due to good education and because it is a very good school	School Ranking
Rotterdam	Father went on numbers, mom went on feeling, teachers, environment	School Ranking,Culture of School
Rotterdam	Parents like choosing specific methodology schools	School Ranking,Culture of School
Rotterdam	School was chosen because cousins go there	Sibling/Family Aspect
Rotterdam	Youngest child goes to the same school as older siblings	Sibling/Family Aspect,Ease/Comfort
Rotterdam	Drive is 15 minutes, bike ride is 45 minutes	Timeliness

Appendix F

Urban Form Analysis

Jan Gehl "Rating"

Rotterdam 1			
Location	Grade	%	
R1-L-1	12.91	86.1%	
R1-L-2	11.17	74.5%	
R1-C-1	4.46	29.7%	
R1-C-2	7.12	47.5%	
R1-A-1	9.98	66.5%	
R1-A-2	4.53	30.2%	
		49.7%	57.0%

Rotterdam 2			
Location	Grade	%	
R2-L-1	8.15	54.33%	
R2-L-2	10.3	68.67%	
R2-C-1	10.37	69.13%	
R2-C-2	5.06	33.73%	
R2-A-1	7.29	48.60%	
R2-A-2	5.05	33.67%	
		51.36%	51.47%

Averages (per city, per street type)

Location	Grade	%
R1-L	12.04	80%
R2-L	9.225	62%
R1-C	5.79	39%
R2-C	7.715	51%
R1-A	7.255	48%
R2-A	6.17	41%

Denver 1			
Location	Grade	%	
D1-L-1	8.59	57.3%	
D1-L-2	9.67	64.5%	
D1-C-1	11.2	74.7%	
D1-C-2	13.7	91.3%	
D1-A-1	2.74	18.3%	
D1-A-2	6.57	43.8%	
		58.3%	60.9%

Denver 2			
Location	Grade	%	
D2-L-1	9.25	61.67%	
D2-L-2	9.32	62.13%	
D2-C-1	13.91	92.73%	
D2-C-2	9.4	62.67%	
D2-A-1	6.33	42.20%	
D2-A-2	5.4	36.00%	
		59.57%	61.90%

Averages (per city, per street type)

Location	Grade	%
D1-L	9.13	61%
D2-L	9.285	62%
D1-C	12.45	83%
D2-C	11.655	78%
D1-A	4.655	31%
D2-A	5.865	39%

Good quality = 11-15 (67%-100%)
Average Quality= 6-10 (34%-66%)
Poor Quality= 1-5 (0%-33%)

			Parking				Traffic Mitigation					
	Number of Lanes	Speed	Free	Permited	Paid	No Parking	Pedestrian Bump-outs	Speed Bumps	School Zone	Narrow Lanes	Landscaping/ median	No Traffic Mitigation
R | U Local 1	2	19 mph	X				X					
R | U Local 2	1	19 mph			X			X		X		
D| U Local 1	2	25 mph	X	X					X			
D| U Local 2	1	25 mph	X	X								X
R | MU Local 1	1	19 mph	X					X				
R | MU Local 2	1	19 mph	X				X	X				
D | MU Local 1	2	25 mph	x							X		
D | MU Local 2	2	25 mph	x									X
R | U Collector 1	3	19 mph	X								X	
R | U Collector 2	2	19 mph	X								X	
D| U Collector 1	1	25 mph			X							X
D| U Collector 2	2	25 mph			X		X					
R | MU Collector 1	2	25 mph	X					X			X	
R | MU Collector 2	2	25 mph	X				X					
D | MU Collector 1	2	30 mph	X									X
D | MU Collector 2	2	30 mph	X									X
R | U Arterial 1	2	28 mph			X							X
R | U Arterial 2	9	31 mph	X								X	
D| U Arterial 1	6	45 mph				X						X
D| U Arterial 2	6	35 mph				X					X	
R | MU Arterial 1	2	45 mph	X								X	
R | MU Arterial 2	2	31 mph			X						X	
D | MU Arterial 1	5	45 mph				X						X
D | MU Arterial 2	4	35 mph				X					X	

	Type of Facility					Bike Parking Avaliable	
	Cycle Track	Buffered Bike Lane	Unprotected Bike Lane	Marked Sharrow	No Facility	Yes	No
R | U Local 1					X	X	
R | U Local 2					X	X	
D| U Local 1					X		X
D| U Local 2					X		X
R | MU Local 1					X		X
R | MU Local 2					X		X
D | MU Local 1					X		X
D | MU Local 2					X		X
R | U Collector 1	X					X	
R | U Collector 2		X				X	
D| U Collector 1					X	X	
D| U Collector 2					X	X	
R | MU Collector 1	X					X	
R | MU Collector 2	X						X
D | MU Collector 1				X		X	
D | MU Collector 2					X		X
R | U Arterial 1		X				X	
R | U Arterial 2	X					X	
D| U Arterial 1					X		X
D| U Arterial 2					X	X	
R | MU Arterial 1		X					X
R | MU Arterial 2		X				X	
D | MU Arterial 1					X		X
D | MU Arterial 2					X		X

	Quality of Sidewalk			Accessibility			Width				Protection		Pedestrian Amenities			Crossings				Signals			Pedestrian Refuges		Bump-outs	
	Good	Fair	Poor	Curb Cuts	No Obstacles	Not Accessible	<5 ft	6-10 ft	11 to 20 ft	>20ft	Yes	No	Good	Fair	Poor	Striped/ Painted	Crossings available, but no striping	Raised Crosswalk	No crossings	Traffic Light	Stop Sign	No signals	Yes	No	Yes	No
R | U Local 1	X			X	X			X			X			X			X					X	X		X	
R | U Local 2		X					X				X		X				X					X		X		X
D| U Local 1	X			X	X			X			X			X		X					X				X		X
D| U Local 2		X		X			X				X				X		X				X				X		X
R | MU Local 1	X			X			X				X				X			X				X		X	X		
R | MU Local 2		X					X					X			X			X				X		X	X		
D | MU Local 1	X						X				X				X		X				X				X		X
D | MU Local 2	X						X				X				X	X					X				X		X
R | U Collector 1	X			X	X			X			X				X	X	X					X	X				X
R | U Collector 2	X			X					X		X				X	X	X			X			X		X		
D| U Collector 1	X			X	X			X	X		X		X			X					X				X	X	
D| U Collector 2	X										X		X			X					X				X	X	
R | MU Collector 1	X			X	X				X		X		X			X						X	X		X		
R | MU Collector 2		X		X			X				X			X		X				X			X		X		
D | MU Collector 1	X			X	X		X				X			X		X					X				X		X
D | MU Collector 2		X		X			X				X			X		X				X					X		X
R | U Arterial 1	X			X	X					X	X			X		X						X	X				X
R | U Arterial 2		X		X				X			X			X		X				X			X		X		
D| U Arterial 1			X			X	X					X			X	X	X			X			X				X
D| U Arterial 2	X			X	X				X		X			X		X				X			X				X
R | MU Arterial 1		X		X	X				X		X			X		X				X			X		X		
R | MU Arterial 2	X			X	X			X			X				X	X					X		X		X		
D | MU Arterial 1		X		X			X					X		X		X				X				X			X
D | MU Arterial 2		X		X			X				X				X		X					X		X	X		

			Types			Quality		
	Number of Stops	Number of Lines	Bus	Tram/ Light Rail	No Transit Available	Good	Fair	Poor
R | U Local 1	N/A	N/A	N/A			N/A		
R | U Local 2	N/A	N/A	N/A			N/A		
D| U Local 1	N/A	N/A	N/A			N/A		
D| U Local 2	N/A	N/A	N/A			N/A		
R | MU Local 1	N/A	N/A	N/A			N/A		
R | MU Local 2	N/A	N/A	N/A			N/A		
D | MU Local 1	N/A	N/A	N/A			N/A		
D | MU Local 2	N/A	N/A	N/A			N/A		
R | U Collector 1	N/A	N/A	N/A			N/A		
R | U Collector 2	N/A	N/A	N/A			N/A		
D| U Collector 1	N/A	N/A	N/A			N/A		
D| U Collector 2	N/A	N/A	N/A			N/A		
R | MU Collector 1	2	1	X			X		
R | MU Collector 2	N/A	1		X		N/A		
D | MU Collector 1	1	1	X			X		
D | MU Collector 2	1	1	X			X		
R | U Arterial 1	2	2	X	X				X
R | U Arterial 2	2	3	X			X		
D| U Arterial 1	1	1	X				X	
D| U Arterial 2	2	5	X			X		
R | MU Arterial 1	2	1		X		X		
R | MU Arterial 2	N/A	2	X			N/A		
D | MU Arterial 1	1	1	X				X	
D | MU Arterial 2	N/A	1	X			N/A		