

Bettering Access to Care Through Public Transit

by

Evan Paul Klein

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This essay is submitted

by

Evan Paul Klein

on

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and approved by

Essay Advisor: Tina Batra Hershey, JD, MPH, Associate Professor, Health Policy and Management; Law, School of Public Health and School of Law, University of Pittsburgh

Essay Reader: Richard Garland, MSW, Assistant Professor, Behavioral and Community Health Sciences, School of Public Health, University of Pittsburgh

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Abstract

Access to healthcare has long been subject to research within the public health field. Access can be defined in a number of ways and achieved in even more, from clinic location to insurance payment policy. Public transit has been used to connect residents of metropolitan areas to the care they seek, yet remains an ever-present barrier for many who seek healthcare. Efficient, reliable, and convenient public transit that is planned with healthcare in mind can begin to provide a solution to the access to care problem. This is significant to public health by addressing healthcare access and quality, and the built environment, two of the five social determinants of health goals of Healthy People 2030. Bus rapid transit (BRT) has been implemented in many cities across the world, and a health-focused BRT line would help to better access to care in Pittsburgh, PA. More people able to access high quality healthcare through safe, reliable, and efficient public transit directly benefits the health of the public, and through the long-lasting nature of transportation infrastructure, ensures these benefits continue.

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Preface

Thank you to Professors Hershey and Garland, for their guidance throughout my essay writing process. I am forever grateful that Professor Hershey pushed me to alter my timeline to deliver the best possible product and made sure that I did not compromise on my values for the sake of convention, and to Professor Garland for helping me to look through a new lens to see the problem I looked to solve from all angles.

To my roommates, thank you for allowing my Mountain Dew fueled typing at all hours of the day and night. To my wonderful parents, thank you for all of your support while I chased my passions for helping others. To my cat, Fish, thank you for your emotional support.

1.0 Background and Review of Existing Literature

Healthy People 2030¹ identifies the built environment, which includes transit and other modes of transportation, and healthcare access and quality as key factors that contribute to the overall health of individuals and communities. Many cities in the U.S. have public transit systems in place that have been designed to connect people to everyday destinations like work, schools, and healthcare facilities, safely and reliably². However, with personal vehicle usage rising faster than any other mode of travel¹, issues with efficiency, reliability, and routing of public transit modes have impacted its riders, contributing to the growing usage of convenient personal vehicles, in a country where 41.7% of households have only one vehicle or less. The 2021 Infrastructure Report Card gives the US a “D-” grade for transit³, reporting that 45% of Americans have no access to public transportation. Access has a broad definition across existing literature and does not have a concrete definition, but the U.S. Green Building Council (USGBC) provides guidelines for transit, requiring that “within a ¼-mile (400-meter) walking distance of existing or planned bus, streetcar, or informal transit stops, or within a ½-mile (800-meter) walking distance of existing or planned bus rapid transit stops, light or heavy rail stations, commuter rail stations or ferry

¹ Healthy People 2030, U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. Retrieved [15 June 2023], from <https://health.gov/healthypeople/objectives-and-data/social-determinants-health>

² “Public Transportation System: Introduction or Expansion.” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 19 Oct. 2018, <https://www.cdc.gov/policy/opaph/hi5/publictransportation/>

³ “Transit.” *ASCE's 2021 Infrastructure Report Card*, 12 July 2022, <https://infrastructurereportcard.org/cat-item/transit-infrastructure/>

terminals⁴” is considered accessible transit. A 1993 study⁵ of Head Start Programs in New York, New Jersey, Puerto Rico and the US Virgin Islands found that 67% of parents reported that private transportation was not available, and 63% cited the cost of transportation as a barrier to care. Through a review of existing literature and a case study, this paper will specifically look into how public transit affects access to care.

1.1 Underutilization of Transit to Access Healthcare

Wallace et. al⁶ investigated access to health care and non-emergency medical transportation across Americans and found that there are a multitude of factors, including income, disability status, geographic isolation, or inability to drive, contribute to the underutilization of public transportation to access healthcare. They found that about 3.6 million Americans do not obtain medical care because of a lack of transportation in a given year and that they are predominantly older, minority group, low income females with low educational backgrounds. Public health has historically researched and found that access to transit and health care are positively correlated to race and income. In lower socioeconomic status (SES) neighborhoods that are made up of minority racial groups, between 10 and 20 percent of households were found to be transportation insecure⁴. Additionally, many public transportation routes do not provide access to

⁴ “Access to Quality Transit.” U.S. Green Building Council, <https://www.usgbc.org/credits/new-construction-retail-new-construction-data-centers-new-construction-hospitality-new-const>

⁵ Giambruno C, Cowell C, Barber-Madden R, Mauro-Bracken L. The extent of barriers and linkages to health care for head start children. *J Community Health*. 1997 Apr;22(2):101-14. doi: 10.1023/a:1025160705362. PMID: 9149952.

⁶ Wallace, R., Hughes-Cromwick, P., Mull, H., & Khasnabis, S. (2005). Access to Health Care and Nonemergency Medical Transportation: Two Missing Links. *Transportation Research Record*, 1924(1), 76–84. <https://doi.org/10.1177/0361198105192400110>

medical care, “especially for the most economically disadvantaged neighborhoods⁴.” Of patients using public transportation to get to care appointments, 86% reported missing that appointment, and 95% reporting late arrival because of transportation. In interviews with patients of a pediatric clinic at a large, urban hospital, 60% had previously missed or arrived late to an appointment because of complications with transportation. In summary, those that depend on public transportation to access care face significant challenges, especially those in low SES minority groups, as households don’t have access to transportation, and routes don’t go to the care they need⁷.

1.2 System Redesign Effectiveness

Lee and Miller⁸ looked into the effectiveness of proposed public transit redesign of the Central Ohio Transit Authority (COTA) on accessibility to healthcare for the population of Linden, Ohio, a neighborhood of Columbus. The proposed expansion would occur in two phases; the first phase, Transit System Redesign (TSR), would “revamp the existing COTA bus system⁷” by simplifying complex routes and making the system more reliable with better access to destinations. The second phase entails building a new bus rapid transit (BRT) service called CMAX, which would operate through northeast Columbus and the Linden neighborhood to specifically elevate their access to healthcare and other opportunities. TSR is a crucial first step in this process to better

⁷ Heaps, Wendy, et al. Public Transportation in the US: A Driver of Health and Equity. <https://www.healthaffairs.org/doi/10.1377/hpb20210630.810356/>

⁸ Lee, Jinhyung, and Harvey J. Miller. “Measuring the Impacts of New Public Transit Services on Space-Time Accessibility: An Analysis of Transit System Redesign and New Bus Rapid Transit in Columbus, Ohio, USA.” *Applied Geography*, vol. 93, 2018, pp. 47–63., <https://doi.org/10.1016/j.apgeog.2018.02.012>.

access to care by addressing the stagnation of development in the public transit system while the city around it has been drastically dynamic. The city is still using bus routes from COTA's inception in 1974, which has "increasingly failed to satisfy customers' needs to access their destinations⁷." TSR adapted the existing bus lines by making them simpler and more direct, reducing the overall number from 74 to 48, and allocating 70% of service to high-ridership routes, while maintaining the same schedule between weekdays and weekends, rather than reducing frequencies during non-peak times.

CMAX is a logical next step in facilitating easy, fast access after completing a simplification of the overall system. It consists of two sections, high and low frequency, where buses arrive every 10 and 30 minutes, respectively. CMAX operates within a dedicated bus lane and utilizes non-traditional trip payment methods to maintain reliability and adherence to schedules. When summarizing the effects in access to healthcare, TSR only increased access by 5% overall, and with decreased accessibility for pediatrics and OB/GYN, the effectiveness is ambiguous⁷. However, CMAX increased its riders' accessibility to healthcare by an impressive 21%, providing an excellent example of efficient and reliable transit can better access to healthcare while working within an overall system. Some elements of their initial plan left gaps in opportunity and ultimately contributed to the ambiguous effectiveness in bettering access to healthcare. However, the drastic increase of access by the CMAX service offers promising insight to support similar services in similar cities.

1.3 No-Show Appointments

Smith, Yang, Golberstein et. al⁹ investigated the impact of robust public transit on the prevalence of no-show medical appointments. No-show appointments, as their name implies, occur when a patient does not appear for their scheduled appointment, and are common, as recent studies finding that between 6-33% of appointments are no-show appointments. No-show appointments (no-shows) can have negative effects on patients, often creating gaps in otherwise continuous care, delaying necessary screenings, treatments, of medication refills⁸. Echoing the findings of the study of Head Start Program¹⁰ enrollees in 1993, where 63% of parents reported transportation problems being the reason for late or missed appointments, this study also finds that transportation barriers are associated with increased no-shows, especially for patients living in low socioeconomic status (SES) areas in urban settings. The study uses the opening of the Green Line in the Minneapolis-St. Paul metro area, a light rail line that connects the Twin Cities together. Of their 97 identified outpatient primary care clinics, 14 (14%) of these were located near the Green Line, and 86% of these were not.

They found that while the difference was small, there was a statistically significant decline in no-shows for patients living near the Green Line when compared to patients who do not live near it. This decline in no-shows was particularly evident for patients living close to the Green Line going to clinics located near the Green Line, as people are more likely to keep their

⁷ Lee, Jinhyung, and Harvey J. Miller. "Measuring the Impacts of New Public Transit Services on Space-Time Accessibility: An Analysis of Transit System Redesign and New Bus Rapid Transit in Columbus, Ohio, USA." *Applied Geography*, vol. 93, 2018, pp. 47–63., <https://doi.org/10.1016/j.apgeog.2018.02.012>.

⁹ Smith LB, Yang Z, Golberstein E, Huckfeldt P, Mehrotra A, Neprash HT. The effect of a public transportation expansion on no-show appointments. *Health Serv Res*. 2022;57(3):472-481. doi:10.1111/1475-6773.13899

¹⁰ Giambruno C, Cowell C, Barber-Madden R, Mauro-Bracken L. The extent of barriers and linkages to health care for head start children. *J Community Health*. 1997 Apr;22(2):101-14. doi: 10.1023/a:1025160705362. PMID: 9149952.

appointments if they have a direct, convenient route to get there. Looking demographically, the difference in no-shows was greatest in the Medicaid population, who saw a 9.5% decrease from baseline for patients living near the Green Line compared to those who did not. Although state Medicaid programs were historically required to provide assistance to enrollees for transportation to care, the implementation of such policies varied greatly between states, leaving many Medicaid enrollees to continue to miss or delay care due to transportation concerns. This study does solely investigate light rail expansion and determines a correlation between proximity to transit and fewer no-shows and does not investigate other modes of transportation that are common in other metropolitan areas, like buses and subways/passenger rail. However, it is clear that reliable, convenient sources of public transportation are crucial for health care accessibility and promoting health equity.

1.4 Bus Lanes and Bus Rapid Transit

Todd Litman of the Victoria Transport Policy Institute¹¹ discusses when a dedicated bus lane is appropriate, based on strategic planning initiatives, system efficiencies, and social equity. Bus lanes, by definition, are lanes on motor vehicle roadways that are dedicated solely to use by buses, providing a lane free from regular traffic to allow public transit to operate more efficiently. Cities and other densely populated metropolitan areas benefit greatly from space-efficient modes of transportation, and bus lanes can increase total capacity (people per traffic lane) and increase

¹¹ Litman, Todd. "When Are Bus Lanes Warranted? Considering Economic Efficiency, Social Equity and Strategic Planning Goals." Victoria Policy Institute, 25 Nov. 2016.

transit system operating efficiency¹⁰, making them valuable for passengers and the transit system itself, as efficient transit can provide a better alternative to driving personal vehicles.

When looking to improve access to healthcare via transit, maximizing efficiency and speed of travel is important. This report stipulates that under certain conditions, bus lanes can significantly improve bus travel speeds, and on roads with heavy traffic congestion, could “double or triple” the bus travel speeds. The study suggests travel time as the evaluating measure, since buses generally carry more passengers than personal vehicles. Buses do have lag time, as riders load/unload, as buses slow to arrive at a stop, etc. However, these are justified by the volume of passengers able to be taken to their destinations. Litman concludes that “if bus lanes cause 1,000 bus passengers to save 5 minutes per peak-hour trip, these lanes are justified even if, by increasing general traffic lane delays they cause 2 minutes of incremental delay to 2,000 automobile passengers, since the total transit passenger time savings (5,000 minutes) is larger than the total automobile passenger incremental delay (4,000 minutes).”

Bus lanes and busways, separate bus-grade throughways with exclusive egress points, can be used to better efficiency of bus service, resulting in easier access to healthcare for riders. Ang-Olson and Mahendra¹² expand on reliable bus service by analyzing the conversion of bus lanes to Bus Rapid Transit (BRT). Although they vary in application, BRT offers higher levels of service than traditional bus transportation faster, as BRT lines make fewer stops and run frequently. This study includes that BRT can function the most freely, and therefore provide the highest efficiency and reliability, when free from delays caused by sharing roadway with other vehicles. A fully separate busway, or a bus lane at the very least, would allow buses to operate with this type of

¹² Ang-Olson, Jeffery, and Anjali Mahendra. “Cost/Benefit Analysis of Converting a Lane for Bus Rapid Transit--Phase II Evaluation and Methodology.” Transportation Research Board of the National Academies, Apr. 2011, <https://doi.org/10.17226/14518>.

freedom. The research conducted in this paper builds from Project 20-65, Task 21 of the National Cooperative Highway Research Program (NCHRP), a multi-state cooperative effort to analyze and evaluate the highway transportation in member states. Project 20-65 was focused on BRT projects and the methods used to evaluate their costs and benefits specifically. NCHRP Task 22 provides transportation agencies with resources to understand the potential benefits to converting a mixed-flow (buses and other vehicles) lane to BRT use exclusively.

The analysis of costs and benefits, potential time and financial savings, throughput, and length of BRT corridor were all taken into consideration when conducting the analysis. The researchers did note that their findings are predicated on specific assumptions made in their calculations. Their research found that the best candidates for conversion to BRT are those with high per day throughput (>40,000) and at least 15% of vehicles in that corridor be transit vehicles. The average speed at which the bus can travel also effected the cost benefit ratio, as corridors where buses had an average speed of 11mph were only recommended to convert to BRT when the throughput was more than 40,000/day. However, when buses were able to travel on average 13 mph, the threshold to convert to BRT was 30,000 per day, a 10,000 person decrease per day. While this research requires further inquiry to be generalizable, it does provide frameworks to evaluate potential opportunities for BRT lines in existing systems. Not only does BRT make transit faster, both in speed of the buses and in actual time of travel but makes buses more reliable and efficient for the riders, ensuring that they arrive to their destinations quickly, on time, and safely.

2.0 Case Study

This paper takes interest in the transit system servicing Pittsburgh, PA. What was once an industrial hub for steel and coal mining has transformed into an academic, technological, and medical powerhouse. The city of Pittsburgh is home to several health systems and health insurance companies, like UPMC, Allegheny Health Network (AHN), and Highmark, as well as six institutions of higher learning: University of Pittsburgh, Duquesne University, Carnegie Mellon University, Chatham University, Carlow University, and Point Park University. Available to the 1.4 million residents of Allegheny county, with 300,431 residents in the city of Pittsburgh¹³ alone, is the Pittsburgh Regional Transit (PRT), a transit system comprised of 725 buses and 81 light rail vehicles (PRT 2021 Annual Report¹⁴) that service 775 square miles of Allegheny County. The PRT 2021 Annual Report is a public facing document that includes system service data and analyses, including system efficiency, reliability measures, and financial data. Included in the annual report is a section that compares system data to other transit systems across the country that the PRT deems to have “some combination of similar city/metropolitan area population, similar transit service levels, and similar modes of service provided¹³.” Identified systems include Portland, Seattle, Denver, Baltimore, St. Louis, Minneapolis, Buffalo, Cleveland, and Milwaukee. This paper will compare the PRT system to Cleveland, as these systems have similar service populations, geography, demographic makeup, and healthcare landscape. This paper will use

¹³ “U.S. Census Bureau Quickfacts: Pittsburgh City, Pennsylvania.” U.S. Census Bureau, <https://www.census.gov/quickfacts/pittsburghcitypennsylvania>

¹⁴ 2021, *PORT AUTHORITY OF ALLEGHENY COUNTY ANNUAL SERVICE REPORT 2021*.

Cleveland's HealthLine BRT system as a case study for potential expansion of PRT bus offerings to better access to healthcare within the PRT service area.

2.1 Pittsburgh Public Transit

The current public transportation landscape in Pittsburgh is a hub-and-spoke design, where Downtown Pittsburgh serves as a central converging point for all bus and light rail routes offered. This design is necessary to navigate Pittsburgh's unique topography and geography and poses challenges to accessibility for all riders throughout the service area. PRT offers 96 bus routes¹³ that operate across dedicated bus lanes, in regular commuter traffic, and dedicated busways, which are separate throughways with controlled access for bus transit only and PRT's rapid transit routes. PRT system map depicted in *Figure 1*.

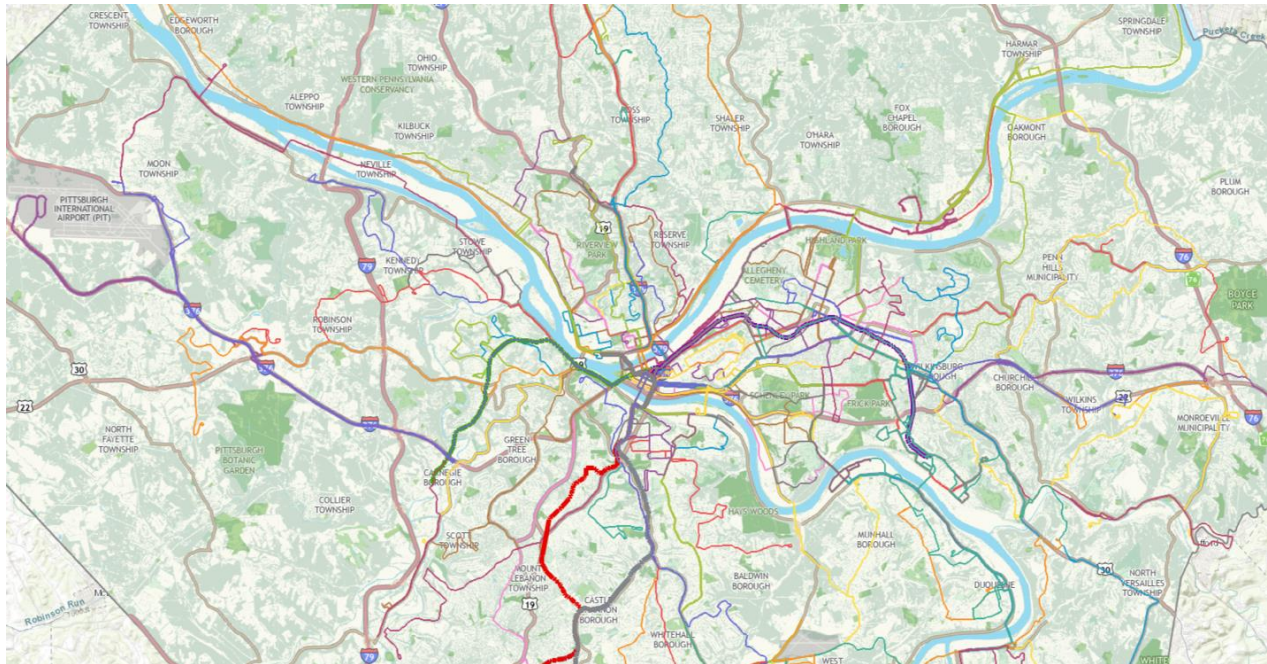


Figure 1 PRT System Map¹⁵

In FY2020, PRT buses spent 85.6% of time in service, and arrived on time 71.8% of the time. 46% of residents and 55% of jobs were within walking distance to transit on weekdays, with those numbers falling slightly on the weekend service times, as transit is limited during that time. PRT examined access in “frequent service areas,” defined as 1/4 mile area around a transit stop or the 1/2 mile area around a transit station where transit vehicles come, on average, every 15 minutes for 15 hours of the day and every 30 minutes for an additional five hours of the day, every day of the week¹³. In FY2020, 18% of residents and 36.8% of jobs had access to frequent service. *Figure 2* displays the geography of Frequent Service, where not all areas of the metropolitan area have equal access to frequent, reliable transit options every day of the week. Being able to access transit services is vital to many communities, but more importantly, the ability to access transit without

¹⁵ “PRT System Map.” System Map, www.rideprt.org/system-map/. Accessed 15 June 2023.

having to schedule life activities, like healthcare, around transit availability promotes transit utilization and allows residents the freedom of not owning a personal vehicle¹³.

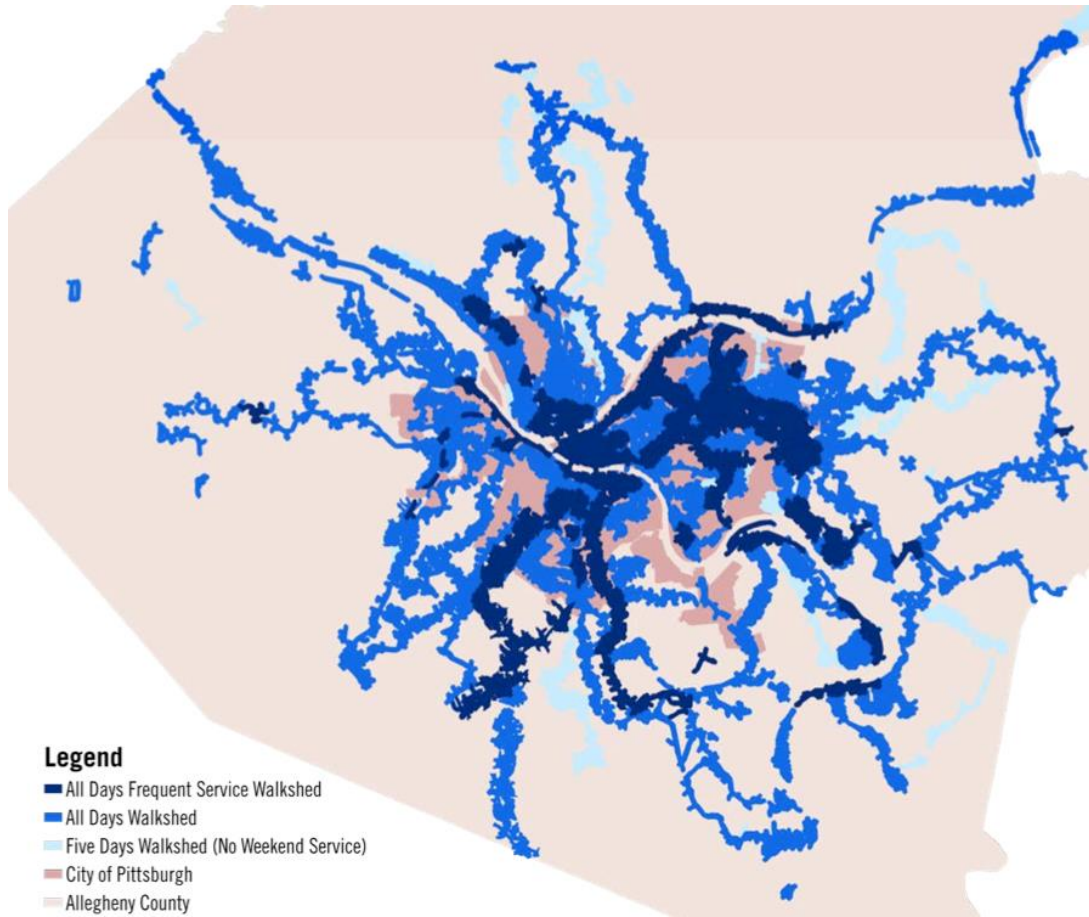


Figure 2 PRT Frequent Service Area Map¹⁶

¹⁶ 2021, *PORT AUTHORITY OF ALLEGHENY COUNTY ANNUAL SERVICE REPORT 2021*.

2.2 GCRTA's HealthLine

The Greater Cleveland Regional Transit Authority (GCRTA) operates 79 bus routes within a 458 square mile service area, home to 1.4 million people. Operating in a similar hub and spoke design (*Figure 3*), GCRTA keeps its buses in service 93.2% of the time and those buses arrive on time 86.7% of the time.

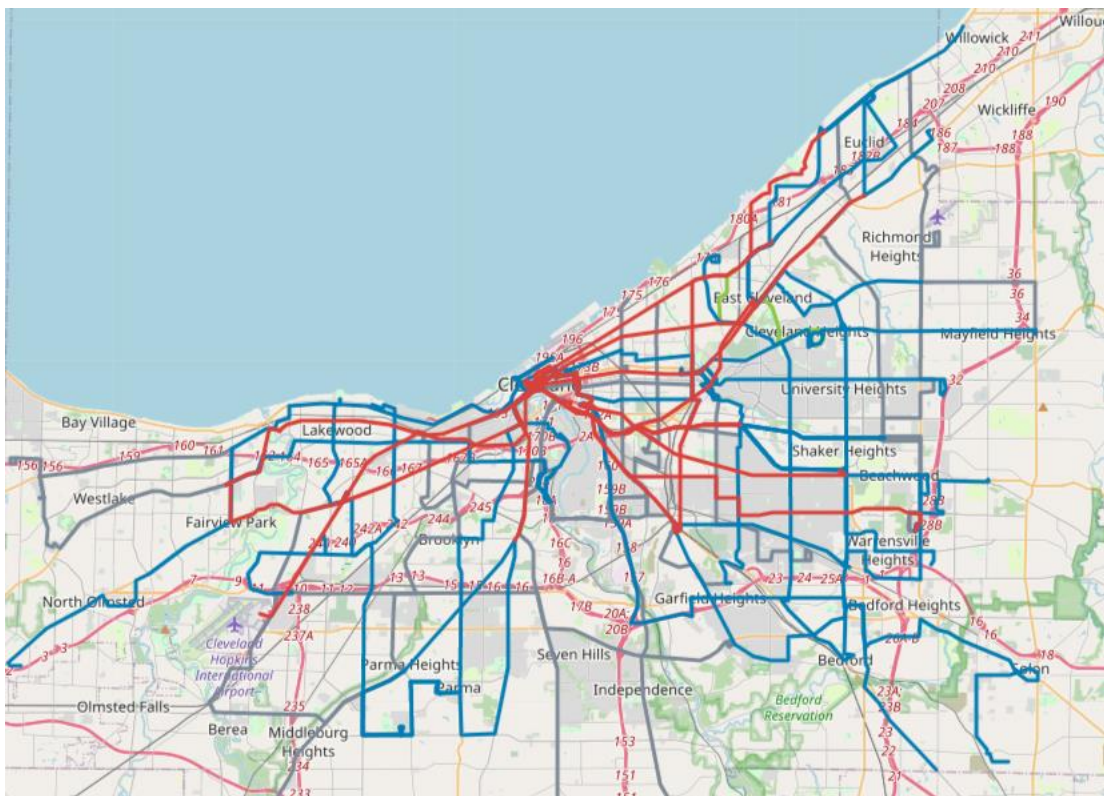


Figure 3 GCRTA System Map¹⁷

The bus fleet is comprised of 55 local routes¹⁷ that serve 6,000 bus stops across the greater Cleveland area, extending out from downtown to the surrounding neighborhoods. The GCRTA also offers bus rapid transit (BRT) in a service called “HealthLine,” which runs along Euclid Avenue, with service to 36 stations 24/7, arriving every 8 minutes during peak times. Euclid Avenue is home to countless businesses, residences, and healthcare centers, most notably to the Cleveland Clinic Health System and University Hospitals’ Cleveland Medical Center and Rainbow Babies & Children’s Hospital. HealthLine has been heralded for its efficiency and economic development by The Institute of Transportation and Development Policy¹⁸, American Society of Civil Engineers¹⁹, and Forbes²⁰. HealthLine connects downtown to the Euclid Avenue corridor, effectively bringing efficient and reliable BRT pathways to major employment and healthcare areas. GCRTA reports that HealthLine has reduced travel time from 46 minutes to 34 minutes, serves more than 4 million riders yearly, and increased ridership 60% over the bus line that it replaced. Since opening in 2008, HealthLine services 10% of the GCRTA’s total riders. This program was so successful that GCRTA opened additional BRT lines, the Cleveland State line and MetroHealth line in 2014 and 2017, respectively. MetroHealth connects downtown to University Hospitals’ Parma Medical Center, MetroHealth Medical Center, and Cleveland Clinic – Lutheran Hospital. By connecting the central hub to nearby healthcare facilities via BRT, GCRTA is

¹⁷ “Overview: Facts about the Greater Cleveland RTA.” Greater Cleveland Regional Transit Authority, <https://www.riderta.com/overview>

¹⁸ “ITDP Celebrates Cleveland’s Healthline as Best Practice for US BRT - Institute for Transportation and Development Policy.” Institute for Transportation and Development Policy - Promoting Sustainable and Equitable Transportation Worldwide, 21 Nov. 2014, www.itdp.org/2013/04/18/itdp-celebrates-clevelands-healthline-as-best-practice-for-us-brt/

¹⁹ “Bus Rapid Transit Brings Investment: ASCE’s 2021 Infrastructure Report Card.” ASCE’s 2021 Infrastructure Report Card |, 8 Mar. 2017, infrastructurereportcard.org/gamechanger-item/bus-rapid-transit-brings-investment/

²⁰ McMahon, Jeff. “Bus Rapid Transit Spurs Development Better than Light Rail or Streetcars: Study.” Forbes, 15 Sept. 2013, www.forbes.com/sites/jeffmcmahon/2013/09/15/bus-rapid-transit-spurs-development-better-than-light-rail-and-streetcars/?sh=3aaedc3a73c2

maximizing access to care opportunities, providing fast and efficient transit options that originate in densely populated and frequented areas.

2.3 Pittsburgh’s Healthcare Connectivity

Pittsburgh’s healthcare facilities belong to UPMC²¹ and AHN²², located in the Uptown, Oakland, Shadyside, and Lawrenceville neighborhoods. 28 of the 96 (29%) bus routes go to at least one of the hospitals, and many of these routes overlap with each other yet retain individual routing. Fifth and Forbes Avenue connect downtown to these neighborhoods and care centers, being serviced by more than 25 routes alone. Routes 61A, 61B, 61C, and 61D (61s) and the 71A, 71B, 71C, and 71D (71s) act as a patchwork BRT system for riders who look to go between downtown and Uptown, Oakland, and Shadyside. The individual lines of the 61 and 71 have poor on-time percentage (OTP) performance, however, when combined together, the 61s have an OTP of 72% and only 7% of trips are crowded, and the 71 have an average OTP of 71% and only 5.3% of trips are crowded. Pitt students often advise each other to “catch a 61 or 71 to get to downtown” because these lines in particular have train-like availability and reliability. The 61s and 71s are key connectors to healthcare, stopping at five of the eight hospitals within the City of Pittsburgh. Adopting a BRT system like the HealthLine based on the routing of the 61s and 71s would greatly benefit access to care and could feasibly be integrated into the current PRT system. If successful, this BRT line would provide the increases in speed, reliability, and efficiency to support the patients of the numerous Pittsburgh hospitals.

²¹ “UPMC Hospitals in Southwest PA.” UPMC, <https://www.upmc.com/locations/hospitals/southwest-pa>

²² “Locations: Allegheny Health Network.” Wwww.ahn.org, 16 Feb. 2023, <https://www.ahn.org/locations>

3.0 Policy Recommendation

It is the recommendation of this paper to institute a BRT line along Fifth and Forbes Avenue, connecting downtown Pittsburgh to the UPMC and AHN hospitals in North Shore, Uptown, Oakland, and Shadyside. This line, called Pittsburgh’s General Hospital Shuttle (PGHS), will be routed similar to the PRT 61 and 71 bus routes, but will not replace them. Instead, PGHS will only serve a central hub in downtown and stations at the following hospitals: AHN Allegheny General Hospital (North Shore), UPMC Mercy (Uptown), UPMC Magee Women’s Hospital (Oakland), UPMC Montefiore and UPMC Presbyterian (Oakland), and UPMC Shadyside Hospital (Shadyside). The limited number of stops would allow for the PGHS to maintain a high (>85%) OTP and low crowding, keeping the vehicles available to patients accessing care, while regular commuters retain use of the 61s and 71s. The PGHS would run every 10 to 12 minutes between 7 am and 10 pm every day of the week, mimicking the schedule of the HealthLine in Cleveland without exactly replicating it in the primary stages of the PGHS service rollout.

3.1 PGHS Routing

PGHS routing would begin on the North Shore, north of downtown across the Allegheny River, with AHN Allegheny General Hospital (AGH), currently serviced by the 8, 11, 15, 17, and 54 bus routes²³. PGHS would begin service at existing PRT stop at the intersection of North

²³ “PRT System Map Spring 2023.” ArcGIS Web Application, <https://pgh-transit.maps.arcgis.com/apps/webappviewer/index.html?id=a50e4b85f444455094eac48294d6137d>

Avenue and Cedar Avenue before turning down Cedar Avenue towards downtown. Crossing the Rachel Carson Bridge and turning right onto Grant Street, the route continues to Fifth Avenue, stopping at the existing stop at Fifth Avenue and Ross Street. Turning right and continuing to Forbes, the routing next stops at UPMC Mercy, located one block over from Forbes Avenue on Locust Street. To accommodate all abilities, the route makes a square detour down Stevenson Street, turns to Locust, stops at Mercy, turns up Pride Street, and arrives back to Forbes Avenue. No stops occur between Mercy and UPMC Magee Women's Hospital, accessible from the stop at the intersection of Forbes Avenue and Halket Street. UPMC Montefiore is accessible from the Forbes and McKee Place stop, and for passenger convenience, a stop at Forbes and Atwood Street for service to UPMC Presbyterian. The PGHS route continues down Forbes Avenue, making a left onto Bellefield Avenue, then turning left onto Fifth Avenue. The remaining route will follow the routing of the 71A (*Figure 3*) to reach UPMC Shadyside and ending at the current PRT stop at "Centre Avenue at Shadyside Hospital."

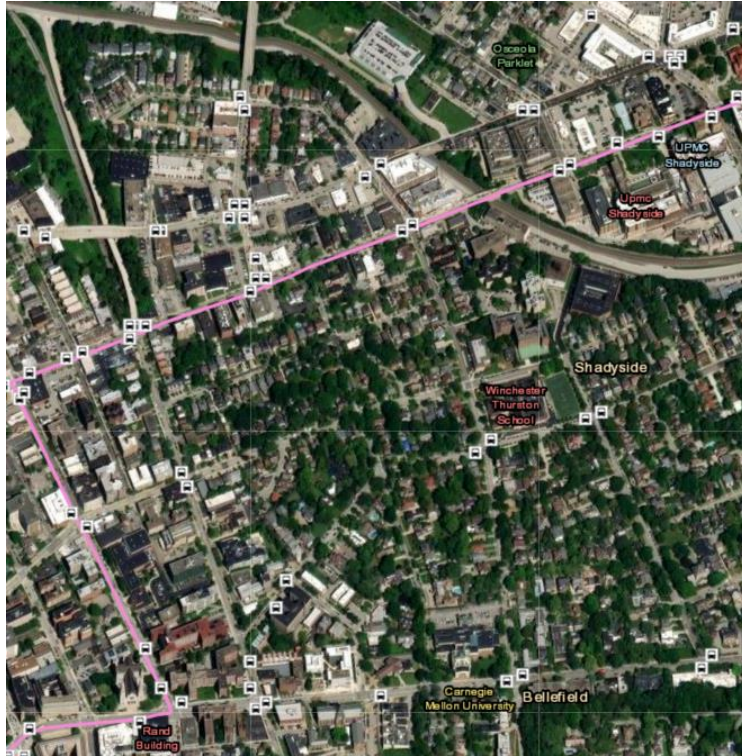


Figure 4 PRT Bus Route 71A²⁴

To begin the return trip, I recommend turning left onto Liberty Avenue and left again on Baum Boulevard, maintaining on Baum until its intersection with Millvale Avenue, and turning left onto Centre Avenue. Centre Avenue will then intersect with Craig Street, which will lead the route back to Fifth Avenue, leading service to UPMC Western PA Behavioral, UPMC Presbyterian, and UPMC Montefiore. PGHS completes the loop after entering downtown, stopping at the inbound stop across from the stop at Fifth Avenue and Ross Street. The route continues back across the Rachel Carson Bridge to arrive back at AGH.

3.2 Limitations and Future Research

This project is not without its potential drawbacks. First, while no new infrastructure needs to be built to enact this new line, it does require vehicles, which would necessitate either the purchasing of new buses or allocating buses currently in the fleet to the new line, potentially taking away route support from another line. Taking vehicles from other routes goes against the primary objective of this project of better access to care through transit, so new buses are likely to need purchased, which is expensive. PRT would also need bus operators, and in a system that has been facing driver shortages²⁴ that have resulted in service cuts, recruitment efforts would need to generate a new cohort of drivers.

The routing of the PGHS would need revisiting to ensure efficiency. The author of this paper is not a city planner, transportation planner, or engineer, and while the routing listed above could work in ideal circumstances, more qualified individuals should be involved to ensure practical feasibility. The current routing also leaves out AHN's West Penn Hospital in Bloomfield and UPMC's Children's Hospital in Lawrenceville. Potential expansion routes would need to be considered (ex. PGHS North & PGHS South, etc.) to bring patients to their sought-after care destinations. The route's extension across the Allegheny to AGH also challenges the line's reliability and speed. AGH is not in line with the other hospital locations within the city limits, but if PGHS only serviced UPMC facilities, it may dissuade non-UPMC patients from accessing care via PGHS. The inclusion of AGH opens the ridership pool to both UPMC and AHN patients, removing any bias towards one provider system or another.

²⁴ Hoffman, Chris. "Pittsburgh Regional Transit Riders Reporting Late or No-Show Buses." *CBS News*, CBS Interactive, 16 Mar. 2023, <https://www.cbsnews.com/pittsburgh/news/pittsburgh-regional-transit-riders-late-buses/>

There are also improvements to be made to this plan to better equity of access to care. The current routing of the PGHS counts on the ability of the individual to access downtown or one of the stops at one of the hospitals. As previously mentioned, one of the shortcomings of Pittsburgh Regional Transit (PRT) is the lack of route interconnectivity, where riders have limited opportunity to use the full network potential of the system. Many of the neighborhoods that make up the Mon Valley region have few options to reach downtown Pittsburgh or any of the hospitals serviced by the PGHS. The bus routes that do connect to downtown and the hospitals have low on time performances and arrive between every 40 minutes to an hour. These neighborhoods, especially Homestead, Rankin, Braddock, and Wilksburg, who have been identified by the EDA-Census Poverty Status Viewer²⁵ as high poverty areas, where as low as 20.4% and as high as 43.1% of people living within those communities have earned less than the poverty threshold in the last year.

In order to make ends meet for low-income individuals and families, many people work a second job. A new measure from the U.S. Census's has found that the multiple jobholding rate increased from 6.8% in the second quarter of 1996 to 7.8% in the first quarter of 2018²⁶, up one percentage point. While this does not seem like a lot, a one percent change in multiple jobholders, based on current employment and population records, equates to about 2.1 million people over the last 20 years who work multiple jobs, which is about 104,000 people per year.

There is no data available for multiple jobholders below the state level, but it is likely that those facing poverty would seek another job to support themselves and their families. These

²⁵ "EDA-Census Poverty Status Viewer." United States Census, mtgis-portal.geo.census.gov/arcgis/apps/experiencebuilder/experience/?id=ad8ad0751e474f938fc98345462cdfbf. Accessed 30 May 2023

²⁶ Keith A. Bailey and James R. Spletzer. "Using Administrative Data, Census Bureau Can Now Track the Rise in Multiple Jobholders." Census.Gov, 8 Oct. 2021, www.census.gov/library/stories/2021/02/new-way-to-measure-how-many-americans-work-more-than-one-job.html

individuals do not operate within a flexible schedule, so doctors' appointments are likely left to either the emergency room/urgent care, or not at all. With such unreliability and low arrival frequency, these already disadvantaged communities are having to center healthcare in their world, or drive themselves there in a personal vehicle, which is not always possible. With the nature of Pittsburgh's geography and topography, more research is needed to connect all communities with care through reliable and available transit.

4.0 Conclusion

Public transit is an important part of our healthcare landscape. It has been proven time and time again that efficient, reliable, and convenient transit improves access to care and subsequent health indicators, like a reduction in no-show appointments and patients connecting with the care they seek. Public transit is a common service available in metropolitan areas through the U.S., existing in many different forms, and all systems have the capacity for improvement of their services to better the access to healthcare space. In the specific case of Pittsburgh, PA, a bus rapid transit (BRT) line that connects the downtown area to area hospitals would bring about access to care improvements and economic development observed in Cleveland, OH with the HealthLine BRT line. Although questions remain regarding funding and implementation, the literature available supports utilizing BRT as a method to achieve the goal of increasing access to care for all through public transit.

Using public transportation as a vehicle for access to care holds implications for the future of public health as the field progresses towards social determinants of health-driven policy decisions and research interests. Holding the person at the center of numerous determinants of health, as opposed to only at their presented medical symptoms, allows a person to live a healthier life and stay healthier for longer. Access to care, reliable transit, and their combination together is a step towards a healthier society, one where no person has to wonder how they will access their care, but know that there is little that remains in the way of reaching the care they seek.

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