Transit Fare Options Analysis

City of Madison, June 2021

Executive Summary

- This study considers costs and benefits of three fare system options: fare-free transit, a proof-of-payment system, and a cashless tap-card system.
- The costs of making transit fare-free *at pre-pandemic service levels, not including Bus Rapid Transit,* are estimated to be $7.5-$18.4 million annually. This report discusses several revenue loss scenarios and mitigation options, including various partnerships. It also discusses revenue replacement scenarios, including a vehicle registration fee, a levy limit referendum, and a transportation utility fee.
- This study considers various costs and benefits of proof-of-payment and cashless tap-card systems, including equity concerns. The enforcement concerns associated with a proof-of-payment system make this a less attractive option.
- Metro staff recommend the continued collection of fares. Without an additional revenue source, service cuts may impact under represented communities. If additional revenue sources were found, staff believe expansion of service and hours would have a more beneficial impact to the Madison area communities.
- With the continued collection of fares, Metro staff recommend a cashless tap-card system. This would include a half-fare system for those who qualify, fare-capping, a broad retail network, and limited vending kiosks, but may pose barriers for unbanked and under-banked residents, and those with limited internet access.
- Using this research as a background, next steps include community seeking community input on these fare options.

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Background

Madison's Metro Transit is currently considering a number of options relating to fare systems. Currently, most passengers pay with passes or cash at the front of the bus upon boarding, under supervision of the driver. However, potential operational, technology, and policy changes requires consideration of prospective additional or replacement fare systems and/or policies.

First, Metro Transit is implementing Bus Rapid Transit (BRT). A typical feature of BRT is enhanced passenger boarding, which requires a rapid fare system. Two potential options having passengers pay prior to boarding and using a proof of payment onboard; or eliminating cash fares and having passengers board at all doors using contactless cards. Another consideration is allowing mobile ticketing for each of these options as well as for local buses.

Second, cities around the world are experimenting with fare-free transit, and there is interest in seeing how this model would affect Metro Transit. Such a change may increase transit ridership and have positive environmental effects, which aligns with the equity and environmental priorities of the Mayor's Office. However, such a change may also have negative financial impacts on Metro Transit and tax the transit system's capacity. Such a change would also negate the need for the mobile fare systems discussed above.

Amidst these opportunities for change, this project will examine the feasibility of different fare systems, mobile ticketing, and fare-free transit as they relate to costs and operations. Using this research as a background, next steps include community seeking community input on these fare options.

Literature Review

Several cities are trying, or have tried, a fare-free transit program. The Transit Cooperative Research Program's (TCRP) *Implementation and Outcomes of Fare-Free Transit Systems* (2012), provides an in-depth review.

Relevant findings from this synthesis include:

- "Providing fare-free public transit service is virtually certain to result in significant ridership increases no matter where it is implemented. Evidence from the literature search and returned surveys indicate that ridership will usually increase from 20% to 60% in a matter of just a few months, and even more in some areas." (p. 2)
- "In locales such as resort towns and university-dominated communities, there are often crush loads of passengers at many stops." (p. 2)
- "Reports documenting past fare-free experiments indicate that a relatively small percent-age of the additional trips (from 5% to 30%) were made by people switching from other motorized modes. Most new trips were made by people who would have otherwise walked or used a bicycle, or would not have made the trip if there was a fare to pay. A disproportionate amount of new trips were made by existing riders, as well as students and seniors who were much more sensitive to transit pricing than automobile users are." (p. 3)
- "Some public transit systems that have experimented with or implemented a fare-free policy have been overwhelmed by the number of new passengers or been challenged by the presence of disruptive passengers, including loud teenagers and vagrants. Transit agencies could be well

served by developing local ordinances to provide them with the authority to deal effectively with disruptive passengers" (p. 2)

Communities with a strong university presence are among those that often provide fare-free transit; in these, students may account for up to 45% of the passengers of the transit system. In this case, the university often financially partners with the local transit system. An example of this is Chapel Hill Transit in North Carolina, the largest fare-free U.S. public transit system. The city began its fare-free policy in 2002, and annual ridership grew from 3.5 million to nearly almost 7 million between 2002 and 2012. This increase in ridership, in turn, placed higher demands on the transit system. Due to financial constraints, Chapel Hill Transit has recently re-assessed the costs and benefits associated with re-instituting fares (Nelson/Nygard Consulting Associates).

Two other cities that piloted fare-free transit—Austin, Texas, in 1989-1990 and Talinn, the capital of Estonia, starting in 2013—found that while their programs did increase ridership, they did not accomplish their stated goals of reducing car usage (TCRP, 2012, and Kollinger, 2021). This is in line with the TCRP's finding that most of the ridership increase in fare-free transit programs does not come from the conversion of car trips, but rather from a shift from other modes, or taking trips that would never have occurred otherwise.

Recently other US cities have implemented fare-free, with Kansas City being the largest to implement it in 2020. The system is rolling out fare-free transit incrementally, on different fixed routes. For Kansas City Area Transportation Authority (a Regional Transit Authority), the loss of fares represented about 8% of the agency's $100 million dollar budget. Much, though not all, of the shortfall from implementing fare free transit was made up through greater contributions from Kansas City. With the pandemic, it has been an unusual year to study the effects of the suspension of fare collection. However, ridership on KCATA declined less during the pandemic than on other transit systems nation-wide (Ziegler, 2021; Casale, 2020).

Current Costs and Revenues

Due to the disruption caused by the COVID-19 pandemic, this section only considers information from 2019 and before, unless otherwise noted. This includes 2019 levels of service and ridership. Potential costs associated with the increased levels of service and ridership that may arise from a BRT system or fare-free transit system, as well as impacts to revenue caused by the COVID-19 pandemic, are outside the scope of the present study.

Current costs relating to fares include: costs of farebox equipment and maintenance, fare media, fare collection, and customer service.

Table 1: Costs Relating to Fares in Current System. Data is from 2016-2019.

Category	Capital Costs	Average Annual Operating Cost	Notes
Initial Farebox System	**$ 3,262,497**		Implemented 2014.
Farebox Maintenance		**$ 234,759**	
Metro maintenance employee salary and benefits		$ 180,000	0.9 FTE.
Parts and repairs		$ 24,259	Per contract, increases 3% per year.
Vendor services		$ 30,500	
Farebox Operations		**$ 278,054**	
Armored car services		$ 2,200	
Cash and pass handling		$ 180,000	Includes emptying fareboxes, counting cash, pass sales, pass delivery, and invoicing. 2.6 FTE.
Credit card fees		$ 10,000	Approximate estimate; Metro is also billed for charges other than pass sales.
Fare media		$ 75,000	Magnetic stripe and tap cards.
Outlet commissions		$ 10,854	
Total	***$ 3,262,497***	***$ 512,813***	

Current revenues relating to fares include: revenues from individual rides and passes; revenues from pass partnerships; revenues from route partnerships; and revenues from agency paratransit services.

Pass partnerships are partnerships with area employers and educational institutions, which contract with Metro to provide unlimited-ride passes for their employees and students. These partners range from large local institutions like the UW-Madison, Madison College, and St. Mary's and Meriter Hospitals, to small local businesses. These contracts vary, but involve a fixed cost per ride, and sometimes have an upper cap per pass-holder. Holders of such passes may use them on both fixed-route and paratransit services.

Route partnerships are partnerships between Metro and area institutions and municipalities, which contract with Metro to provide transit services. Institutional partners include UW-Madison, which campus-area transportation, and the Madison Metropolitan School District, which buses older students to and from school. For municipal partnerships, Metro and the municipality split costs according to the portion of Metro's total scheduled vehicle hours dedicated to the route, and the portion of the route that runs within that municipality's boundaries. These costs are reduced by the amount of state and federal aid Metro receives, also relative to the route's proportion of total scheduled vehicle hours. Finally, these costs are further reduced through a fare rebate: any fares generated by the route are refunded to the partner, proportional to the percentage of route costs the partner bears. Most

municipal partners contract with Metro for both fixed-route and paratransit services, but several contract for only one of these services. Overall, since partners' costs derive directly from Metro's, these partnerships do not lead to profits for Metro, but they are an important source of cost-sharing.

Agency paratransit services provide a mechanism for area social-service agencies to provide their clients with accessible transportation. Under Wisconsin's FamilyCare long-term care program, these agencies are responsible for providing each client transportation in connection with their individual treatment plan, and are given federal Medicaid money to do so. This money is then passed on to Metro via the purchase of agency fares. These agency fares reflect the actual cost of providing service. This is separate from paratransit services for individuals—those not coordinated through an agency or provided in conjunction with a treatment plan—which are charged at the same rate as fixed-route rides. The same person may ride paratransit at different times using an agency fare or an individual fare; the deciding factor is whether that ride is for a purpose connected to their treatment plan.

Table 2: Revenues Relating to Fares in Current System. Data is from 2016-2019 unless otherwise noted.

Category	Average Annual Revenue	Notes
Individual Rides and Passes	**$ 6,073,421**	This revenue is what is collected when boarding a bus.
Cash fares	$ 1,516,083	
Passes	$ 4,557,338	
Pass Partnerships	**$ 6,527,949**	
Route Partnerships	**$ 3,916,037**	These partnerships do not lead to profits for Metro, but are an important source of cost-sharing.
Operating expense	$ 12,467,717	
Aid rebate	$ (5,612,456)	Federal and State revenue pass through
Fixed-route passenger revenue rebate	$ (1,990,581)	Fare revenue pass through
Paratransit passenger revenue rebate	$ (697,041)	Fare revenue pass through
Other rebate	$ (251,603)	Advertising revenue pass through
Agency Paratransit Fares	**$ 1,344,800**	Data from 2018 on only, when new FamilyCare transportation rules went into effect.
Total	***$ 17,862,206***	

Costs and Revenues in a Fare-Free System

Like the above section, this section uses information from 2019 and earlier to estimate costs and revenues in a fare-free transit system. This includes 2019 levels of service and ridership. This section does not consider potential costs associated with the increased levels of service and ridership that may arise from a BRT system or fare-free transit system. Impacts to revenue caused by the COVID-19

pandemic, while outside the scope of the present study, are entering the national discussion regarding transit and fares.[1]

In a fare-free system, many of the operating costs of the fare-collection system would no longer be required. Capital costs related to implementing the system would not be recoverable.

Table 3: Costs Relating to Fares in Fare-Free System. Data is from 2016-2019.

Category	Average Annual Operating Cost	Projected Operating Cost in Fare-Free System	Change in Fare-Free System	Notes
Farebox Maintenance	**$ 234,759**	**$ -**	**$ (234,759)**	
Metro maintenance employee salary and benefits	$ 180,000	$ -	$ (180,000)	0.9 FTE. Savings in this area do not indicate a termination of employment, but rather shrinking the pool through attrition.
Parts and repairs	$ 24,259	$ -	$ (24,259)	
Vendor services	$ 30,500	$ -	$ (30,500)	
Farebox Operations	**$ 278,054**	**$ -**	**$ (278,054)**	
Armored car services	$ 2,200	$ -	$ (2,200)	
Cash and pass handling	$ 180,000	$ -	$ (180,000)	2.6 FTE. Savings in this area do not indicate a termination of employment, but rather shrinking the pool through attrition.
Credit card fees	$ 10,000	$ -	$ (10,000)	
Fare media	$ 75,000	$ -	$ (75,000)	
Outlet commissions	$ 10,854	$ -	$ (10,854)	
Grand Total	***$ 512,813***	***$ -***	***$ (512,813)***	

[1] As an example, a recent Washington Post article discusses transit agencies considering going fare-free in the wake of the pandemic: "With some agencies predicting lower ridership levels until 2024, a proposal is bubbling up aimed at serving the low-income passengers relying most heavily on public transportation during the pandemic: Make transit free" (Aguilar, Benichou, Blanchard, George, and Subramanian, 2021).

Revenues would also be affected in a fare-free system. This would, largely, simply reflect the absence of fares. However, a fare-free system could also create uncertainty regarding pass partnerships, route partnerships, and agency paratransit fares.

In a fare-free system, some pass partners may choose to remain in their partnership, and some may not. As discussed in the Literature Review section above, in Chapel Hill, NC, the local university had a longstanding contract with the local transit agency to provide free passes for its students; when the transit agency moved to free fares, the university actually increased its payments to help underwrite the system. In Madison, partners – perhaps especially large institutions—may also maintain or increase their contributions, seeing it as a civic act. However, there are also concerns that some partners may decline to purchase rides that can be had for free. Small employers, especially, often use the pass program as a "pass-through": the employer coordinates the program to enable employees to access discounted transit, but the actual cost of the pass is borne by the employee; employees in this situation may be particularly hesitant to continue purchasing passes in a fare-free system.

Route partners would also be affected by a fare-free system. As discussed above, route partners' costs are reduced by a rebate of fares collected on their routes. Were fares to be made free, these rebates would fall to zero, raising route partners' costs. Many route partners have already stated that their Metro transit costs are higher than they would prefer. In Wisconsin, levy limits pose a significant challenge for most municipalities with their operating budgets. Increases in one category of operating costs often require decreases in another category. Because state and federal funding have remained relatively stagnant (apart from COVID relief), partners would experience a disproportionate effect in contribution in replacing fare revenues.[2] For some partners, the increased contribution may push them to discontinue their partnerships (e.g. Wethal, 2019).[3] Since partners' costs derive directly from Metro's, these partnerships do not lead to profits for Metro, but they are an important source of cost-sharing for Metro.

A fare-free system may also pose challenges to agency paratransit fares. Individual riders qualify for a reduced fare, while social service organizations buying tickets in bulk must pay for the entire actual cost of service. However, if fares are not charged then neither the individual riders nor the social service organizations will need to purchase fares. At present, there is no formal mechanism to verify that a paratransit user is riding as an individual, or under the auspices of a social-services agency as part of their treatment plan.. Even so, there have been anecdotal reports of some agencies circumventing the agency fare process. There are concerns this may accelerate in a fare-free system, where the two main checks on this – inability to purchase individual fares, and inability to physically handle fares – would no longer pose a barrier. In that case, Metro would provide paratransit rides that social-services agencies are contractually obligated to provide – and for which they are fully federally compensated – with no reimbursement. A new mechanism could perhaps be put in place, but may lead to new costs and would involve a degree of policing paratransit riders that fixed-route riders are not subject to (see the Equity Analysis section for further discussion).

[2] In 2019, approximately 7.5% of Metro's operating budget is funded by local partners, 25% from fare collection, and the remainder from federal and local sources. Replacing fare collection revenue would be fully borne by local partners.

[3] This article quotes Fitchburg officials considering reducing services offered through Metro or forming their own transit service in the face of an unexpected 22% increase in Metro costs.

The following table outlines several scenarios from how, under a free-free system, the revenue from pass partnerships, route partnerships, and agency partnerships would be reduced. The table investigates the full elimination in individual rides and pass revenue (e.g. the elimination of the collection of fares), and then the reduction of other categories of fare revenue. These include:

- Pass Partnerships – agencies that purchase transit passes for their employees or groups.
- Route Partnerships – cities and agencies that contribute to the costs of the route that serves their constituency.
- Agency Paratransit Fares – the fees that human service agencies pay Metro Transit to transport their clients.

These scenarios assume a full elimination of fare collection on the bus, and range from a 25% revenue loss to a total revenue loss for the three other categories of fare revenue. Given UW's unique status, there are also special scenarios considering its impact alone.

Table 4: Revenues Relating to Fares in Fare-Free System. Data is from 2016-2019.

Category	Average Annual Revenue	Project Annual Revenue in Fare-Free System	Change in Fare-Free System	Notes
Individual Rides and Passes	**$ 6,073,421**	**$ -**	**$ (6,073,421)**	Full elimination of the collection of fares on the bus
Pass Partnerships	**$ 6,527,949**	**$ 0 to 5,509,403**	**$ (1,631,987) to (6,527,949)**	
	25% loss	$ 4,895,962	$ (1,631,987)	Pass partners may withdraw if they feel they are paying for a free product. UW, as a unique civic institution, may choose to remain.
	50% loss	$ 3,263,974	$ (3,263,974)	
	90% loss	$ 652,795	$ (5,875,154)	
	100% loss	$ -	$ (6,527,949)	
Scenarios	Only UW maintains partnership	$ 5,509,403	$ (1,018,546)	
Route Partnerships	**$ 3,916,037**	**$ 0 to 2,937,028**	**$ (979,009) to (3,916,037)**	Broken out by individual partner in appendix
	25% loss	$ 2,937,028	$ (979,009)	Loss of fare rebates would cumulatively increase route partners' average annual costs by $2,687,622, which may lead some to withdraw. UW routes, already fare-free, would not be affected, and so UW may maintain the partnership.
	50% loss	$ 1,958,018	$ (1,958,018)	
	90% loss	$ 391,604	$ (3,524,433	
	100% loss	$ -	$ (3,916,037)	
Scenarios	Only UW maintains partnership	$ 1,902,136	$ (2,013,901)	
Agency Paratransit Fares	**$ 1,344,800**	**$ 0 to 1,344,800**	**$ 0 to (1,344,800)**	
	0% loss	$ 1,344,800	$ -	Some agencies may attempt to circumvent agency fare process due to lowered barriers.
	25% loss	$ 1,008,600	$ (336,200)	
	50% loss	$ 672,400	$ (672,400)	
	90% loss	$ 134,480	$ (1,210,320)	
Scenarios	100% loss	$ -	$ (1,344,800)	
Grand Total	***$ 17,862,206***	***$ 0 to 9,791,230***	***$ (8,070,976) to (17,862,206)***	

In sum, in a fare-free transit capital costs related to fareboxes would not be recoverable, while annual operating costs would fall by around $500,000. However, annual revenues from fare-related sources could fall within a range from $0 to around $9.8 million, depending on pass, route, and social-service agency partners. This would result in an annual revenue reduction of $8.0 to $17.9 million in fare-related revenues. Combined with the annual operating cost reduction, this would result in an annual net revenue reduction of $7.5 million to $17.4 million. Please see the Mitigation section for additional discussion.

An additional potential cost in a fare-free system is that associated with increased ridership. As the above Literature Review section notes, fare-free transit is associated with increased ridership; for instance, in Chapel Hill, ridership rose by almost 100% during the ten-year period following the implementation of fare-free transit, from 3.5 million to almost 7 million annually. This could translate into need for additional bus service, or additional crowding on buses; and pre-COVID, Metro already provided the maximum possible amount of service, given its bus capacity, during the afternoon rush, and nevertheless faced complaints of crowding. It is beyond the scope of the present study to quantify the costs and impacts of increased ridership, but given other communities' experiences, these would almost certainly present an additional cost and affect the customer experience.

Mitigation

The above section found that in a fare-free system, the annual net revenue loss would likely fall within a range of $7.5 million to $17.4 million. This section discusses ways to mitigate that impact.

Revenue Loss

This section will consider which scenarios may result in the least annual net revenue loss. Of note, of $6.5 million in average annual pass partnership revenue, $5.5 million, or 84%, derives from Metro's partnerships with UW employees and students. Further, of $3.9 million in average annual route partnership revenue, $1.9 million, or 49%, derives from Metro's partnerships with UW and UW Hospitals. Thus, retaining the partnership of these UW-affiliated groups would retain $7.4 million in average annual revenue from pass and route partnerships. Given UW's unique status as a civic institution, this may be a possibility.

Additionally, if a secure and equitable mechanism could be found to ensure social-service agencies consistently pay agency paratransit fares, very little to no agency paratransit revenue would be lost, retaining an additional $1.3 million in average annual average revenue. However, this does not include any costs relating to administering an agency paratransit fare-enforcement program.

These two scenarios—retention of UW partnerships, and retention of full agency paratransit fare revenue—together, then, would retain $8.75 million in average annual revenue. This would hold average annual net losses to around $8.6 million, not including any costs of administering a social-service agency paratransit fare-enforcement program.

Revenue Replacement

Additionally, looking at explicit options for revenue replacement and/or new revenue sources may help mitigate costs as well. Options to replace the estimated $7.5 million to $17.4 million in lost revenue from a fare-free system are limited and are discussed below.

Vehicle Registration Fee

Beginning in 2020, Madison implemented a $40 vehicle registration fee (VRF) for auto and small truck registrations. Funds from this fee are deposited in the Metro Transit enterprise fund and currently support Metro operations. The 2021 adopted budget for Metro Transit included $7.5 million in revenues from the VRF. Assuming similar levels of registrations, the VRF would need to at least double to $80 annually to begin covering the $7.5 million to $18.4 million of lost revenue from fare-free transit. Madison currently has the highest VRF among Wisconsin municipalities collecting the fee. The average VRF for other municipalities in Wisconsin is $20.

Levy Limit Referendum

Wisconsin state law allows municipalities to exceed levy limits if approved by referendum. This option would require the City Council to adopt a resolution detailing the amount of the levy increase, its intended purpose, and whether it is a one-time or ongoing increase (Wisconsin Department of Revenue, 2020). The resolution would then need to be approved by voters. The City of Madison has not previously increased its allowable levy through referendum. Based on net taxable property value and revenues/expenses from the 2021 adopted budget, replacing transit revenue through this method would increase the property taxes on an average value home by $80 to $186, which is a 3% to 7% increase.

Transportation Utility Fee

A more recent option explored by Wisconsin municipalities to fund transportation services is the use of transportation utility fees. Under this approach, the municipality creates a transportation utility that charges property owners a fee. Madison property owners would see a transportation utility fee on their municipal services bill issued monthly by the Water Utility. While Wisconsin state law does not explicitly give municipalities the authority to create transportation utilities, a 2020 opinion issued by the League of Wisconsin Municipalities concluded that such authority exists under a city's home rule powers and/or its broad statutory authority (Witynski, Silverman, & Davis, 2020). Currently, transportation utilities are not common throughout the state but several municipalities have pursued them in recent years. The City of Neenah was the first Wisconsin municipality to create a transportation utility and did so in 2019 (McCallum, 2021).

Transportation utility fees are based upon usage of the transportation system similar to how property owners pay for other utility services. The method to calculate property owners' usage of a transportation system can vary and a popular method utilizes traffic volume created by different land use types (Ehlers, 2020). The City of Madison does not currently have a similar fee calculation utilizing traffic generation. As a proxy, Madison's Urban Forestry Special Charge bills property owners by allocating a revenue target across customer types. A rate is set for each customer type and is determined by the percentage of street frontage occupied by the type and the number of customers within the type. Using this approach, a transportation utility fee would need to charge residential property owners between $93 and $214 annually ($7.71 to $17.90 monthly) to cover fare-free revenue losses.

Service Reductions

One feasible, though unpopular option, would be to reduce service levels. A 13 to 30 percent decrease in operating costs would ameliorate the effect of eliminating fare collection. However, this is a less desirable option in that service reductions, whether by route or service span, may affect under-served

communities. Metro Transit currently has capital assets sufficient to serve its current number of revenue hours/routes. If the revenue hours and routes are substantially reduced, Metro Transit will have more buses and storage than necessary.

Lessons from Previous Fare-Free Period

Metro Transit went fare-free from March through September 2020 due to the COVID-19 pandemic, amid concerns that paying fares would require passengers to be in proximity to bus drivers. This section will examine potential lessons from this period – with the caveat that the pandemic created many unusual circumstances and thus this time of fare-free transit may not be directly comparable to future implementations.

Interviews with a Metro Transit supervisor give insight into this period's effect on operations. The biggest impacts identified were a sharp uptick in continuous riders and loitering at transfer points, especially among those perceived to be experiencing homelessness. Many continuous riders and loiterers also exhibited inappropriate bus-riding behavior that upset many bus drivers and was perceived to have intimidated and upset many choice riders, such as drinking alcohol at transfer points, approaching people for change, not wearing masks or otherwise complying with public health regulations.

Customer complaints made during the fare-free transit period reflect this: Out of 713 total complaints received during this time period, 11, or 1.5%, related to this issue.

The supervisor interviewed suggested several possible mitigations. One was having transfer point supervisors, and more road supervisors available to handle on-bus incidents. Another was to partner with a social service agency. However, both would require additional expenditures – labor costs for supervisors, and partnership costs for the agency.

However, overall, the supervisor felt that fares provide a useful method for drivers to enforce prohibitions against continuous riding, and thus against prolonged misbehavior on buses.

Summary of Elimination of Fare Collection

The elimination of fare collection is feasible, yet there would be opportunity costs associated with its implementation. With the local municipality/partner replacement of fare revenues, funding would be taken from other needs within their operating budget or potentially cause them to exit the system. Reducing transit service to offset fare revenue reduction would have substantial detrimental effects, particularly to areas that are already poorly served. Conversely, if additional revenues were generated from other funding sources such as vehicle registration fees or transportation utility fees, there may be better uses for these revenues. Over the past decade there has been a strong community desire to expand transit service and/or hours of operation. Doing so would provide greater access to jobs and service, particular for residents that have jobs that have non-traditional hours. The generation of new revenues may have greater impact in service expansion than in the elimination of fares.

Costs and Revenues in a Fare System

With a decision to continue fare collection, either to reduce the fiscal impacts or to achieve additional service that alternate revenue sources would provide, then a fare collection system is needed. This section will consider costs, revenues, and other considerations of three fare systems: proof of payment

on bus rapid transit combined with front-door boarding on local buses; all-door tap card boarding on all buses; and having no cash fares, as part of either of the former options.

Option 1: Proof of Payment on BRT/Front Door Local Buses

One possible fare model Metro can look at moving towards is off-board proof-of-payment on BRT vehicles, with front door payment on neighborhood routes.

Operational Logistics

Off-board payments on BRT buses could include fares purchased from ticket vending machines (TVM) on a station platform, online or at a retail outlet.

For added convenience, online fare payments could be made using either smartcards or mobile phones. An online account is created where people can purchase fares with a credit or debit card. Several other third party applications such as Google and Apple Pay can also be used to pay a fare.

Once a fare item is purchased, the rider can board at either the front or back doors of the BRT vehicle without showing proof of payment to the driver on running a pass through a farebox.

To ensure a fare is being paid, inspection personnel would be needed to board vehicles to validate at random. Passengers that aren't able to show proof of payment might be issued citations or fines for fare evasion.

In this model, on local buses, passengers would pay for fares when boarding buses in the same manner they do now by using cash or other fare items purchased online or a sales outlet. Riders would be required to front door board, tap their smartcard or phone, or run a valid fare through the farebox.

Considerations

Equity Factors

- All riders whether riding BRT vehicles or neighborhood buses will pay the same amount for cash fare, passes and other fare media.
- Fare inspectors could cause profiling concerns/issues, would be seen as police.

Ridership Improvements

- Since fare payment will still be required, no significant ridership increases are expected with this model. Though, ridership could increase on BRT versus neighborhood routes due the fact riders do not necessarily need a fare, they just need a fare when a fare inspector is around.

Effects on Traffic and the Environment

- Ticket vending machines required at all boarding locations.
- Less idle time at stops due to quicker boarding time.

Customer Experience

- This model will dramatically improve the experience on BRT vehicles. People will board quickly and more efficiently, drivers will have an easier time maintaining schedules, and the number of fare disputes will be greatly reduced.

    - Boarding at both sets of doors on BRT vehicles will allow passengers to be better spaced, providing more comfort and making it easier to get on and off the bus.
    - Negative experiences/conflict between drivers and riders will be reduced by eliminating a fare check every time a passenger boards. This will improve the passenger experience as well as improve driver morale.
- Ticket vending machines are prone to failure and lead to many customer service calls.
- Ticket vending machines may cause security issues or make people feel unsafe when purchasing fare.
- There will be confusion by customers who want to board a BRT bus in the same manner they board neighborhood routes, i.e. using cash. Confusion could cause people just jumping on vehicle, which could then lead to negative interaction with fare inspectors. Confusion likely to cause increased boarding time with neighborhood buses due to fare disputes.
- Boarding a BRT vehicle will be quick and convenient due to boarding through both doors and not needing to initially show a fare.

Administration

There will be a large number of administration issues as a result of this model.

- Metro would need to purchase a partially new fare collection system including ticket vending machines and mobile verification devices for fare inspectors.
- Metro would also need to hire more than 10 FTE fare inspectors and create a citation issuance and adjudication system to handle fare evasion issues.
- Data collection will also be problematic because unlimited ride users will not likely swipe or tap their cards when boarding. This will cause significant employee resources to conduct data cleanup for billing and reporting purposes.
- Validation tickets and readable/ swipe-able fare media on neighborhood buses must be cross functional. Validation devices must recognize current GenFare system on neighborhood buses, or a new system on neighborhood buses has to be purchased.
- A large number of maintenance calls should also be expected due to problems with ticket vending machines, on top of already high call volume for neighborhood farebox issues.
- Metro would also need to re-negotiate and manage various pass programs and contracts.
- Relatively low burden for drivers on BRT, potentially higher burden for drivers on neighborhood buses.

Capital Cost

- Acquire and maintain a ticket vending machine system: $4 million.

Operating Cost

- 10 plus fare inspectors (10 FTE) - $1 million.
- Ticket vending system employee (1 FTE) - $100,000.
- Customer service calls from ticket vending system (1 FTE) - $100,000.

- Staff time for data reconciliation and pass management (1 FTE) - $100,000.
- Armored car service ($7,000 per station) – 30 stations ($210,000).
- Credit card fees ($30,000 plus).
- Sales outlet commission ($125,000 +).
- Would see some slight cost savings due to increased BRT speeds.
- Total: At least $1.65 million annually plus other factors as discussed.

Option 2: All-Door Tap Card Boarding on All Buses

A second model to look at would be all-door boarding on all buses using tap card readers at front and back of the bus.

Operational Logistics

With rear boarding, there would be no driver, attendant or farebox to facilitate cash payment. Drivers would be expected to monitor and enforce tap compliance for both front and rear boardings.

With tap smartcards/phones, a customer can set up an account online and add funds/replenish cards without making a separate trip to a sales outlet. One card can be used to utilize all fare categories (i.e. monthly, daily, adult, child, senior, etc.)

Boarding on both BRT and neighborhood routes would be expected to be sped up, because there wouldn't be time spent depositing cash into the farebox or issuing transfers.

Considerations

Advantages:

- Riders won't need to take a separate bus trip to purchase a pass. Can be done through an online account.
- Riders can eliminate the 7-8 day wait time it takes to receive a mailed pass from an online order.
- Fraud would be reduced. Currently markings on fare media can be easily rubbed off. Paper/plastic cards with magnetic stripes are easily damaged. Both lead to drivers just accepting damaged passes to avoid conflict and speed up boarding.
- All fare items would be available for purchase online and at sales outlets. Currently, not all sales outlets carry all fare items.
- Would be able to more accurately reconcile sales outlet sales.
- Allows for varying incentives to frequent riders, i.e. yearly pass, weekly, monthly, daily etc.
- Allows for ride capping, which caps fare collection after a rider reaches a certain number of rides per period. This provides the best cost per ride for the rider.
- Allows social service agencies to purchase rides for clients and distribute via text or emails without making a trip to pick up the pass.
- Maintenance and trouble calls are reduced because there are no moving parts and no items being deposited such as in current farebox equipment.
- Contactless payments better for the environment and public health.

Equity Factors

- Riders pay the same fare on BRT and neighborhood routes.
- Unbanked customers or those without access to online resources will be at a disadvantage.
- Some customers may feel uncomfortable or may have difficulty accessing specific retail outlets to purchase a fare card.
- Drivers not able to monitor all doors at same time may result in profiling.
- Social service agencies and common council members may express concerns on going to a cashless system.

Ridership

- Since fare payment will still be required, no significant ridership improvements expected with this model.

Customer Experience

- Boarding speed on BRT and local buses would improve. Though, not as much as an improvement as on BRT vehicles in Option 1, tapping smartcards/utilizing mobile devices will smooth out/improve the boarding process on a more moderate level.
- BRT users won't realize the full benefit of improved travel speeds if they need to tap a smartcard to board.
- Cash users may have to stop at retail outlet prior to riding.
- Simple in that the same across neighborhood service and BRT.
- More fare options allows riders to purchase passes better suited to their riding habits.
- Customers do not have to make separate trip to purchase passes. Can reload online, anytime, anywhere.
- More durable card, built to last.
- Metro customer service staff can easily apply rides on accounts instantaneously for customer service issues.

Effects on Traffic and the Environment

- This isn't expected to have any effects on traffic or the surrounding environment.

Administration

- Would need to implement a new collection system.
- It would be more difficult for drivers to monitor both front and rear doors, which could lead to a higher fare evasion rate.
- A number of pass programs would continue to need to be re-negotiated and managed programs.
- Potential to link technology with other modes of transit in the community for easy multi-modal travel.
- Once established, relatively low burden administratively.

Capital Cost

- Acquire and maintain smartcard card system (approximately $3 million).

Operating Cost

- Ticket vending system employee - $100,000.
- Staff time for data reconciliation and pass management $100,000.
- Credit card fees ($30,000 plus).
- Sales outlet commission ($125,000 +).
- System annual maintenance fees.
- Slightly slower BRT speeds/slightly faster local speeds. Cost would most likely equal out.
- Total: At least $455,000 annually, plus costs from other factors as noted.

No Cash Fares – As Part of Option 1 or 2

To further speed up boarding in both scenarios listed above, Metro could stop accepting cash as payment when boarding.

According to Kittelson & Associates' *The Benefits and Drawbacks of a Cashless Public Transit System*, contactless cards will improve speed of boarding. In cashless systems, where riders can scan a card or phone, people are able to move more quickly through the system.

In addition, going cashless avoids the expense of installing ticket vending machines at BRT stations and eliminates the time, staff resources, and negative customer reaction that would be expected to keep problematic equipment operational.

In the Transit Cooperative Research Program's *Transit Capacity and Quality of Service Manual, Third Edition* (2013), the average passenger service time by fare types is below:

Table 5: Boarding Time by Fare Type.

Method	Average Boarding Time (seconds)
Exact Change	2.9 – 5.1
Smart Card	2.5 – 3.2
Visual Inspection	1.6 – 2.6

Compared to exact change, using a smartcard cuts boarding time by nearly half. Cutting this boarding time will help save time throughout the route.

An online account system also will improve ridership data collection and provide the ability to see what times of day, day of week, route, and fare type are being used.

Though, going cashless is expected to generate a large number of equity-related issues. Also according to Kittelson & Associates' *The Benefits and Drawbacks of a Cashless Public Transit System:*

- Roughly 7% of the population doesn't have a bank account, citing a 2017 FDIC survey.
- Individuals with families with lower incomes and less education are less likely to have credit/debit cards as are people of color. Again citing the FDIC survey, 25% of the population is underbanked, meaning they don't have access to credit cards or digital payment systems.

- Cashless systems are also problematic for seniors who are less likely to own a smartphone; citing Pew Research, in 2017, 40% of seniors owned smartphones.

Mitigation measures to address equity issues of a cashless system would bring about their own set of potential resource and financial impacts including:

- Establishing a retail network to increase the number of locations riders can load balances to smartcards.
- Installing ticket vending machines around the city.
- Creating a half-fare program for low-income individuals.
- Allowing accounts to go to a balance below zero, allowing riders to pay after their ride.
- Fare capping to allow riders to pay towards a pass value without the large upfront payment.

Equity Analysis

This section discusses the equity impacts of the three fare options together.

The fare-free option has many benefits from an equity perspective, as it would make transit more accessible to riders living with lower incomes. However, it also has several equity drawbacks. Ridership would almost certainly increase, requiring Metro to stretch its financial resources; this in turn may lead to service cuts. Further, the additional cost could leads to cuts in other areas, including programs supported by the City's General Fund. This option could also lead to more complaints and profiling of riders perceived to be homeless. Finally, as discussed above, paratransit's divide between fares paid by individuals (which would become free in this option) and those paid by social-service agencies (which would not) could lead to uneven fare enforcement and additional barriers for paratransit riders.

The proof-of-payment system, as discussed above, requires a network of fare enforcement officers, leading to concerns about bias, profiling, and over-policing.

The cashless tap system, when combined with the features discussed above, has several advantages from an equity system. Its account-based system allows the implementation of measures that target individuals' circumstances, such as a broader free- and reduced-fare system, and a fare-capping system that allows riders to pay towards a pass value without the large upfront payment. Passes and fares would be more widely available at retail outlets around the city, instead of the current limited number of locations, and also accessible by internet, for instant reloading.

However, the cashless tap system also has drawbacks. Drivers would be responsible for monitoring both forward and rear-door boarding, and ensuring passengers tap; this could lead to increased profiling. Further, if cash fares were to be phased out in conjunction with this option, this could lead to negative impacts on unbanked and under-banked residents, as well as those with limited access to the internet; and these residents are more likely to be Black, Hispanic, people living lower incomes, and/or seniors. This is because in a cashless tap system without cash fares, the rider must have a fare card with pre-loaded funds. If customers cannot load these funds using a bank card over the internet, they must do so at a retail location, which are not accessible every place and every time of day, putting the customer in the catch-22 position of needing to travel in order to travel. Additionally, some customers may be uncomfortable in certain retail outlets.

As mentioned in the Introduction, this study's research can serve as a basis for community input around these options, including their equity impacts. One community group, the Dane County Federation of the Blind, has indicated it supports the cashless tap option as long as the online and on-bus systems are fully accessible to the visually impaired.

Discussion

This section considers the options discussed above side-by-side. The below summarizes these options in chart form.

Table 6: Summary of Fare Options.

Consideration	Fare-Free	Proof of Payment on BRT/ Front Door on Local	All-Door Tap Card on BRT and Local
Equity	→ Free to everyone, no barriers → Potentially an increased need for security intervention, opening door to profiling → If alternate funding is not obtained, service reductions likely would disproportionately affect underserved populations.	→ Everyone pays same amount → Fare inspection could open door to profiling on BRT	→ Everyone pays same amount → Unbanked at a disadvantage → Drivers' inability to simultaneously monitor all doors may result in profiling
Ridership	→ Increased ridership from both the lower cost and faster travel speeds → Some mix of mode shift, those looking for shelter, and those making a trip when they otherwise wouldn't	About the same	About the same
Customer Experience	→ Zero barrier makes boarding faster and easier → Some potential overcrowding and presence of riders looking for shelter	→ Ticket Vending Machines (TVM's) are prone to failure and lead to many customer service calls → Benefit of no-wait boarding of BRT	→ BRT users don't get full benefit of speed improvements, tap to board → Cash users may have to stop at a

Consideration	Fare-Free	Proof of Payment on BRT/ Front Door on Local	All-Door Tap Card on BRT and Local
	could turn some riders away	→ Confusion of different systems on BRT vs local	retail outlet prior to riding → Speed improvement on local buses → Simple in that the same across local and BRT
Environment/ Traffic	→ Overall Improved → Some new trips may have shifted from walking/biking or would not have been made at all, negating benefits → May need to provide additional service to handle demand (more vehicles on the street)	About the same	About the same
Administration	Virtually none	→ High burden administratively → Would require partial new collection system → Would need to hire 10+ fare inspectors and administer a citation issuance and adjudication system → Unlimited ride pass users unlikely to swipe/tap, causing significant data cleanup for billing purposes → Maintenance and trouble calls on TVM's add to workloads	→ High burden for drivers to monitor all doors at once → Likely higher evasion rate → Would require a new collection system → Must negotiate and manage various pass programs → Once established, relatively low burden administratively

Consideration	Fare-Free	Proof of Payment on BRT/ Front Door on Local	All-Door Tap Card on BRT and Local
		→ Must negotiate and manage various pass programs → Relatively low burden for drivers	
Capital Cost	→ None directly → Demand may necessitate more or larger buses at some point	Acquire and maintain TVM system for BRT (~$4m)	Acquire and maintain tap card system fleet wide (~$3m)
Operating Cost	→ No system/admin costs → Faster boarding = fewer hours, lower cost → Additional security costs → Potential for demand to require more service → Total: estimated at $7.5-$17.4 million annually, with $8.6 million being a possible middle ground following potential mitigation measures	→ 10+ Fare Inspectors → TVM Maintenance (1 FTE) → Customer Service calls from TVM's (1 FTE) → Staff time for data reconciliation and pass management (1 FTE) → Armored car service → Farebox annual maintenance fees → Credit card fees → Slightly faster BRT speeds/slightly slower local speeds (net zero?) → Total: At least $1.65 million annually plus other factors as noted in discussion	→ System annual maintenance fees → Credit card fees → Slightly slower BRT speeds/slightly fast local speeds (net zero?) → Total: At least $455,000 annually, plus costs from other factors as noted in discussion

Two major axes for decision-making, and which provide some of the greatest variance among the three options, are cost and equity. The first option, fare-free transit, is widely available to people of many backgrounds and income levels. However, it also comes with a high annual operating cost increase, estimated to be $7.5-$18.4 million annually – even before considering potential service increases resulting from increased demand. An increase of this magnitude would likely require either a dedicated shift in budgetary priorities or a new revenue source. Revenue replacement options include an increased vehicle registration fee, a levy limit referendum, and the creation of a fee-charging

transportation utility. If additional revenues were identified, there may be a greater desire to expand transit service with those revenues.

The second option, a proof-of-payment system, also comes with a higher cost, with the operating cost increase estimated to be at least $1.65 million annually. Of even greater potential import with this system is the necessity of having fare inspectors, which could lead to concerns about profiling and policing.

The third option, all-door tap cards for all buses, avoids the concerns raised by the first two options – it is associated with a lower annual operating cost increase, and, without fare inspectors, does not raise the same equity concerns about profiling and policing. However, it does have its own concerns. It could lead to potentially higher fare evasion. It also raises equity concerns about accessibility to unbanked and under-banked people, as cash users would have to first stop at retail outlets; and about accessibility to those with limited access to smartphones or other internet resources.

Conclusion

This study has examined Madison Metro Transit options relating to fare systems. Currently, most passengers pay with passes or cash at the front of the bus upon boarding, under supervision of the operator. However, potential operational, technology, and policy changes require consideration of prospective additional or replacement fare systems.

Three potential options were examined: fare-free transit, a proof-of-payment system combined with fare enforcement, and an all-door cashless tap system. It is important to note that due to the disruption caused by the COVID-19 pandemic, the analysis of fare-free transit only considers information from 2019 and before, unless otherwise noted. This includes 2019 levels of service and ridership. Potential costs associated with the increased levels of service and ridership that may arise from a BRT system or fare-free transit system, as well as impacts to revenue caused by the COVID-19 pandemic, are outside the scope of the present study.

All three options have advantages and disadvantages. However, the fare-free transit option, estimated to add $7.5-$17.4 million in annual operating costs, would likely require a dedicated shift in budgetary priorities or a new revenue source. The proof-of-payment system, when combined with a fare enforcement system, raises concerns about equity and policing. The cashless tap system has lower costs and fewer associated concerns about profiling, but does raise questions about accessibility for unbanked and under-banked populations, and those with limited internet access.

On the basis of this study, Metro staff recommends maintaining fare collection. The challenges associated with replacing this revenue source are formidable and are unlikely to be shared by all partners of Metro Transit. Additionally Metro staff believe that if additional funding sources were obtained, expanding service area and hours would provide greater benefits to the community.

If fare collection remains, Metro staff recommend a fare collection system that comprises the following:

- Cashless tap system with all door boarding.
- No fare inspectors.
- Half fare program for low income, seniors, and those under 18, with registration and documentation.

- Half fare card balances are allowed to go below zero.
- Retail network to allow users to reload accounts with cash in many retailers.
- Kiosks possible in some key locations, but minimized.
- Cash collected onboard local buses only, to be phased out over several years.
- Weekly and daily fare capping.
- Mobile payments only utilizing device Near Field Communication, but no visual or barcode validation.

Using this research as a background, next steps include community seeking community input on these fare options.

Appendix

Table 7: Annual Average Operating Revenue for Pass Partnerships by Partner. Data is from 2016-2019.

Partner	Average Annual Operating Revenue
UW ASM	$ 3,528,232
UW Employees	$ 1,981,171
MATC	$ 419,430
City of Madison	$ 178,006
Edgewood	$ 61,333
St. Mary's	$ 41,180
Meriter	$ 24,207
Dane County	$ 40,425
Commuter	$ 253,967
Total	***$ 6,527,949***

Table 8: Annual Costs and Revenues for Route Partnerships by Partner. Data is from 2016-2019.

Partner	Operating Expense	Aid Rebate	Fixed-route Passenger Revenue Rebate	Paratransit Passenger Revenue Rebate	Other Rebate	Total
Fitchburg	$ 1,455,786	$ (694,998)	$ (171,251)	$ (85,928)	$ (29,195)	$ 474,413
MATC	$ 87,163	$ (41,119)	$ (13,742)	$ (5,149)	$ (1,746)	$ 25,406
Middleton	$ 1,455,771	$ (682,778)	$ (257,532)	$ (86,123)	$ (29,134)	$ 400,203
MMSD	$ 3,807,948	$(1,703,486)	$(1,257,037)	$ (227,308)	$ (76,411)	$ 543,706
Sun Prairie	$ 33,753	$ (2,883)	$ (3,221)	$ -	$ (558)	$ 27,091
Town of Madison	$ 440,776	$ (206,881)	$ (76,953)	$ (26,044)	$ (8,826)	$ 122,071
UW	$ 3,689,616	$(1,822,556)	$ (16)	$ (218,087)	$ (73,735)	$ 1,575,222
UW Hospital	$ 821,303	$ (401,835)	$ (27,704)	$ (48,402)	$ (16,449)	$ 326,914
Verona (fixed-route only)	$ 675,602	$ (55,921)	$ (183,124)	$ -	$ (15,548)	$ 421,009
Total	***$12,467,717***	***$(5,612,456)***	***$(1,990,581)***	***$ (697,041)***	***$ (251,603)***	***$ 3,916,037***

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