

West Chester & West Goshen Equitable Transportation Report

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1 EXECUTIVE SUMMARY

1.1 (EXECUTIVE SUMMARY)

This report aims to highlight the importance of transportation equity, and determine whether existing transportation is equitable and accessible in West Goshen and West Chester. Some of our recommendations and improvements to West Chester and West Goshen public transportation include improving overall infrastructure working with existing framework, making public transit more cost effective, and building more bus stops in underserved areas.

2 INTRODUCTION

2.1 GOALS AND OBJECTIVES

Goals:

Evaluate equity in transportation, locally and theoretically. A few targets of the report include highlighting the importance of transportation equity as well as assessing if the available transit meets equitable conditions. In addition, the report intends to recommend improvements to West Chester and West Goshen public transportation. These improvements include designing better, but still cost effective, bus stops than those which are currently available.

Thesis:

Despite West Chester and West Goshen's insufficient public transportation, improvements can be made to create a more equitable transportation system.

2.2 IMPORTANCE AND RELEVANCE

2.2.1 EQUITY IN PLANNING

Equity is an essential facet of planning, which makes it vital to expand access to resources and opportunities for disadvantaged people (Loh & Kim, 2020). This can look different in different places and communities, and as a result, there are two main types of equity. Horizontal equity is the equal distribution of costs and benefits between people of equal needs and abilities (Van Dort et al., 2019). In this situation, regulations and policies are implemented equally for everyone. Costs, service quality, and transit modes are equal for different groups. Everyone bears the cost they use but all have opportunities to take part in making decisions (Litman, 2018). Another type of equity is known as vertical equity. Vertical equity compensates for the inequalities between groups by having more able people pay more, while providing more benefits to the people who are most

in need (Van Dort et al., 2019). When vertical equity is applied into the planning process, policies will become more progressive with respect to income and focused on necessities instead of luxuries. This can be applied to the transportation industry by making decisions that support disadvantaged people and help people take transportation to jobs, schools, and medical activities (Litman, 2018). It is important to plan for equity in a way which equally distributes revenue amongst all community members. In order for this to happen, community members should be included in the planning process and be given a reasonable amount of power, equal to other stakeholders and experts (Loh & Kim, 2020). Overall, there are many different ways to plan for equity, and show how it is an integral piece in the planning process.

2.22 PLANNING FOR EQUITY CURRENTLY

Today, planners understand the importance of equity more than ever. Recent comprehensive plans have started to focus on the concept of equity more frequently, making policy recommendations to help ensure equitable development (Loh & Kim, 2020). Along with the planners, community members themselves often push for equity. In fact, for plans that included vigorous public participation, using multiple communication channels and processes, there was a significant focus on equity. This is a great step for the spread of equity recommendations since 76% of plans include public participation (Loh & Kim, 2020). The push from planners and the public is why 46% of comprehensive plans include equity (Loh & Kim, 2020). Moreover, as planners know, having the word equity is not enough to make a change. One of the first steps in planning for equity is identifying communities in need. In comprehensive plans, 65% of plans address specific underserved groups, but only 42% state the geographic area of those people (Loh & Kim, 2020). Sadly, only 2% of plans mentioned historically marginalized groups (Loh & Kim, 2020). Within those plans, only 6% take part in another crucial step of planning for equity- providing incentives (Loh & Kim, 2020). Planning for equity is not as high of a priority as it needs to be, and more direct actions must be taken in order to develop more equitable communities and transportation systems.

2.23 TRANSPORTATION IN WEST CHESTER

Although West Chester is not a large public transportation hub- with less than 8,000 users- it is still important for the community to have good transportation (Chester County Planning Commission & Delaware Valley Regional Planning Commission, 2014). Public transportation users are unable to access the stations and stops safely and efficiently by foot or bike. Only 6% of stops have covers despite 23% of stops having active riders (Chester County Planning Commission & Delaware Valley Regional Planning Commission, 2014).

Ridership of public transit is not very high, and conditions of the stations and stops are not ideal. The residents' average commute time is about twenty-five minutes (Chester County Planning Commission & Delaware Valley Regional Planning Commission, 2014). Rising gas prices as well as advancements in mobile technology are increasing public transportation ridership rates. Especially since local trends are moving away from suburbanization and towards urbanization. Public transportation and its future improvements in West Chester are important for the existing and predicted new users.

2.3 CONNECTION TO SUSTAINABILITY

In the early twentieth-century United States, most roads outside of metropolitan areas were not paved. America's booming cities and economies were separated by hundreds of miles of mostly dirt roads. In 1919, the United States Army decided to highlight the miserable state of America's roads by embarking on a road trip from Washington DC to San Francisco. At an average of only fifty-two miles per day, the caravan finally reached San Francisco after sixty-two days. Today, the total drive time between the two cities is only 42 hours. One of the young men on the 1919 journey was Captain Dwight D Eisenhower. While in Germany in World War II, General Eisenhower recognized how efficient the Autobahn was at quickly moving men and material. It was these two experiences that prompted President Eisenhower to push for the Interstate Highway Act of 1956 (History).

The completion of the interstate highway system brought people and markets closer together but had devastating impacts on American cities. Planners went too far when they began running their highways directly through their cities. Most neighborhoods that were demolished to make way for these massive projects were poor nonwhite communities. This displaced thousands and led to further economic hardship. An overreliance on personal vehicles for transportation has threatened the health of Americans in several ways. The first and most obvious way is car accidents. Every year in the United States, there are an average of 6 million vehicle collisions. 90 Americans die every day due to car accidents. Traveling by public transportation is 10 times safer per mile than traveling by car. There is also the issue of noise pollution. Cities aren't loud, cars are loud. Automobiles are the leading cause of noise pollution in cities (RecipeUSA). Noise is often dismissed as a minor annoyance, but the loud engines of cars and their incessant honking can lead to long-term stress. Additionally, it's much more stressful to sit through traffic or navigate city streets in your car than to take public transportation. On a bus or train, you can pass the time by reading a book or watching a movie on your phone. Lastly, cars are a major producer of particulate matter. Breathing particulate matter is linked to higher rates of asthma, chronic bronchitis, and heart disease, among others (EPA). In the United States, exposure to particulate matter is uneven across races. On average, Asian Americans are the worst affected. Asian Americans are exposed to particulate matter at a rate 34% higher than the national average. Blacks endure 24% over the national average. Latinos suffer 23% over the national average. By comparison, whites are exposed to 14% below the national average. Communities in cities

experience higher concentrations of particulate matter because there are more cars and traffic jams spewing pollution.

But the largest threat that cars pose is to the health of our planet. Motor vehicles are a major cause of climate change. Americans are addicted to their cars. 91.55% of American households have access to a car (Value Penguin). Personal vehicles account for 15% of pollution in the United States. (EPA Fast Facts) The average passenger automobile emits 4.6 metric tons of carbon dioxide annually (EPA). Cars produce even more CO₂ when idling. Idling for more than 10 seconds uses more fuel and produces more carbon dioxide than starting up your car (Canada National Resources). Idling becomes a bigger issue when roadways are clogged up because cities do not invest enough in public transportation alternatives. Instead of one person occupying a car and burning its fuel, several people can fit into just one bus or train, creating less traffic and pollution.

Owning a car is expensive. Including car payments, gas, inspections, and more, the annual cost of owning a car is estimated at \$9,282 (Expatriot). In contrast, a pass to use all of SEPTA's buses, trolleys, and trains for a year will only cost \$1,152 (SEPTA). The average American spends 16% of their paycheck on transportation. 93% of this goes to buying, maintaining, and operating cars alone. This makes the cost of a car the largest expenditure in the United States after housing (American Public Transportation Association).

Passenger vehicles are undoubtedly helpful in helping Americans and products traverse vast distances across our enormous country. However, having cars run directly through our cities has had a negative impact on our wallets, mental health, physical health, and the health of our planet. Moreover, these costs disproportionately affect the most vulnerable Americans, the poor communities of color. An overreliance on single-use automobiles is unsustainable for our public health, our environment, and our economy. In order to curb this trend and compete with the developed and developing world, the United States local, state, and the federal governments must begin investing more money into public transportation. Every \$1 invested into public transportation nets \$4 in economic returns. This does not even take into account the positive benefits to mental, physical, and environmental health. Dense urban areas like West Chester offer a viable opportunity for the public transportation network to expand and help our most vulnerable citizens.

3 LITERATURE REVIEW

3.1 CHANGING TO PLAN WITH EQUITY

The modern world almost exclusively requires the ability to travel or move about in one capacity or another. Whether that movement is to and from employment along the notorious path of the "rat race", or to a store to acquire goods or services necessary for functionality or survival, there will almost certainly be a time in an active society member's life that calls for interaction with the transportation system. There is a problem relying on transport, however: the disparity between levels of access to it by various groups.

Historically, transportation development has been mostly geared towards the ease of access to white, middle-class individuals. Karner and Niemeier (2013) provide a critical assessment of the techniques currently employed to assess the effects of transportation on minority populations in their article, "Civil Rights Guidance and Equity Analysis Methods for Regional Transportation Plans: A Critical Review of Literature and Practice." There are no rules for agencies to go by in order to conduct a rigorous equity study, the authors say. "Prevalent methods of equity analysis are more likely to distort than to reveal." To give greater information on the ways that particular planning decisions affect mobility and accessibility to disadvantaged populations, such as low-income, minority communities, they advise more integrated modeling and Geographic Information Systems (GIS) study. In a larger sense, resource justice and environmental justice are also aspects of transportation equity. These ideas illustrate a development in the relationship between civil rights and transportation, especially when we take into account some of the first instances of slave transport and the circumstances leading up to the 1955 Montgomery, Alabama, bus boycott (Brenman and Sanchez, 2006).

The concept of justice is important to understand when discussing the current climate of transportation equity, and future planning can provide updates to that framework. In particular, environmental justice can serve as a solid foundation for the development of equitable access for minority groups and the undoing of blatantly inconsiderate planning of the past. An effective approach for understanding why minority and low-income communities acquire the greatest inequities from transportation investment is due to a lack of environmental justice (Litman, 2002). Transportation equity (or lack thereof) does not just stay within the confines of racial differences. Differences in income, gender, and mobile ability can have an impact on accessibility alongside racial categories. In order to fight for the equitable distribution of resources, social movements that focus on transportation-related issues have evolved and modified to change regulatory, legal, and planning settings. The benefits and costs of transportation, as well as their incorporation in procedures for planning transportation, are becoming more crucial as time passes.

A limited number of exceptions show several findings that suggest a small output pool of common results running across the dimensions of vehicle availability, race, and income; however, the application provides some basis for desirable land-use and transportation policies and practices for dramatically improving accessibility, which will hopefully, in turn, help to improve prospects for more equitable urban development (Grengs et al, 2013).

3.2 COVID-19 AND ITS EFFECT ON TRANSPORTATION

Equity (or lack thereof) within American transportation systems are put on display during times of crisis. COVID-19 emerged in late 2019 and began to greatly impact Americans and their day-to-day lives in March 2020. Because the virus was highly contagious and transmitted through close contact, the U.S. Centers for Disease Control and Prevention (CDC) recommended social distancing, self-quarantine, and working from home to stop its spread. As more businesses and local and state governments followed these guidelines, travel patterns were dramatically

altered. In particular, “public transit is particularly vulnerable to disruption and shocks from pandemics due to the collective nature of its mobility” (Liu et al., 2020, 1). Most public transportation is designed to gather many people together and transport them in close quarters to their destinations. A virus that spreads like COVID-19 can make these settings particularly risky.

In this case, it certainly matters which groups of people rely on public transportation. In August 2020 during the heart of the pandemic, surveys of populations across the country showed a significantly higher proportion of transit riders were people of color, had decreased incomes since the start of the pandemic, and were more likely to have yearly household incomes under \$25,000. Transit riders were also more likely than non-riders to live in urban areas, occupy buildings with 20 or more units, and less likely to have access to a household vehicle” (Parker et al. 55-56). While public transportation showed declines in ridership and use of public transportation overall, low-income riders did not reduce travel nearly as much as others who have alternate modes of transportation (Parker et al. 53). These riders have what can be described as an “inelastic demand for travel” (Parker et al. 60), meaning their jobs cannot be done from home like many white-collar jobs, and their financial situations made it unrealistic to quit to find work from the safety of their home. These same people are at the whim of the transit schedule, which was greatly altered by COVID-19. Without access to another vehicle and without the choice to stay home, “minority populations (African American, Female, Hispanic), middle-age and senior people” needed public transportation for commuting and did not decrease their ridership (Liu et al., 2020, 17).

Many of those that could not decrease their ridership belonged to the most vulnerable population. Their access to health care is minimal at best, and exacerbated by the costs to test for and treat COVID-19. This is especially important because studies have shown a “strong correlation between COVID-19 incidence and use of public transport use” (Medlock III et al. 8). While those with high quality insurance and high paying jobs were able to stay home, others would have to continue to put themselves in high risk situations by taking public transportation, and having no choice but to risk illness and death.

3.3 BUS STOP DESIGN

If the goal of public transportation is to “provide safe, efficient, and reliable service for passengers to reach their homes, jobs, shopping and other destinations,” then transit agencies must ensure the physical safety of riders in order to maintain and increase ridership. This need for safety applies to “both passengers on board the vehicle, as well as when they are accessing the system at a transit stop” (Blackburn and Chaney, 2013, 44). Equity in bus stop design includes its location and features, but perhaps most importantly includes accessibility for those with health conditions/impairments, or even someone with a large load of groceries or a parent with a stroller. The federal government regulates certain features and dimensional requirements from the American Disabilities Act. Local and regional organizations as well as authorities like SEPTA and Chester County provide further guidelines for stop signs and shelter designs (Chester County Board of Commissioners & Chester County Planning Commission, 2012).

These include the curbside design such as the loading area, keeping clear where both sets of bus doors open to receive and discharge passengers, an accessible pedestrian path to the bus stop, curb height and curb width, and even traffic calming features to allow for safe arrival and departure to and from the stop (Delaware Valley Regional Planning Commission, 2019).

The Civic Design Studio at Luckett & Farley addressed inequity in bus shelters in Louisville by actively seeking input and creating shelters that focused on rider needs, promoted public safety, and addressed frequent concerns. The public outreach helped connect with riders, boost morale, and improve communities that may feel disenfranchised and unheard. (Lindgren, 2020). One shelter in particular, SmART Shelter #2, was designed to be a piece of urban architecture in a part of the city without much of this thoughtful design: outside the Kentucky Center for African American Heritage at the corner of 18th Street and Muhammad Ali Boulevard (Lindgren, 2020). After speaking with riders, the architects designed a shelter specifically based on the conditions in Louisville. It has an open design to allow wind to blow through to mitigate heat and maximize shade while also allowing sun to shine through in the colder winter months. As an added feature, they integrated a green roof to temper the heat island effect in the city and offsetting the pavement by capturing rainwater and removing runoff from the overloaded municipal storm system (Lindgren, 2020). All of these features and elements provided an attractive and well-designed shelter at a bus stop that serviced a prominently black and low-income population.

Another case study, this in the Minneapolis-St. Paul region, shows how a transportation authority can utilize public feedback to ultimately serve the ridership that depends on their service for their mobility. Metro Transit, the regional transportation agency, launched their Better Bus Stops program as a response to this feedback, advancing procedural equity by providing funding to community-based organizations (CBOs) to conduct outreach. These CBOs were able to ensure participants reflected their neighborhoods, as the demographics of the survey results were similar to the demographics of bus riders in terms of age, gender, Hispanic ethnicity, and race. Riders were asked for their thoughts on shelter placement, design, features, community assets of historic significance, and how Metro Transit could advance regional equity (Transit Center & CNT, 2021). Hearing directly from riders clearly altered how Metro Transit approached bus stops and revealed how riders thought about certain amenities.

Importantly, the program led to more equitable outcomes by deliberately improving bus shelters in racially concentrated areas of poverty. As the Transit Center lays out in their equity guidebook for transit agencies, “Before Better Bus Stops, 40 boardings per day were needed to justify a shelter in Minneapolis or St. Paul, compared to 25 per day in the suburbs, where service frequency was lower and riders were assumed to wait longer for the bus. However, riders engaged in the project argued that this was unfair. The agency’s Department of Strategic Initiatives also analyzed data from a University of Minnesota study and found no evidence of longer wait times in suburban areas.” The combination of public feedback and statistical analysis created a strong justification for Metro Transit to switch course and address the inequities inherent in the current conditions.

Engagement also changed the approach to shelter design, improving the accessibility and equity. Metro Transit's standard was to provide the largest shelter possible, but riders with disabilities pointed out that placing large shelters on narrow sidewalks made it difficult to pass. Due to this feedback, a narrow shelter design was utilized in most cases and the agency developed a new internal process for shelter placement to allow other departments to evaluate proposed designs. What started as a one-off project has evolved into a fully funded program for the entire service area. "As of January 2020, the agency has added 135 shelters and upgraded another 78 with light or heat." Crucially, two-thirds of boardings in racially concentrated areas of poverty now take place at stops with shelters, similar to the results across the system (Transit Center & CNT, 2021). These equitable improvements are the result of a concerted effort to gain feedback from a diverse group of transit riders.

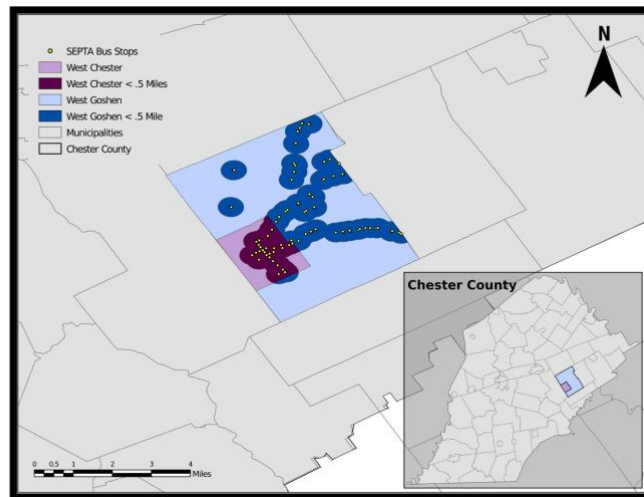
Some recommendations for designs based on studies concerning the quality and equity of bus stops include investing in basic access and stop features, such as sidewalks adjacent to the stop, a level and clear landing pad, and pedestrian-oriented street crossings. There is increasingly a demand for infrastructure that incorporates bicycle transportation, which may include bike parking or racks on buses. Additionally, the spacing between stops and their placement can be addressed to encourage ridership as a whole and for passengers to cross at intersections, as opposed to mid-block (Blackburn and Chaney, 2013, 47).

4 CURRENT STATE OF PUBLIC TRANSPORTATION

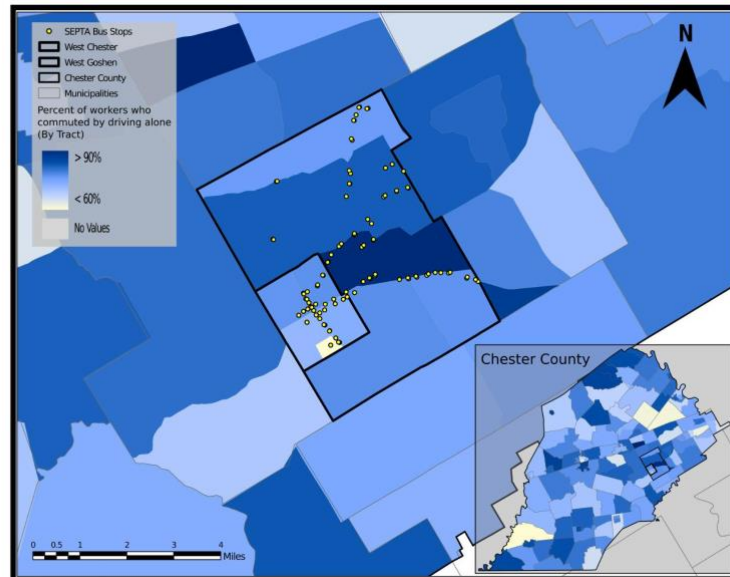
4.1 GIS AND MAPPING REPORT OVERVIEW AND BACKGROUND

To perform a geographical analysis of the state of bus transportation in West Chester and West Goshen we started by finding what an acceptable walking distance to the bus would be. The Federal Highway Administration views this to be $\frac{1}{4}$ - $\frac{1}{2}$ a mile or five to ten minutes by foot. For the purpose of our analysis we went with one quarter mile. We had to then locate the bus stops within the municipal boundaries of West Chester and West Goshen In ARCPro. After this was done, we created a buffer around the stops to encapsulate the land area within one quarter of a mile of the stops. THis buffer zone was then divided up in the two municipalities. This gave us our areas of interest for this project. Using this method we can run demographic reports and spatial analysis on the different areas in order to solicit data trends.

Map of Area of Interest (*Figure 1*)



Map depicting the study area for the transportation equity analysis.
(*Figure 2*)



Single driver (Non-carpool) commuter to work data by percentage (In census tracts) (Note West Chester Campus)

(Figure 3)

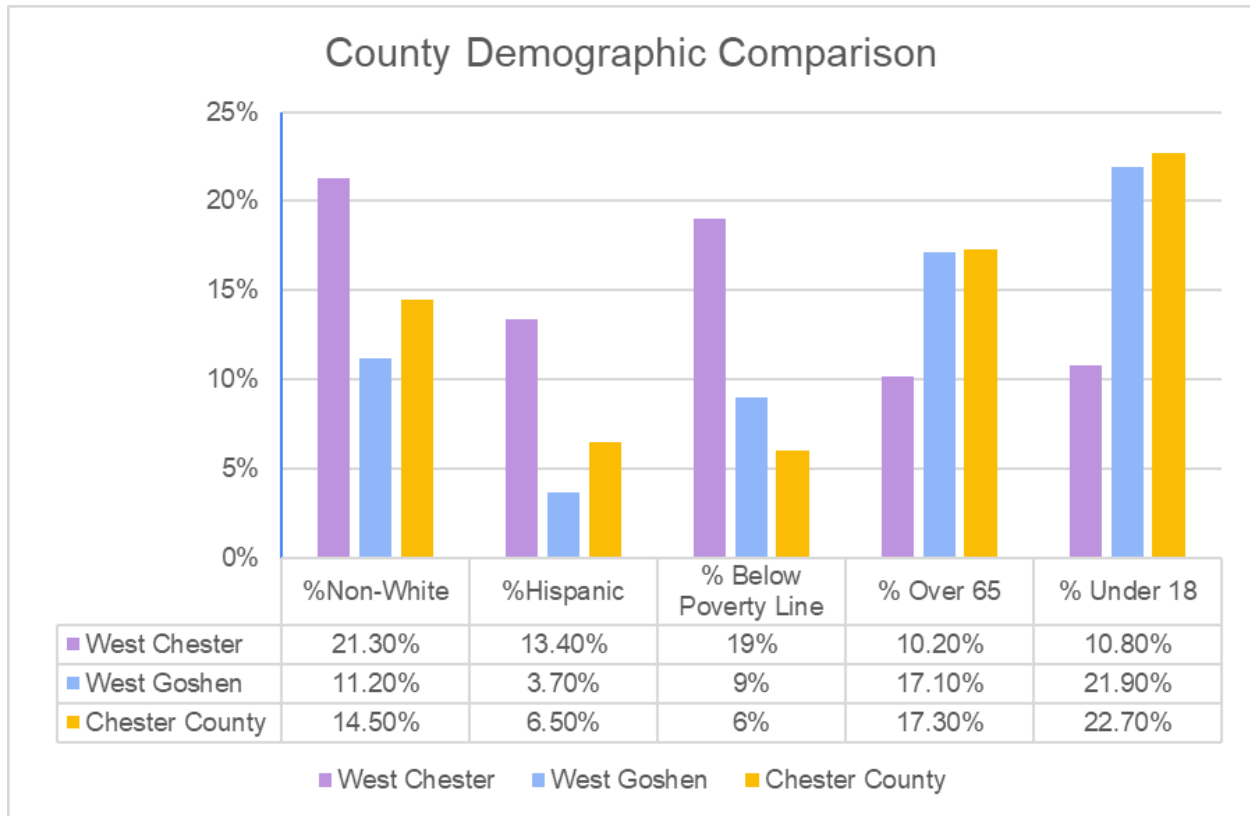
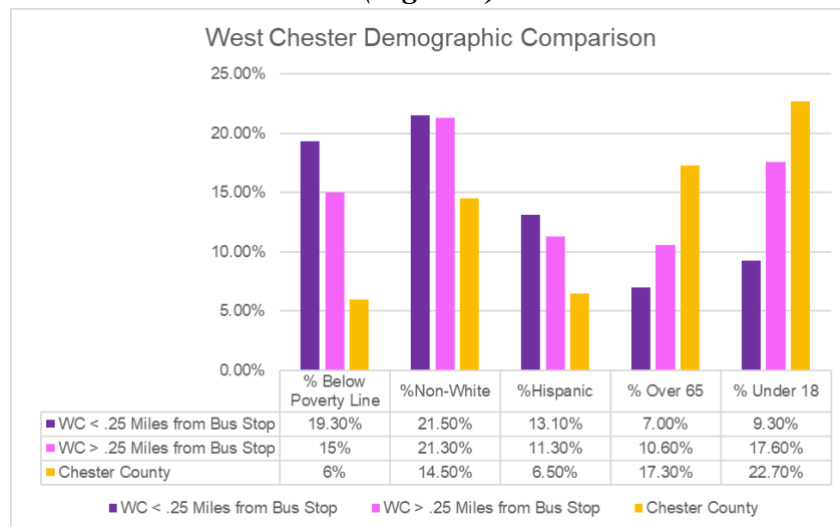


Figure 3 shows demographic trends in the three municipal areas of note to compare trends. Some important things to note are that in both West Goshen and West Chester the percent below the poverty line is significantly higher than the county average. (West Chester > 3x)

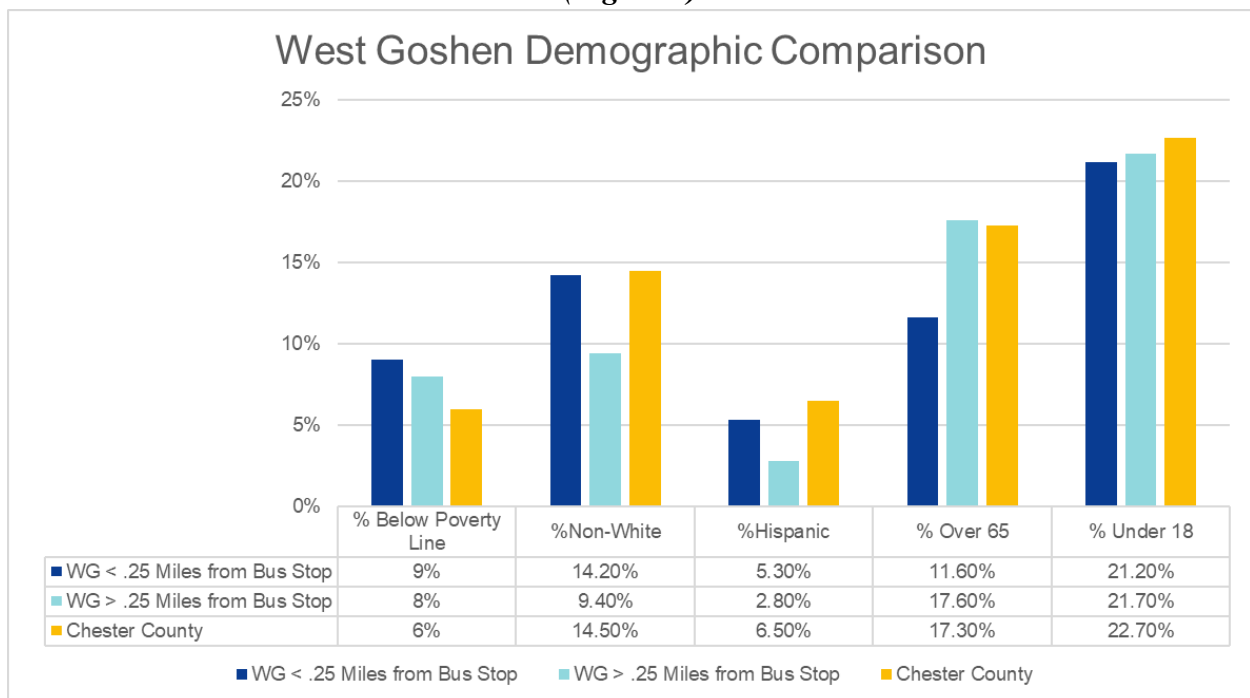
(Figure 4)



This demographic comparison in Figure 4 shows the same data as the previous graph but is broken down by the land area inside and outside of the quarter mile buffer zone in West Chester. Based on this data, the bus stops in West Chester are doing a good job at servicing the part of the

population below the poverty line but are not doing a great job at servicing the people above 65 years old or under 18 years old.

(Figure 5)



Same as in West Chester, Figure 5 breaks down the data by the buffer area, except for West Goshen. West Goshen does a bit better of a job than West Chester in meeting the demand for bus access. Among these demographic groups, about half of the population is within one quarter of a mile of the bus stop. It is important to note though that the area in West Goshen is far less walkable than in West Chester. Therefore outside of the quarter mile buffer the chance that people are going to walk to the bus stop is less likely than in West Chester.

(Figure 6)

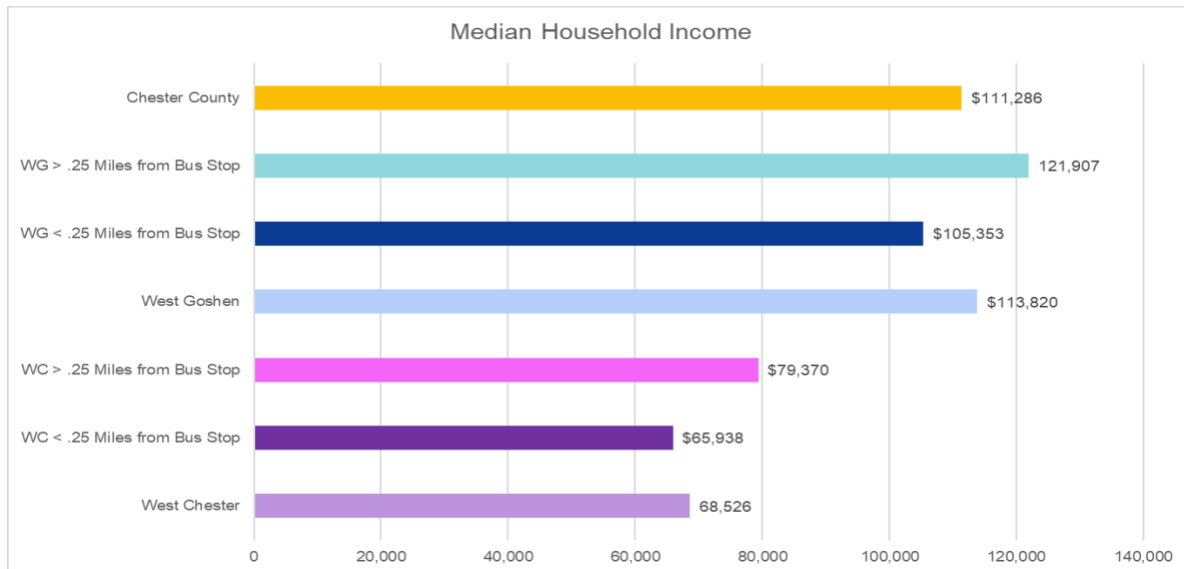


Figure 6 shows that the areas farther than one quarter mile in both West Chester and West Goshen have higher median household incomes. This goes to support that the bus stops that do exist are able to proportionately serve people on the lower end of the economic spectrum.

(Figure 7)

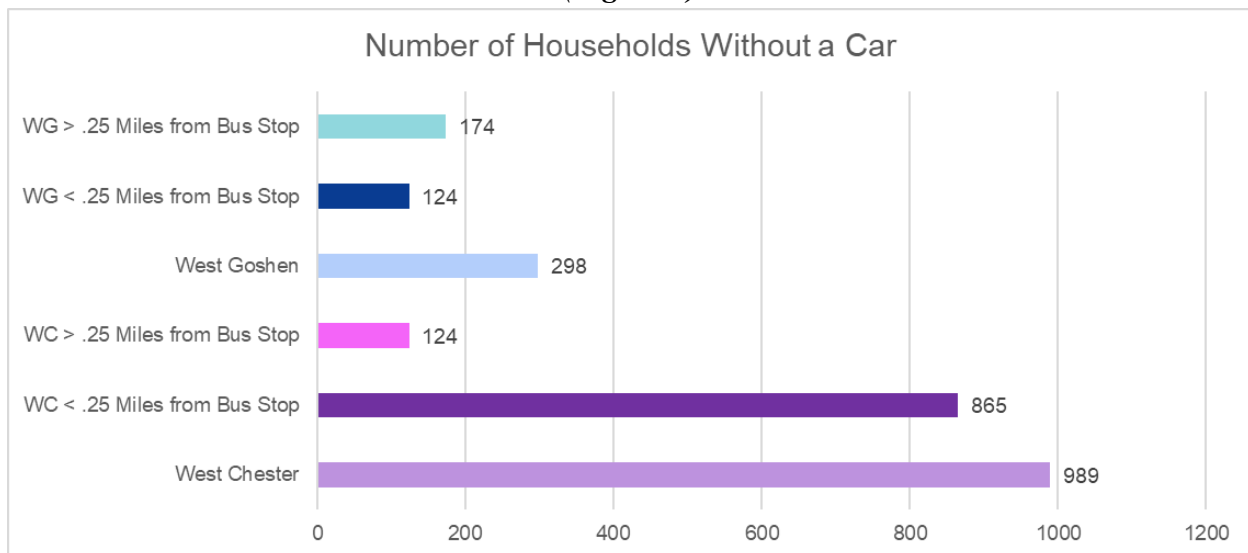


Figure 7 depicts households in West Chester and West Goshen without a car. This is interesting but skewed a bit probably due to the walkability of West Chester Borough lending to the lack of a need to own a car. Though it is still pertinent because the people in the Borough without cars do overwhelmingly have access to the bus.

(Figure 8)

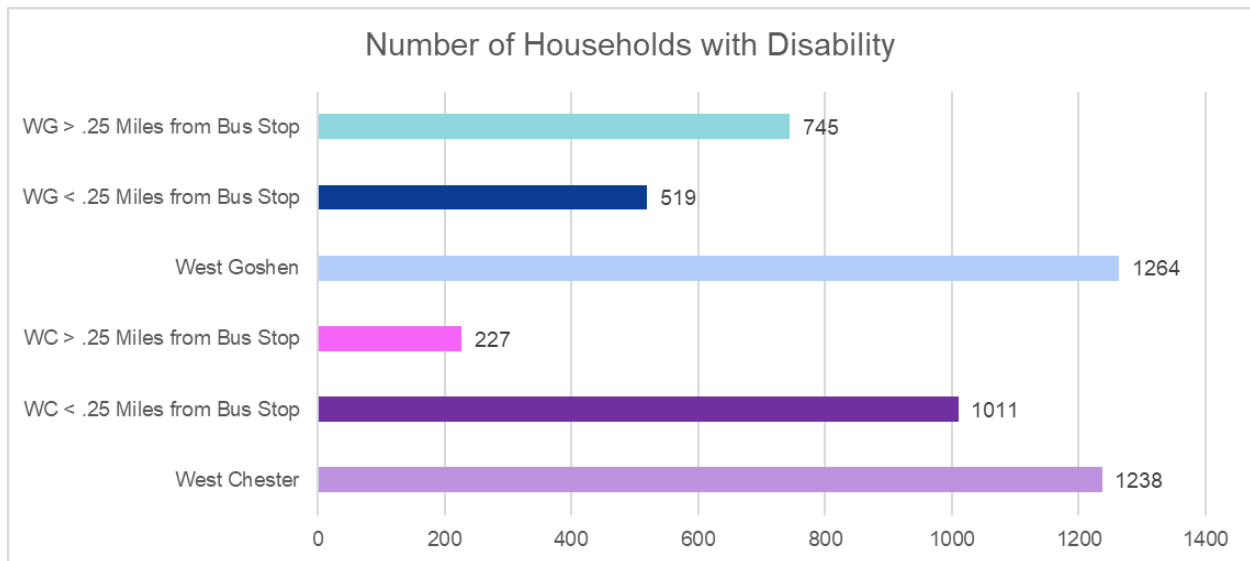


Figure 8 shows the number of households with at least one person having a disability. In West Chester, most of these households are within one quarter of a mile from bus stop, but in West Goshen the majority of the households with a disabled resident are farther than one quarter of a mile from a bus stop.

(Figure 9)

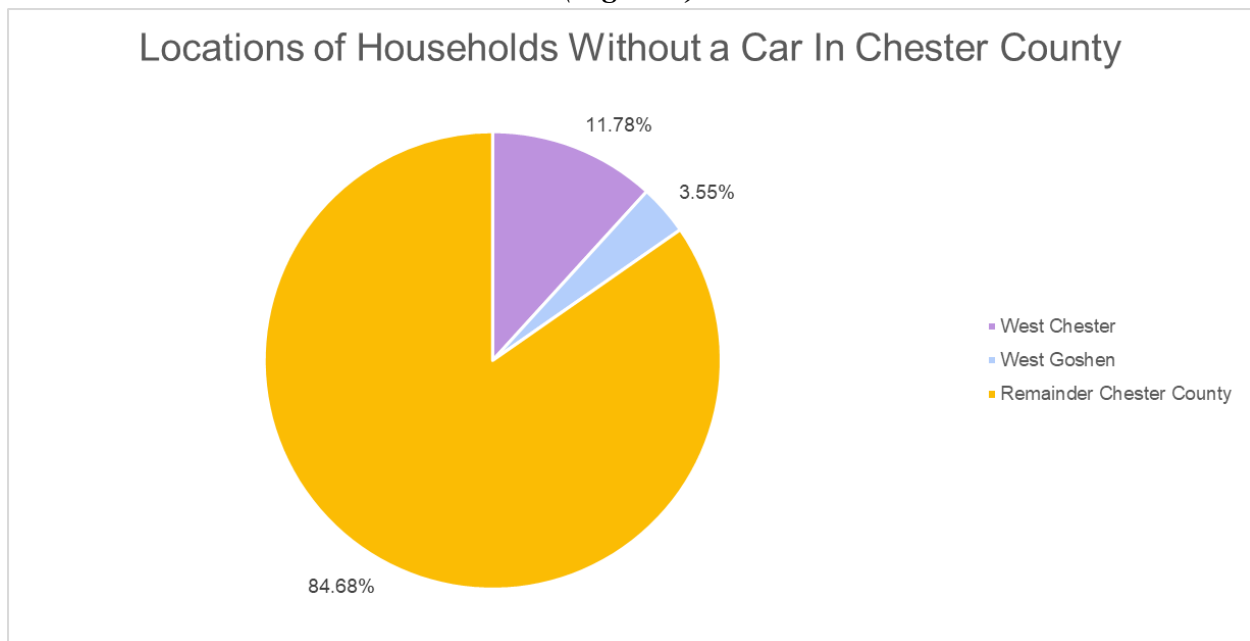


Figure 9 shows how the percent of households without a car within Chester County is broken down. The Yellow is the area of Chester County not contained by our study area of West Chester and West Goshen. This is quite interesting because over 10 percent of the carless households in the whole county are in West Chester.

4.2 PICTURES OF IMAGE ANALYSIS OF CURRENT INFRASTRUCTURE (ALONG WITH DISCUSSION)

Bus stops in West Chester and West Goshen, at a minimum, consist of some type of signage to indicate that a bus route passes the location and will stop to pick up or drop off riders. A bus stop may include other features to improve the accessibility, safety, and comfort of those utilizing the stop. Some of the most important features include a shelter and bench for comfort, an area to wait outside of the traffic lanes, and location at an intersection to encourage safe crossings at crosswalks for safety. Some stops may also have sidewalks coming to and from the stop and a curb depression for accessibility.

Nearly all of the bus stops in the study area are marked by a sign showing which bus lines stop there. Many of the bus stops in West Chester have room for riders to wait but do not have a shelter. The bus stop at the north east corner of N High Street and E Chestnut Street has plenty of room to wait and has a depressed curb to access, but much of the area is the brick material that can easily warp and become difficult to navigate.

(Figure 10)



(Figure 11)



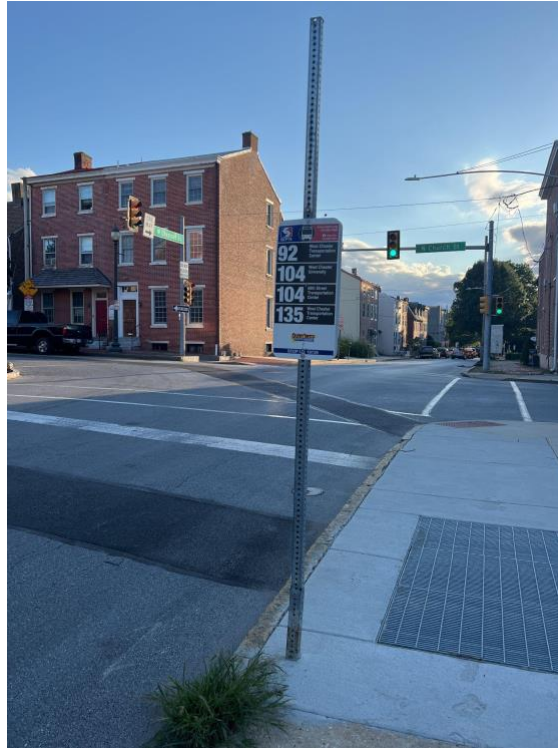
Nearly every bus stop in West Chester is extremely minimal, without many features, as depicted in Figure 10. If any have a shelter, they are part of the local environment unconnected to the stop, like the stop at the northwest corner of W Gay Street and N High Street in West Chester shown in Figure 11. This shelter is not a part of the bus stop but rather is scaffolding for the adjacent building. There is a bench nearby as well, which is not officially a part of the bus stop but inevitably will be used by waiting riders.

(Figure 12)



Most of the bus stops in West Chester blend into the streetscape. The stop shown in Figure 12 at the southwest corner of E Market Street and N Walnut Street is immediately outside a restaurant and is between several of the outdoor dining tables.

(Figure 13)



Nearly all of the bus stops in West Chester are at intersections to encourage legal crossings at crosswalks, not mid-block crossings. This stop is right next to the intersection of N Church Street and W Chestnut Street, which has traffic lights and four crosswalks. This stop also features detailed signage that is typical for most bus stops: the route number and the route destination.

(Figure 14)



This bus stop shown in Figure 14 at the southwest corner of W Miner Street and S High Street is a good example of the typical bus stop in West Chester. It has plenty of room to wait outside of the traffic lanes, sidewalks going in multiple directions, and is located at an intersection to encourage safe crossings, but doesn't have other features to increase comfort such as a trash receptacle, shelter, or bench, and may cause issues boarding the bus from the sidewalk with no curb depression.

(Figure 15)



As you get further from downtown West Chester, the form the bus stop takes varies. At the north corner of the five way intersection between Marshall Drive and E Marshall Street shown in Figure 15, the sidewalk is not immediately accessible to the bus loading zone. If a rider wants to wait in an area that is immediately next to the loading zone, they will have to move down into one of the two streets' right-of-ways.

(Figure 16)

(Figure 17)



There is a bus stop on either side of the street near the intersection of E Marshall Street and Convent Lane, serving the hospital. One has virtually no area off-street to wait and may be difficult to access any loading area. The crosswalk to the stop leads to a small concrete pad that looks to be the beginning of a sidewalk but doesn't continue anywhere. The other is indicated by a simple sign on a post several feet away from the sidewalk. This side has no accessible way from the sidewalk to the street to load. Neither have shelters.

(Figure 18)



The bus stop on the west side of N Five Points Road at Lawrence Drive, near the business park in West Goshen, is essentially in the brush off the side of the road. There is no waiting area off the road free of vegetation. Any riders waiting for the bus must decide if they want or can wait on the curb in the brush or if they must wait in the street.

(Figure 19)



Some of the bus stops in West Goshen have amenities, The stop shown in Figure 20 on the south side of West Chester Pike at Five Points Road has a shelter, benches, and trash receptacle. It is accessible via sidewalk and is located close to the intersection to encourage safe crossings at the crosswalks. This bus stop contains some key features to keep it safe and accessible. Where it can be improved is by providing bus route information in the form of a map in the shelter. Instead it contains an advertisement, which may help provide some revenue. Additionally, the lack of a depression from the high curb may cause difficulty boarding the bus, depending on where it stops relative to the curb.

(Figure 20)



The stop on the north side of West Chester Pike near the eastern boundary of West Goshen contains a bench and a shelter, but is missing the trash bin and sidewalks, as well as not being located near an intersection or crosswalks.

(Figure 21)



The stop on the south side of West Chester Pike directly across from the previous one contains no features or traits that would lead to safe, accessible, or comfortable waiting or boarding. There are no sidewalks, no shelter, no benches, no crosswalks, barely any room outside the driving lanes to wait.

(Figure 22)



This stop on the north side of West Chester Pike near Rolling Road in West Goshen has a sidewalk leading up to it, but otherwise is similar to the previous stop in that there are no other safe or accessible features present to provide for riders.

(Figure 23)



4.3 REPORT OF COMMUNITY ENGAGEMENT DATA

Background:

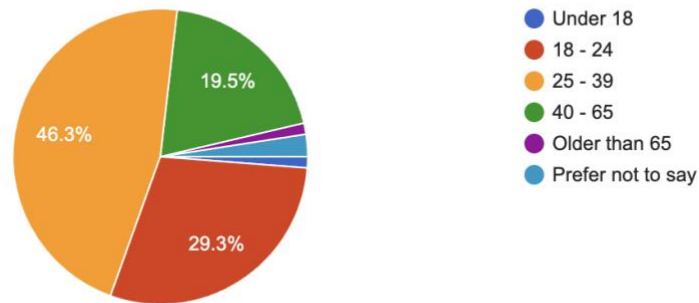
Community outreach efforts included a survey of riders at SEPTA bus stops within the study area. During the months of October and November, surveys were collected by team members approaching riders with paper copies of survey questions that were then compiled into a Google Form to produce visual results. Questions focused on equity within the SEPTA transportation bus systems. A total of 82 completed survey responses were received.

Demographics Section

Our response rate is such that our results do not necessarily represent the entire bus riding population of West Chester, West Goshen, and surrounding areas. However, the data can show significant trends by those willing to respond to the survey.

Age of Survey Respondents

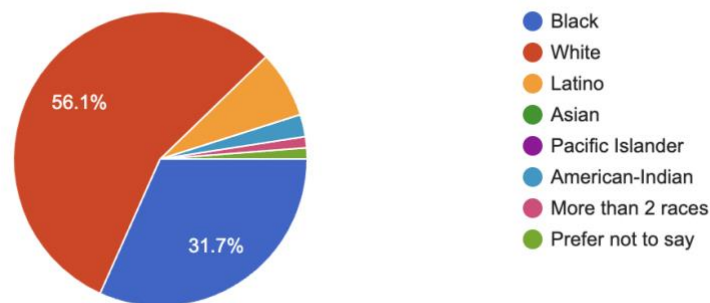
82 responses



Nearly half of all survey respondents were between the ages of 25 and 39 (46.3%). The next two most frequent age groups were 18-24 (29.3%) and 40-65 (19.5%).

Race/Ethnicity

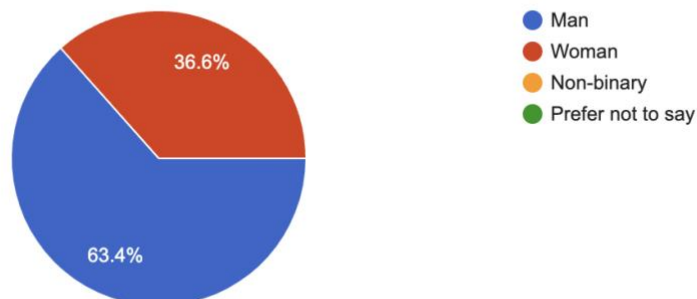
82 responses



A majority of respondents were white (56.1%) with another 31.7% being black. Latinos made up 7.3% of respondents. One factor that could decrease survey response from certain races and ethnicities is a language barrier, as the survey was only available in English.

Gender

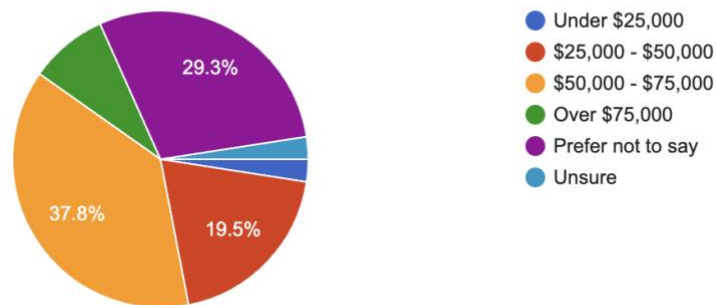
82 responses



Just about two-thirds of those that took the survey identified as male, with 36.6% indicating they identify as female. A factor for this could be that those that identify as female are less likely to engage with a stranger approaching them in public. Several people were unwilling to participate or talk about their experience, especially in bad weather.

Annual household income

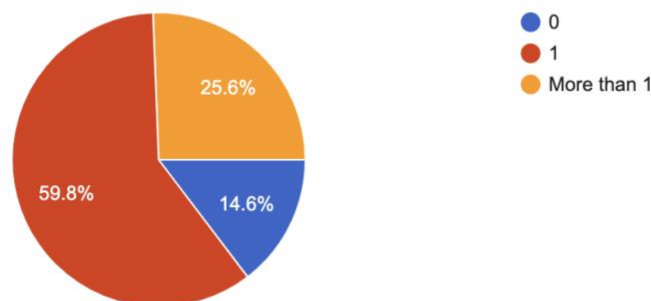
82 responses



The most frequent response to household income was \$50,000-\$75,000, with 37.8% of respondents choosing that response. 19.5% of respondents indicated their household earns between \$25,000-\$50,000 annually, but 29.3% declined to answer.

Household Cars

82 responses

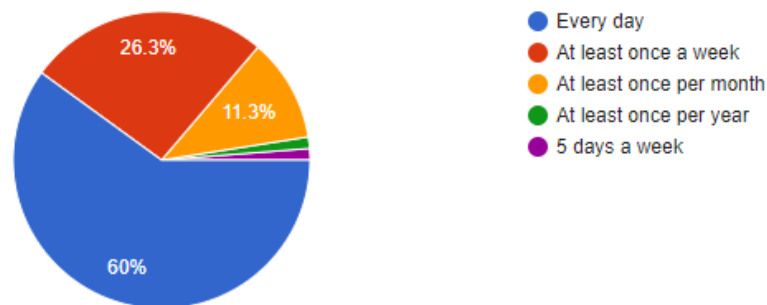


59.8% of respondents indicated their household had access to a car, and 25.6% more indicated their household had access to two. This contradicted our preexisting notion that many people utilize the bus in the study area because of a lack of access to a vehicle, but for many of our respondents, it is possible their vehicle or vehicles were being used by another member of the household, potentially for commuting purposes, and thus unavailable.

Ridership Trends

Frequency of Ridership

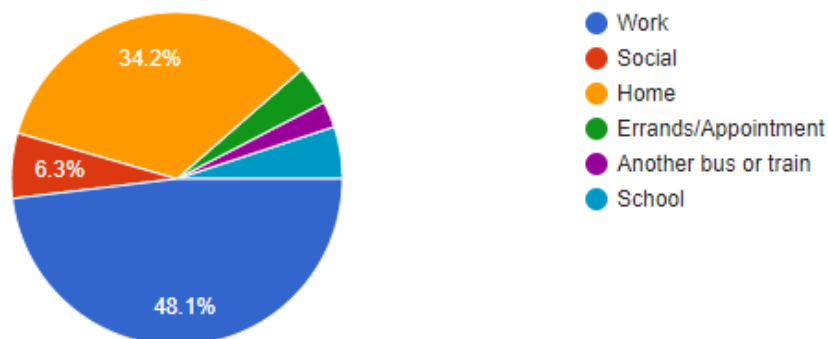
80 responses



Most respondents (60%) reported they take the bus everyday, with another 26.3% indicating once a week. Only 1.2% of respondents take the bus 5 days per week, mirroring a typical work schedule, and another 1.2% take it once per year. These figures indicate that those that take the bus likely rely on it for both commuting to work and for other trip needs such as errands or recreation. If riders do not have a SEPTA key card, they must have exact change of \$2.50 to ride. This can be discouraging to those that ride infrequently, as they may not carry change with them as required to board the bus. Instituting other ways to pay (credit card, digital wallet) or changing the fee to a flat dollar amount may encourage infrequent riders to utilize the bus.

Destination

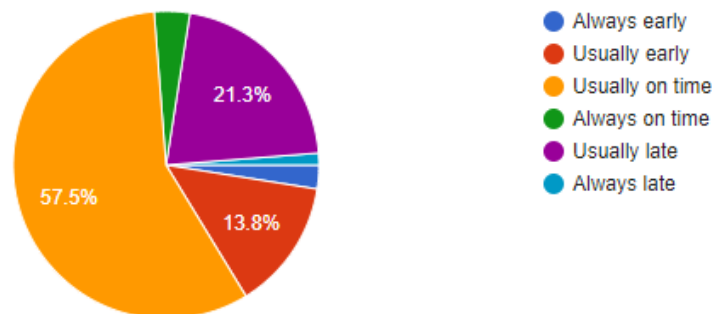
79 responses



Nearly half the respondents (48.1%) were traveling to work and another third (34.2%) were traveling home, for a total of 82.3% of respondents likely commuting when answering the survey. Depending on the

Bus Arrival

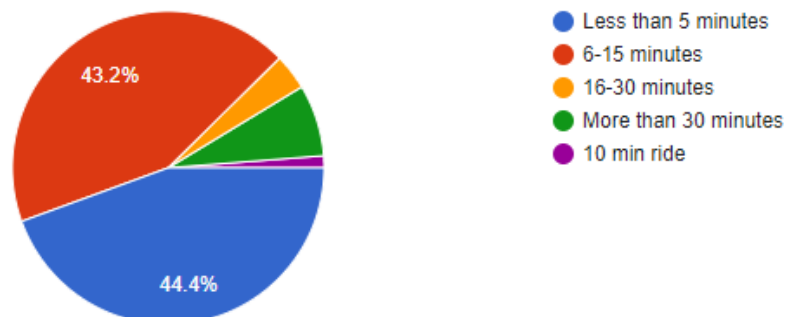
80 responses



Over half of the respondents indicated the bus is usually on time, and the next highest response was usually late at 21.3%. While it is undoubtable positive that most find the bus to arrive on time, further research should review if certain bus lines routinely arrive late and if so, where those lines reach within the greater area. Several riders shared that the bus sometimes does not show up, especially when it snows or it is late at night. Additionally, the only way to track arriving buses is through online means, such as the website or SEPTA app. If riders do not have access to a smartphone or wifi/cellular data, they are not able to track bus status or delay updates. Improvements to bus stops such as digital boards that update with bus arrivals can improve equitable access to changing bus schedules.

Travel Time to Bus Stop

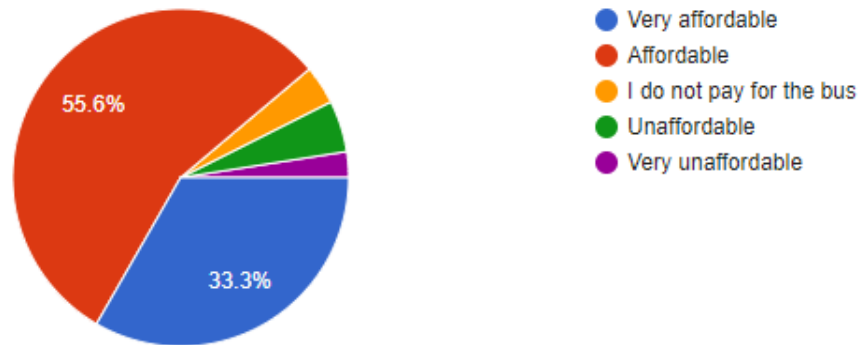
81 responses



44.4% of respondents indicated it takes less than 5 minutes for them to get to their bus stop, followed by 43.2% indicating 6-15 minutes. Most riders do not travel farther than 15 minutes to get to the bus stop, however 11.1% of respondents take over 16 minutes to get to their bus stop.

Bus Affordability

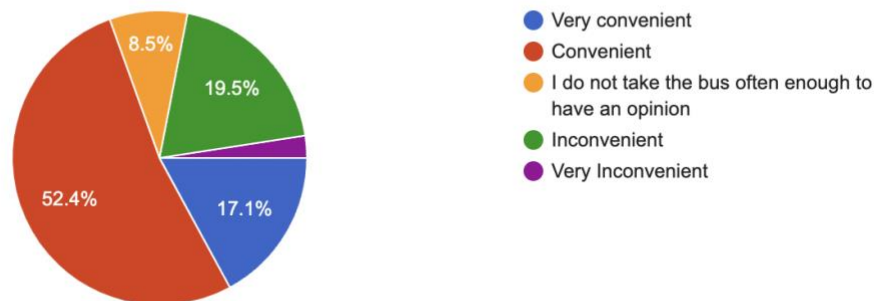
81 responses



88.9% of respondents indicated the bus is affordable or very affordable. Results from this question suggest that the bus rarely causes financial issues for riders. It is worth pursuing what types of people answered unaffordable and very unaffordable of the 7.4% that did.

Bus Schedule Conveniency

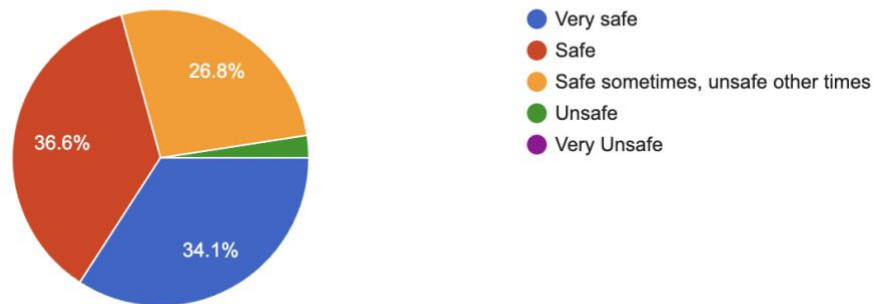
82 responses



Over two-thirds of the riders interviewed consider the bus schedule to be convenient (69.5% between convenient and very convenient) , however, the second most common answer was inconvenient. 21.4% of respondents answered inconvenient or very inconvenient. If over a fifth of respondents answered this way, then there must be some underlying issue with the bus schedule that affects people with a specific schedule.

Safety at Bus Stops

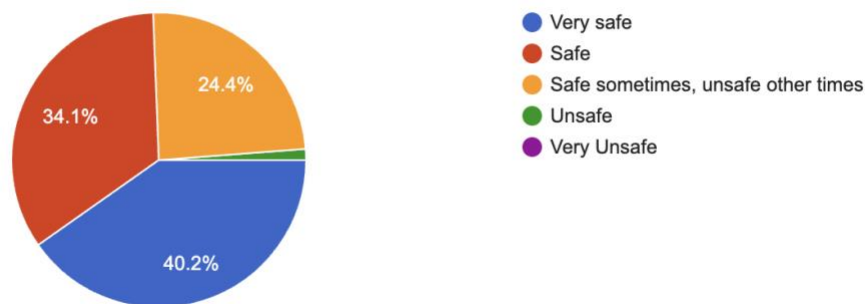
82 responses



Impressions of safety at bus stops resulted in varied responses, though 71.8% of respondents answered safe or very safe. 2.4% of respondents feel unsafe, while another 26.8% feel safe sometimes and unsafe other times. This answer may be related to the demographics of respondents, particularly the breakdown of gender identity.

Safety on Buses

82 responses



Thoughts on bus safety fell along very similar lines as bus stop safety, with very safe being the most common answer, followed by safe. Even less feel unsafe on the bus, at 1.2% of respondents.

5 POLICY RECOMMENDATIONS

5.1 ACTION ITEMS TO BE COMPLETED

- Coordinate with community organizations to conduct public outreach (regarding location and design of bus shelters) and maintain existing and future bus shelters
 - Chester County Opportunities Industrialization Center: <https://ccoic.org/about/>
 - West Chester Area Senior Center
 - Black Women of Chester County In Action
 - The Arc Of Chester County: <https://arcofchestercounty.org/>

- Reevaluate stop locations to account for those that rely on public transportation for commuting and mobility e.g. POC and low income populations
- Deliberately improve bus shelters in racially concentrated areas of poverty
 - Guidelines to add or remove a shelter: <https://www.metrotransit.org/shelter-guidelines>
- Add route and schedule signs to each bus stop
 - Examples from minneapolis–st. paul, metro transit’s better bus stops program





- Audits to ensure consistency with set schedules and arrival times
- Implementation of an SMS messaging system with status updates for those who cannot access TransitView in the app

5.2 3D MODELING/RENDERING

The first step toward creating a more equitable transportation system is to simply improve the design of the bus stops themselves. According to the DVRPC’s design guidelines, “a high quality bus stop is one that is well connected to the neighborhood or community it serves, accommodates the needs of all transit passengers safely and comfortably, and permits efficient and cost-effective transit operations” (2019). As noted on the field observations, many of the bus stops in the West Chester and West Goshen study area lack some of the basic features that should comprise a bus stop. Additionally, because of the suburban nature of the area, many of the stops are situated along high speed roads that lack any sort of accommodating infrastructure to help the rider navigate this hostile environment. To accompany this project’s efforts to investigate the state of public transportation in the area, the authors chose three different bus stops and used 3D technology to create 3D renderings on how these renderings might be improved. These designs represent an ideal bus stop that meets the DVRPC’s ideal description. These design standards are described in the following paragraph.

The first aspect of a bus stop is its actual geographical location, called “stop placement”. While there are many different factors that should be accounted for in determining the stop placement, this type of analysis was outside of this project’s scope. The location of the bus stops

chosen for the 3D rendering proposal were already established, and the authors did not have access to any of the relevant information that would be necessary to propose a new location. The second component of a bus stop is the “in-street design”, which refers to the space along the right of way allocated for the bus to stop and maneuver in and out of traffic. Again, due to a lack of knowledge with regard to traffic volumes, the authors could not propose an improvement with regard to this aspect. However, the 3D renderings did take into account the third and fourth components of bus stop guidelines: curbside design and stop elements.

Curbside design concerns the actual layout and design of the bus stop itself. The purpose of the design should be to establish a safe and functional space for passengers while they wait for their bus. While each bus stop’s design will depend on the capacities and limitations of its environment, there are four main basic elements included in any design . First is the loading area, which provides a space for passengers to board and exit the bus. At a minimum, loading areas should be five feet wide along the curb and eight feet deep (DVRPC 2019). Next, is the waiting area. The size of a bus stop’s waiting area depends on the volume of passengers expected to use it. The general rule is that each person should be allocated seven square feet, which includes any space provided by a shelter. Lastly, a pedestrian path is also an important feature to any bus stop. Since most passengers using the bus are also pedestrians traveling to and from the bus stop by foot, it is vital that they should have a safe and accessible path to reach the bus stop. The path should be four feet wide and should provide access to the waiting area and the loading area.

Stop elements include any street furniture or other features that are added to a stop for the ease and and comfort of the passenger. Street lighting, a shelter, benches, and trash receptacles are all examples of stop elements that create an enjoyable experience all waiting for the bus. These elements can be installed by an organization other than the transit authority, and oftentimes they are funded by nearby businesses and organization to improve the environment for their patrons or employees who might take transit. These elements also reduce the perceived time for the passenger to wait for the bus.

i. 3D Design Scenarios and Justifications & Costs

Dimensional guidelines for bus shelters were provided by the Delaware Valley Regional Planning Commission. These standards account for accessibility under the Americans with Disabilities Act in terms of how much space is needed within and around the shelter’s structure (Delaware Valley Regional Planning Commission, 2019). All exact dimensions can be found in Figure X, which were used as the basis for all proposed models.

Adding shelters to underdeveloped stops provides equitable access to tools used for riders. This could include the addition of further sanitation tools, area lighting, maps and bus schedules.

Figure 24: Dimensional Requirements of a SEPTA Bus Stop

Element	Details
Loading Pad	5 ft. (1.5m) long x 8 ft. (2.4m) deep; pad must be firm, stable, and slip resistant, and connected to the pedestrian path. Provides a 5 ft. (1.5m) diameter clear turning radius for wheelchair users. Where possible, loading pads should be provided for both front and rear doors to accommodate more passengers boarding and alighting. Sign should be located adjacent to the loading pad to clearly indicate bus stop.
Waiting Area	16 ft. (6.1m) long x 6 ft. (1.8m) deep between doors. After subtracting bench dimension, provides enough net area for 12 standing passengers at 7 sq. ft. (0.65m²) per person (86.3 sq. ft. or 8.01m² total), plus seating space for 3. Shelter design and configuration may vary.
Stop Area	26 ft. (7.9m) long area should be kept free from obstructions along the curb edge. The length should provide free access to vehicle's front and rear doors.
Pedestrian Path	Minimum 4 ft. (1.2m) deep pedestrian path, or wider, as called for by local sidewalk standards, along a sidewalk or walkway. Should be a firm, stable, and slip resistant surface connected to the loading pad and separate from waiting area. Keep 3 ft. (0.9m) clear around all street furniture and building elements.
Furniture	15 ft. (4.6m) long x 6 ft. (1.8m) wide x 9 ft. (2.7m) high shelter with lean rail, 3-seat bench, information, & ad panel. Glass panels allow view of arriving bus and weather protection. 78 net interior sq. ft. (7.2 m²) can accommodate 10-11 standing passengers plus seating for 3. Existing shelters may vary in size based on their location.

Source: *SEPTA Bus Stop Design Guides 2019*

1. Urban-High Density (Linden & High Street)

The crossroads of High Street and Linden Street in West Chester Borough is a currently unsheltered bus stop. This stop serves the 104 bus from the 69th Street Transportation Center in Philadelphia to the West Chester Transportation Center. Field observations reveal that those who use this stop often sit on the less visible steps to the local businesses while waiting. The desire for infrastructure is presented by the public.

(Figure 25-A: Urban-High Density Design Scenario Stop Model (Linden & High Street))



(Figure 25-B: Urban-High Density Design Scenario Model in Context (Linden & High Street))



Because the sidewalk is maintained by the West Chester Borough, the street corner meets the American with Disabilities Act accessibility metrics. The space provides the proper dimensions and aspects of the bus shelter as required by SEPTA and Chester County (Delaware Valley Regional Planning Commission 2019). Figure 25-B places the proposed shelter into the space in front of the businesses. The space has enough for the two necessary loading zones as well as the pedestrian walkway. The addition of the bench within the shelter will allow for riders to view the incoming bus from the street and prevent trespassing on private property of the local businesses.

According to the community survey, the majority of riders surveyed are on a work and/or home commute. This area is surrounded by employers, local businesses, and residential housing. This area has high visibility along a major roadway. The stop is equipped with amenities such as streetlights and sanitation. This would decrease the overall cost of the construction of the shelter.

2. Suburban High Volume/High Speed Road (1330 West Chester Pike)

(Figure 26-A:)



(Figure 26-B:)

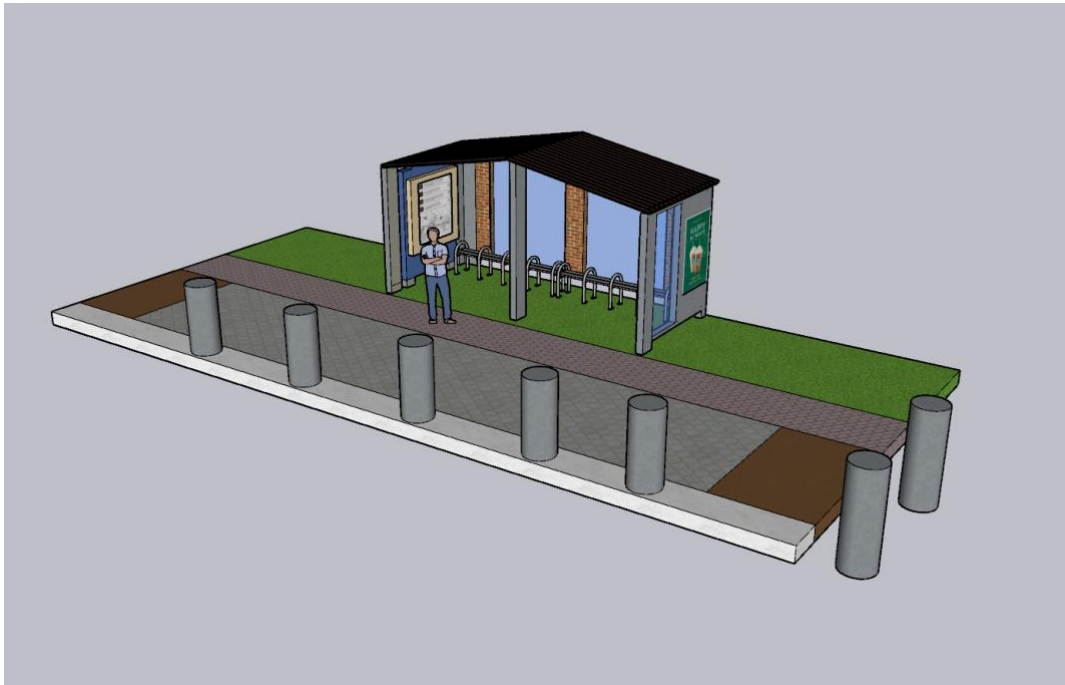


Most of the land in this section is maintained by West Goshen Township. This multi-lane commuter line is lined with frequent bus stops and apartment complexes. This bus stop was designed with the recommended dimensions of SEPTA, Chester County, and the ADA in mind (Delaware Valley Regional Planning Commission, 2019). Figure 25-B places the proposed shelter in front of one of the aforementioned apartment complexes. This space has two entrance points: one bench accessible via an elevated step, and one empty space designed for wheelchair accessibility. This sheltered bus stop is designed to improve user safety and comfort while waiting for the bus on a high volume road. The compact design allows these shelters to be made cheaply and frequently.

The stop is additionally equipped with a sample SEPTA map and space for potential advertisers. This design additionally contains streetlights for safety and a concrete and brick floor for wheelchair accessibility.

3. Semi-Suburban Near Large Employer (West Goshen Shopping)

(Figure 27-A:)



(Figure 27-B:)



Lastly, the bus stop along Paoli Pike fronting the West Goshen Shopping Center was chosen to be improved. Due to the 15 businesses in close proximity, passengers travel to this location via transit as both shoppers and employees. However, the current of state of the bus stop does not reflect this high usage. The bus stop lacks a shelter, a bench, lighting, trash receptacles, and bus route information. Instead, passengers are compelled to wait for their bus several feet from a high speed corridor with no easily identifiable loading or waiting area, nor a pedestrian path.

Along with the renderings described above, the 3D model for an improved bus stop at this sight adheres to the DVRPC guidelines and general universal design standards. The model includes a sizeable waiting area eight feet deep and 38 feet long, which could hold about 38 people, not including the area underneath the shelter. The pedestrian path is four feet wide and provides access to a vegetated and landscaped walkway that leads to the area's grocery store. In addition, the loading area adheres to the eight feet deep and five feet wide standards establishing the guidelines. There is also lighting, trash receptacles, landscaping, concrete barriers to protect the passengers, route information, and vertical space for advertising.

Budgeting:

Estimated costs of price and material fluctuate on the basis of inflation, however similar projects can act as a guide to understand budgeting thresholds. The University of Indiana constructed a high budget shelter with facilities at a reported external cost of \$594,000 and additional maintenance costs of \$100,000 in 2011 (Indiana University, 2011). This went towards the construction of one high volume facility rather than the multiple proposed smaller facilities.

Federal and state grants to transportation networks are offered at competitive rates dependent on the goal of the grant. Grants are often offered to transportation systems seeking more sustainable and equitable means of operations, including the "Rebuilding American

Infrastructure with Sustainability and Equity” Program (U.S Department of Transportation, 2022). In addition, the proposed stops provide an opportunity for advertising revenue. New York City advertising offers four week cycles for the shelter posters with an estimated range of \$1,600-\$6,000 per stop (Blue Line Media, 2022). The money from advertising inside the bus shelter could assist in funding maintenance and overtime become profitable.

Figure 26 - Sample Budget for Bus Shelter

Item	Cost
Price of Structure	Estimated \$600,000
Price of Maintenance	Estimated \$100,000
Advertisement Revenue	Range of \$1,600-\$6,000 in ~4 week cycles
Grants/Funding	Competitive Rates

5.3 LOOKING TOWARDS A MORE EQUITABLE FUTURE

When individual driving becomes an impossibility, public transportation must be developed enough to fill the need of a community without that ease of access. Within the subject area of West Chester and Goshen, access to public transportation has proven to be few and far between. . The typical travel time for residents in West Chester is roughly 25 minutes, despite the fact that ridership and station and stop conditions may be better (Chester County Planning Commission & Delaware Valley Regional Planning Commission, 2014). Most public bus stops seem to be missing one form of “amenity” (if they may even be called such; most are presumably basic requirements for equitable access) The coronavirus pandemic has resulted in further safeties and protections in need of application, such as hand sanitizer dispensers, face masks, and potentially plastic barriers in high traffic bus stations. Within our study area, the surroundings of the transport pickup and drop offs warrants the most urgent attention, as this could assist in generating the most increase in equitable ridership. Environmental concerns also play into the need for a revamped transportation system, as our study area would benefit from the infrastructure boost by allowing for a decrease in the mass amount of independent vehicles being operated on a day-to-day basis. Environmental justice is a great example of a model in which other justices related to transportation can be formulated from, and therefore special consideration should be made to include the ideas founded in that school of thought.

Based on the information provided from the community outreach and surveying that was completed, it is unsurprising to discover that answers were polarized on the topics of safety, convenience, and affordability. The majority of bus riders identified as white and viewed the

public transportation system as mostly convenient, affordable, and safe. This poses the question whether or not opinions would be shifted if this demographic was not included in the final data. With planning decisions, it is always the wiser choice to aim towards inclusivity rather than the latter to ensure that access remains the best it can for the most amount of people. The use of public transportation is increasing as a result of rising gas prices and advances in mobile technology. In addition, urbanization is on the rise as a trend that is moving away from suburban areas. For the current users and anticipated additional users in West Chester, public transportation and its upcoming enhancements are crucial.

Transportation is an innate part of the human experience. As mentioned previously, it is quintessential to the functions performed by society: for career, recreation, medicine, nourishment, etc. Certain irresponsible planning decisions from previous decades have created an unusual predicament where transportation, more specifically convenient transportation, is not readily accessible to all people. David Hodge, author of *Traditional Building Magazine* and co-director of the film “Life on Wheels: Transportation for a New Urban Century”, expresses this concept perfectly: “Transportation is an unusual public service in that it is not consumed for its own sake but, rather, as a means to another end. Thus, the value of the service depends primarily on how well it provides access to other places” (Guildford Press, 1995). Planning for a more equitable future for our public transportation system will ensure that current issues with our system will not reappear in the future, and help the members of our community continue to pursue their needs and interests with ease of movement and peace of mind.

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