



Article

Impacts of Local Transit Systems on Vulnerable Populations in Michigan

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Abstract: Residents in small urban and rural areas frequently depend on unreliable personal transportation to maintain their lifestyle and get to essential destinations within their society. Especially, vulnerable populations, such as seniors and low-income residents, have lower access to personal vehicles and therefore are mobility-challenged. Being challenged in terms of mobility has effects on the health of the population concerned as this constraint not only limits economic activity that leads to perpetuation of lower means and poverty but also social activity that leads to physical and mental isolation. In a study of Michigan public and nonprofit transit systems, the customer satisfaction, particularly of vulnerable populations, with transit services is analyzed through on-board intercept surveys. Results illustrate the significance of employment, age, income, disability, and demand-response services in public transit planning and ultimately public health.

Keywords: vulnerable populations; seniors; low-income; transit; accessibility; satisfaction



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1. Introduction

In small urban and rural areas of the United States, those who do not have access to private vehicles, typically seniors and individuals with disabilities, are increasingly reliant on available paratransit services. Paratransit is a flexible demand-responsive form of public transportation planned for transporting mobility-impaired individuals.

Transit service in small urban and rural areas is considered a vital lifeline for the at-risk population, especially because it provides opportunities for riding into town for necessary services [1]. In such areas where fixed-route transit is not a viable option, transit agencies usually provide demand-response services, which operate more on a flexible schedule and route depending on the demand from the riders. While the majority of literature on public transit and the at-risk populations focuses on large urban transit systems and economic benefits that can be garnered from such services, the availability of literature on the necessity of transit, and especially demand-response service, for rural seniors or those with low income is scarce. More importantly, the link between transit availability and an individual's socioeconomic opportunity must be recognized as an important piece of transit valuation in lesser-populated regions.

Much of the scarcity in the literature on the ability of at-risk populations to reach necessary goods and services is due to an inherent bias toward evaluating transit services simply based upon their economic footprint. Researchers ran an economic analysis of the monetary benefit that public transit can provide in small urban or rural areas, determining that, on average, every dollar spent on transit infrastructure in small urban and rural areas in the United States led to a return on the investment plus additional benefit [2]. However, the study left out the human/social element of the economic evaluation, an element that would focus on the ability of transit riders in these areas to access means of social empowerment or potential employment that may otherwise be unattainable [3,4]. Such a shift requires a more holistic approach regarding how transit can provide a necessary

social link for those lacking other means of transportation. This result, in turn, can be beneficial by providing the at-risk populations with quality transit while simultaneously bolstering the local economy and public health.

A second key determinant in the service provided by transit agencies is the level of customer satisfaction. While large urban transit agencies can afford to undergo agency-specific customer evaluations of service, it is a financial burden for a small urban or rural transit agency to perform a similar task. In the state of Michigan, only agencies in locations that could be defined as “large urban”, such as Detroit and Ann Arbor, were able to finance a customer satisfaction survey through agency funding sources. None of the small urban or rural transit providers in the state reported undergoing a similar evaluation process. Our study fills this gap in the literature by providing an overall evaluation of customer satisfaction for smaller transit agencies in Michigan. The main research question of the study is to assess the satisfaction and importance of various transit elements to the vulnerable populations using it. The aim is to understand the characteristics of vulnerable populations, who are specifically mobility-challenged, and the relationships with various elements of public transportation. The purpose of this paper is to understand the needs of underserved riders of public transportation, such as seniors and low-income populations, and the implications for livable transit-friendly Michigan communities.

2. Literature Review

2.1. Background on Public Transit for Seniors and Low-Income Earners

Generally, public transportation is provided in two different ways: fixed-route transit systems and demand-response systems. Fixed-route systems typically have busses running on fixed, predetermined routes serving the majority of population living in denser urban areas. Demand-response systems are more flexible transit systems in smaller urban and rural areas where buses/smaller vans run on routes depending on the demand from the passengers. Passengers are usually picked up and dropped off, and rides are required to be scheduled in advance to allow the transit agency to create routes for the day based on service demand.

2.2. Need for Public Transit

Senior citizens comprised 13% of the population of the United States in 2010, and it is estimated that the number of seniors, defined as age 65 or higher, will continue to grow in the coming years [5–7]. As the senior population grows, their need for services, both formal and informal, will see a corollary increase [8,9]. It is therefore paramount for transit agencies to be capable of serving the needs of this growing population. In addition, adopting policies to enhance and improve paratransit services could address the mobility needs of the aging population as they lose the ability to drive [10]. There is a wide range of literature on serving the needs of seniors by using transit. In general, senior citizens are defined by limited mobility, lack of access to personal vehicles, and lower incomes.

An increasingly important concept in meeting the needs of the senior population is the “aging in place” phenomenon. “Aging in place” defines the desire of older Americans to stay in the same place as they age instead of moving, often to long-term care units such as assisted living facilities. Seventy-five percent of respondents age 55 or older in an AARP study agreed that “what I’d really like to do is stay in my current residence for as long as possible” [11,12]. A majority of the respondents said that family, friends, and proximity to familiar places are the main reasons why they decide to stay in their current location [13,14]. The “distance decay” theory is especially important for the senior population because they feel safer the closer they are to their home or a comfortable locality. The further away they are from a place that they deem to be comfortable or safe, the more fearful they are of their surroundings [15]. Fear of “cold” nursing homes or retirement living centers further complicates matters in regard to the housing preferences of seniors by lessening their interest in moving into such a facility [16]. This phenomenon has created a major issue because many communities in the United States lack the proper physical or social infrastructure to

sufficiently serve their senior population as it ages in place [14,17]. It is therefore important for these communities to be able to adapt their infrastructure and transportation options to meet the needs of their senior population. Creating community guidelines for age-friendly communities and determining funding priority has been identified as a first step toward meeting the needs of the senior population [18,19].

Though public transit has been identified as a key factor in fulfilling the transportation needs of seniors, it is unable to reach a significant portion of the target population. Seniors also often see public transit agencies as unwilling or incapable to meet their personal needs due to perceived safety threats and visibility and hearing limitations that prevent straightforward navigation [20–22]. Long wait times, inconvenient operating hours, and lack of personal safety are some of the most commonly cited criticisms that seniors have for public transit systems [20,21]. Forty-three percent of seniors say they live in areas where there is little to no public transit service, which increases their reliance on the private automobile for travel [23]. Many seniors report being afraid to use public transit because they are unsure of how to access schedule information or do not understand the process of riding in transit vehicles [21,24]. Thirty-five percent of respondents in a 2012 survey of Hennepin County, Minnesota, seniors replied that they were not familiar with available transit services [25]. However, Denson found that older riders, especially those who were completely transit-dependent, were more satisfied with Delaware Dial-a-Ride services than younger riders; this was likely due to the younger riders having access to a greater number of transit alternatives [26]. Researchers are advocating for increased transit services, especially demand-response and paratransit service, and funding to deal with the disconnection between seniors and current public transit service [27–29].

In order for transit to best serve the needs of the senior population, the transit systems themselves must be accommodating to the wide variety of needs of seniors. Decreased vision or hearing impairments make it difficult for seniors to use transit. Dirty bus windows can impede a senior's ability to identify landmarks that signal them to the proximity of their destination [22]. Another significant factor causing seniors to hesitate or avoid transit is a perceived lack of safety. If they did not feel safe, whether at transit stops or on the transit vehicles themselves, then there was little interest in utilizing that transit mode again. Seniors are documented to be more fearful of their personal safety than the general population [15,30]. Patterson [22] found a high number of senior respondents who were afraid of potentially being physically assaulted while waiting for a transit vehicle, more so than the number afraid of being assaulted on an agency vehicle. Many respondents in Patterson's survey advocated for the addition of emergency call boxes at bus stops or on agency vehicles or other measures to deter potential attackers and to provide a relative level of comfort while waiting for and using transit vehicles [22].

2.3. The Low-Income and Their Relationship to Public Transit

Transit demand in America is heavily influenced by riders who are slotted into the lower income brackets, many of whom live at or below the poverty line. For many of these persons, public transportation is the main lifeline for reaching employment and vital services such as doctors or grocery stores. However, equity in regard to reliable access of public transportation is a glaring difficulty that has no clear-cut answer. Researchers suggest that public transportation itself is a major determinant in why the poor live in high-density portions of inner cities [31].

However, it is increasingly common for the poor to be unable to easily access transit. This is defined as the concept of the "transit desert". A transit desert is a concentrated area where resident demand for public transportation is non-existent or vastly undersupplied [32]. Such a scenario places significant pressure on those affected, as most do not have alternative means of transportation. In areas where public transportation services are poor, it can have a devastating impact on the transit-dependent person's employability. What jobs are available to the working poor are often located in the suburbs, which besets a problem of access. A lack of access to those employment opportunities, or the similar

problem of service not running late enough to provide return service home, can prevent workers from being employed in those jobs [3,4].

One of the major obstacles to low-income persons is the lack of availability of private automobiles. Private automobiles are often maligned in studies of public transportation due to their dominance in civil society. However, despite the detractors, many low-income persons would still prefer to own a vehicle rather than take public transit [33]. Though transit may be championed as the modal option that provides the best level of equity across social classes, it may not always be the option of choice for those with financial hardship.

Researchers surmise that it is the private automobile, rather than transit, which is paramount to providing employability to the low-income. Their thesis is based upon the premise that public transit is not reliable enough to ferry someone to a job, which overrides the increased cost of owning a private vehicle [33]. A study of 73 low-income persons in the San Jose, California, area determined that exclusively the group utilized no one mode of transportation. Instead, the respondents would change their mode choice based upon various economic factors, such as the cost of bus fare or gas [34]. In inner-city Detroit, where infrastructure is failing and transit may not be readily accessible, many low-income residents who would otherwise benefit from transit service are forced to rely on automobiles as their primary means of transportation [35,36]. It is therefore paramount for transit systems to remain competitive in the transportation market.

The low-income population is generally regarded as “transit dependent” and therefore a captive market for public transit services. Similarly, the literature suggests that higher-income riders, termed “choice riders”, are the primary focus of agency efforts and marketing due to their freedom of discretion regarding modal choice [37,38]. Some researchers found that low-income riders in Chicago were more likely to experience problems with transit services than choice riders. However, given their inability to rely on other modes, they are forced to “put up” with existing service despite their relative dislike for it [39,40].

Due to a lack of funds, opportunity, and mobility for low-income and senior populations, a heavy reliance on public transit services is formed [14,39,40]. With the focus of large transit systems being rail operations, which are marketed toward riders of a higher income bracket, bus lines that remain a lifeline for low-income workers are underfunded and underserved [38,39,41,42]. As public transit is increasingly considered not reliable enough to ferry someone to a job, the low-income population is discontent with the services they receive [33,39,40], while due to the distance of senior residences, their age group is underserved simply in part of their location [14,23]. There is need for increased demand-response, paratransit service and funding to deal with the disconnection between seniors and current public transit service [29]. This increased access to transit and thereby mobility would enable the vulnerable, underserved population to lead healthier, independent, and active lives. This is crucial not only in terms of public health but also in terms of economic health and social equity.

3. Methodology

Based on the literature review, this study aims to test the following hypotheses:

Hypothesis 1: *Seniors are more dissatisfied with public transportation services than the younger population.*

Rationale: As seniors are afraid of taking unknown transit and are more fearful for their physical safety than the general population, seniors are more dissatisfied with public transportation services [15,21,24,30].

Hypothesis 2: *Seniors, retired, and unemployed are less time sensitive to public transportation than the employed.*

Rationale: As Garasky et al. [33] surmise that public transportation is not considered reliable enough to ferry someone to their place of employment, we predict that the populations who are not typically employed, such as seniors, retired, and unemployed, will be

less time sensitive to public transportation than those who are employed and concerned with arriving to work on time.

Hypothesis 3: *Customer satisfaction is higher with higher income levels.*

Rationale: The low-income population is considered “transit dependent” relying on public transportation for all their transportation needs, despite their dislike for the system [39,40]. This is in direct comparison to higher-income “choice riders” who only ride public transportation when they choose to; thus, we predict higher-income “choice riders”, who are not subject to daily transit worries, will illustrate a higher level of customer satisfaction [37,38].

The study implemented an on-board intercept survey, relying on interpersonal reactions between the survey takers and potential respondents in order to gain useful responses to survey questions. We conducted these surveys over three years (2016–2018) after pilot testing the surveys within two agencies before its state-wide launch. Reporting on that time period is ideal as the effects of the COVID-19 pandemic did not affect the ridership or the perceptions of riders as it obviously has done so since then. We collected 5259 surveys, with results for the survey organized into four categories: customer satisfaction, trip purpose, most frequently asked transit agency questions, and demographics. The questions on satisfaction were all 5-point Likert-scale questions ranging from Very Satisfied to Very Dissatisfied. All other questions were multiple-choice ones with just one question at the end for comments on the transit system that was open-ended. Across the state, respondents provided positive feedback. Customer satisfaction was very high as the majority of respondents answered Very Satisfied for every question in this category. While many previous surveys have focused on utilizing the Internet as a tool on which individuals may fill out a survey, the intercept method has proven to provide tangible and quality results [43]. The survey asked riders about the quality of their experience riding on the transportation system, including timeliness of vehicles, comfort in the vehicle and at stops, cleanliness of the vehicles and stops, the ease of using the system and finding needed information, the quality of customer service provided by drivers and staff, the overall safety on the vehicle, and the affordability of the ride. The survey also contained questions on demographics of the riders, such as the race of the respondent, their age, their employment/retirement status, annual household income, and if they had any disabilities or needed special assistance from drivers or the transit agency. These questions, while basic, painted a better overall picture of who respondents were and why they were utilizing local transit services. Origin and destination questions were asked of respondents to better understand the purpose of their trip. The final question in the transit surveys was alternative modal options, which provided insight into the mobility of respondents outside of the bus system, highlighting those who had no other transportation options and relied on the transit service as a lifeline.

We conducted our analysis using *T*-tests and multi-variate linear regressions. *T*-tests are commonly used to “compare the means of two independent groups in order to determine if there is statistical evidence that the associated population means are significantly different” [44]. *T*-tests are found to give accurate results that are close to the “truth” when analyzing Likert or ordinal data if there is a large enough *N* [45], and with the large sample size from this study, we satisfy that condition for using this test. In addition, the values for some of the variables have been squared to attain normalcy in the data, an assumption for using the *T*-test. Since the *T*-test looks for significant differences in means of two groups, the use of the squared data is interpreted in the same way as the original (un-squared version). The satisfaction variables included in this portion of the study were satisfaction with timeliness; comfort; cleanliness; information availability; and customer service.

For the regression analyses, all but two satisfaction variables were an average of several sub-questions under that category. Satisfaction with Safety and Satisfaction with Cost are the two variables that are not averages, as these categories only consisted of one question and no averaging was necessary. The rest of the satisfaction variables were averaged over the sub-questions asked within that category. Regression modeling was

performed with the ordinal independent variables of age and household income, with categorical variables of gender and employment status as well. We could also possibly treat the employment status variable as ordinal as it went from employed and self-employed at lower numbers to unemployed at higher numbers. Because these variables were ordinal (showing a clear ordering of the variables) we can determine if the dependent variable, satisfaction, is related to increases or decreases in the passenger age, household income, or employment status. Prior to running the regressions, the kurtosis and skewness for both sets of variables were tested to determine the normalcy of the datasets. Both of the ordinal independent variables were determined to be appropriate for regression modeling; satisfaction with timeliness, comfort, cleanliness, information availability, and cost needed to be treated and then were determined to be appropriate to run regressions on. Satisfaction data for customer service and safety were not able to be normalized and were therefore not included in the regression analysis. Lastly, the regressions were conducted with variables that would not introduce multi-collinearity. All VIFs were below 1.2.

4. Results

4.1. *Passengers over and under 65 Years of Age (Testing Hypothesis 1)*

We asked transit riders about their age. The youngest demographic of under 25 years of age comprised less than 15% of riders, with the 35- to 54-year-olds holding the highest response of over 25%. However, with 55- to 64-year-olds with over 20% ridership, and those 65 years and older as well with over 20% ridership, it is safe to say that the general trend of age in those surveyed leans to an older rider. For the *T*-test, respondents were grouped into two groups: under 65 and over 65 years of age. Of all 5259 responses, 1091 (20.75%) identified as over 65. A total of 427 of these respondents (39.14%) said they would not make their trip if they were not using public transit, and 334 (30.61%) responded that “doctor” was the origin or destination of their trip. The *T*-test showed that riders over 65 were significantly more satisfied with all variables than riders under 65 (see Table 1). Descriptive statistics for the variables used in the regression analyses are shown in Table 2. The regression results, which used 4634 responses because some responses were left out of the analysis due to missing values, also indicated a significant, positive relationship between the “age” variable and satisfaction levels for *Timeliness*, *Cost*, *Information Availability*, *Cleanliness*, and *Comfort* (see Table 3). Our findings reject Hypothesis 1. Instead, we illustrate that senior populations are more satisfied with their transit systems.

4.2. *Employed and Unemployed Passengers (Testing Hypothesis 2)*

We asked transit riders about their employment. A total of 35% of riders surveyed indicated that they were employed for pay outside their home. Over 30% of riders responded they were retired, and a little less than 15% indicated they were unemployed. Other options selected were self-employed with over 5%, student with less than 10%, or homemaker with 5%. Passengers were asked to describe their employment situation during this survey. The possible responses included the following: employed for pay outside your home, self-employed, student, homemaker, unemployed, or retired. For the *T*-test, responses were grouped based on whether the respondent was employed (either employed for pay outside their home or self-employed) or unemployed (a group including all other possible responses). The *T*-test showed that unemployed riders were slightly yet statistically significantly more satisfied with timeliness. On the other hand, the regression results indicate that those who were employed or self-employed were significantly more satisfied with *Timeliness*, *Cleanliness*, and *Comfort*. We would tend to go with the results of the *T*-test here because the employment variable is considered somewhat ordinal (and more categorical in nature) as the lower numbers indicate employed or self-employed while larger numbers indicate unemployed. So in essence, the regressions would not be the ideal test with this variable.

Our findings accept Hypothesis 2, which stated that seniors, retired, and unemployed are less time sensitive to public transportation than the employed.

Table 1. Results of *T*-tests.

Variable	Mean and SD	Timeliness	Comfort	Cleanliness	Info Availability	Customer Service
Age						
Group 1: Under 65 years (n = 3674)	Mean SD	17.1 7.6	17.3 7.5	17.9 8.2	17.1 8.0	19.2 7.2
Group 2: Over 65 years (n = 1091)	Mean SD	19.5 7.2	19.6 7.1	20.1 7.6	18.9 8.0	21.5 6.4
t-value		−9.37 ***	−9.03 ***	−8.25 ***	−6.69 ***	−10.17 ***
Employment						
Group 1: Employed (n = 1773)	Mean SD	17.4 7.4	17.5 7.3	18.2 8.1	17.3 7.9	19.5 6.9
Group 2: Unemployed (n = 2902)	Mean SD	17.8 7.8	18.0 7.6	18.5 8.2	17.7 8.0	19.8 7.2
t-value		−1.97 *	−1.94	−1.03	−1.84	−1.24
Income						
Group 1: Under USD 25K (n = 3131)	Mean SD	17.1 7.7	17.3 7.6	17.9 8.3	17.5 7.7	19.3 7.3
Group 2: Over USD 25K (n = 739)	Mean SD	18.1 7.2	17.8 7.2	18.4 7.8	17.7 7.9	20.1 6.5
t-value		−3.46 **	−1.62	−1.70	−0.73	−3.17 **

*: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$. Dependent variables are squared for *T*-tests than employed riders (see Table 1).

Table 2. Descriptive Statistics for Variables used in Regressions.

	Mean	Standard Deviation	Kurtosis/Skewness
Dependent Variables			
Timeliness (Avg Squared)	17.78	7.52	−0.36/−0.80
Cost (Squared)	18.48	8.86	−0.63/−0.94
Info Availability (Avg Squared)	17.59	7.99	−0.40/−0.86
Cleanliness (Avg Squared)	18.55	8.03	−0.40/−0.92
Comfort (Avg Squared)	17.95	7.38	−0.31/−0.80
Independent Variables			
Gender	1.57	0.51	n/a
Age	4.18	1.43	n/a
Employed (Sq. Root)	1.80	0.66	−0.47/−0.72
Income (Sq. Root)	1.23	0.79	−0.83/0.10

N = 4634.

Table 3. Regression Results.

	Timeliness	Cost	Info Availability	Cleanliness	Comfort
Gender	0.05	0.13	0.39	−0.08	0.02
Age	0.92 ***	0.99 ***	0.52 ***	0.68 ***	0.69 ***
Employment	−0.61 ***	0.15	0.12	−0.91 ***	−0.75 ***
Income	−0.21	0.52 ***	0.43 **	−0.34 *	−0.45 **
Constant	16.46 ***	14.22 ***	14.65 ***	19.94 ***	18.37 ***
Adj. R-Square	0.047	0.038	0.015	0.056	0.044

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. N = 4634.

4.3. Passengers with Combined Annual Household Income under and over USD 25,000 (Testing Hypothesis 3)

We asked transit riders about their total combined annual household income. Over 80% of riders surveyed indicated that their total combined annual income was less than USD 25,000, with 40% of riders indicating that their total combined annual income was less than USD 10,000. Less than 5% of riders surveyed identified as having an income of USD 75,000 or over, illustrating that the majority of riders are low-to-moderate income. Riders were asked to identify their combined annual household income range in the demographic portion of the survey. Tests were run on two groups of respondents: those with an annual combined household income of less than USD 25,000 and those with an annual combined household income of more than USD 25,000. The *T*-test showed that riders with an income of more than USD 25,000 were more satisfied with timeliness and customer service than lower-income riders (see Table 1). The regression results indicate that income was positively and significantly associated with satisfaction with *Cost* and *Information availability* but negatively associated with satisfaction with *Cleanliness* and *Comfort*. The test with *Timeliness* showed income was not significantly associated with it. While not all the variables for satisfaction of transit were found to rank as more satisfied amongst transit riders with a total combined annual income above USD 25,000, the exceptions of our findings on timeliness and customer service partially accept Hypothesis 3, which states that customer satisfaction for cost and information availability is higher for transit riders with higher income levels.

Although we did not hypothesize about the other variables, we did run regressions on some of the other variables with the satisfaction categories. The regression models overall were significant. However, the selected independent variables taken together account for a small fraction of the variation (ranging from 1.5% to 5.6%) in the satisfaction (dependent) variables. The results indicate that gender was not significantly associated with any of the satisfaction variables, age was positively and significantly associated with all of the satisfaction categories, employment was significantly and negatively associated with *timeliness*, *cleanliness*, and *comfort*, and income showed mixed results with positive relations with *cost* and *information availability* and negative relations with *cleanliness* and *comfort* (see Table 3).

5. Discussion

As the senior population characterized by limited mobility and preference to age in place is expected to grow, the need to bridge the transit gap intensifies [5,6,12]. While the majority of literature points to the dissatisfaction of seniors in their local public transportation [20,21], those who identified as seniors in this survey were satisfied with all characteristics of their transit service more so than any other rider as results of the *T*-test and regression analyses show. The 39.14% of senior riders who would not have made the trip without public transit and the 30.61% who used the transit service to access their health-care provider further illustrate the necessity for continued accessible public transportation options for seniors. Furthermore, 72.5% of the trips made by seniors were non-essential or choice trips (trips that were not to work, medical appointments, or school/college). This indicates that these seniors are able to be mobile in their communities and participate in social activities, a critical component to their physical, mental, and social wellbeing. However, this also leads to implications for those seniors who do not/are not able to use public transportation and might not be mobile within their communities. Policy implications point toward a consistent level of demand-response transit services throughout the State such that seniors are able to access it and be physically and mentally active.

Garasky et al. [33] surmise that public transit is not reliable enough to ferry someone to a job, for with employment and the livelihood of their family on the line, timeliness becomes of paramount importance in daily transportation for low-income communities. Given the inability to rely on other modes in order to maintain their employment, low-income communities are forced to “put up” with existing service despite their relative

dislike for it [3,4,39,40]. Therefore, riders who are not restrained by employment, those who identified as elderly, retired, and unemployed in our survey (62% of our sample), were proven to be less time sensitive to public transportation than employed riders according to the *T*-tests; however, regression analysis results pointed out that those who were employed were more satisfied with the timeliness, cleanliness, and comfort of their transit system, and they were less satisfied with cost and information availability.

On the contrary, our *T*-tests on employment, analyzing the riders who were employed, show they were less satisfied with the transit system than those who are seniors, retired, or unemployed, specifically with timeliness. A total of 38% of this group of respondents (seniors, retired, or unemployed) and 40% of retired respondents only indicated they would not make this trip if it was not for public transit. This points to another critical policy implication that improving access and performance of public transit would help the marginalized population that is not “employed for pay” with being able to get to their daily destinations within their communities without being isolated.

The lack of investment in transit directly affects low-income riders, creating a captive market for public transportation despite being discontent with the services they receive [33,37–42]. Our findings from the *T*-tests illustrate that low-income riders are less satisfied than higher-income riders for timeliness and customer service, echoing the need to address this underserved population. Those who identified as passengers with a combined annual household income of under USD 25,000 (80% of the sample) were less satisfied with the timeliness and customer service of their local transit than those households with an income above USD 25,000. The regression analyses showed that higher-income riders were more satisfied with cost and information availability and less satisfied with the cleanliness and comfort on their transit system. This is understandable as those with higher incomes can bear the costs associated with transit and can access information on a transit agency easier than those with lower incomes. Also, those with higher incomes start expecting better amenities such as cleanliness and comfort, as they would have other transportation options that have these amenities and would not be totally dependent on these transit systems. Almost a third of the lower-income respondents indicated that they would not have made their trip if public transit were not available to them. Inherent in these facts is the critical component transportation makes in the daily lives of the poorer residents and neighborhoods. There needs to be a greater focus on providing transit coverage in all areas and specifically where lower-income residents live as transit is often their only means of mobility. This affects not only their ability to secure a livelihood but also to be able to lead active, healthy, and productive lives.

6. Conclusions

The main finding from our evaluation of customer satisfaction for smaller transit agencies in Michigan is that the senior population is more satisfied with their transit service, a rejection of our hypothesis that seniors would be more dissatisfied with their transit service. Our findings also accept our hypotheses that seniors, retired, and unemployed are less time sensitive to public transportation than the employed. Customer satisfaction with cost and information availability is higher for transit riders with higher income levels, while it is lower for cleanliness and comfort, amenities that they can probably afford on other alternative transportation systems.

Our findings regarding seniors’ customer satisfaction with their transit service is a new contribution to literature that previously has stated senior customers were critical of public transportation, which our rejected hypothesis was based upon. Our accepted hypotheses that seniors, retired, and unemployed are less time sensitive to public transportation than the employed and customer satisfaction for timeliness is higher for transit riders with income levels over USD 25,000 are derived from literature that illustrates its counterpart—that employed, low-income communities who are transit dependent are less satisfied and more time sensitive to their public transportation. The two types of analyses carried out in this study also stress the facts that once riders are grouped into certain

socio-economic characteristics, their perception may be different if we only went with straightforward analyses that treated the variables as continuous. In this study, we posit that the regression analyses help ground the results from the *T*-tests, but the *T*-test results are more telling of the characteristics of riders and their perception on the importance of various transit system facilities.

The limitations of this study include the fact that while this study was carried out pre-COVID-19, it could have been improved if there were data that looked at these aspects throughout and post-COVID-19, so that the change in perceptions of riders after a worldwide event that alters the way people live and move around in their community could be assessed. Future research could try and assess these variables in a post-COVID-19 world and gauge the differences. Just as we have included the older adults (seniors) in this dataset, future studies could also look at those with disabilities to assess that vulnerable group's perceptions.

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