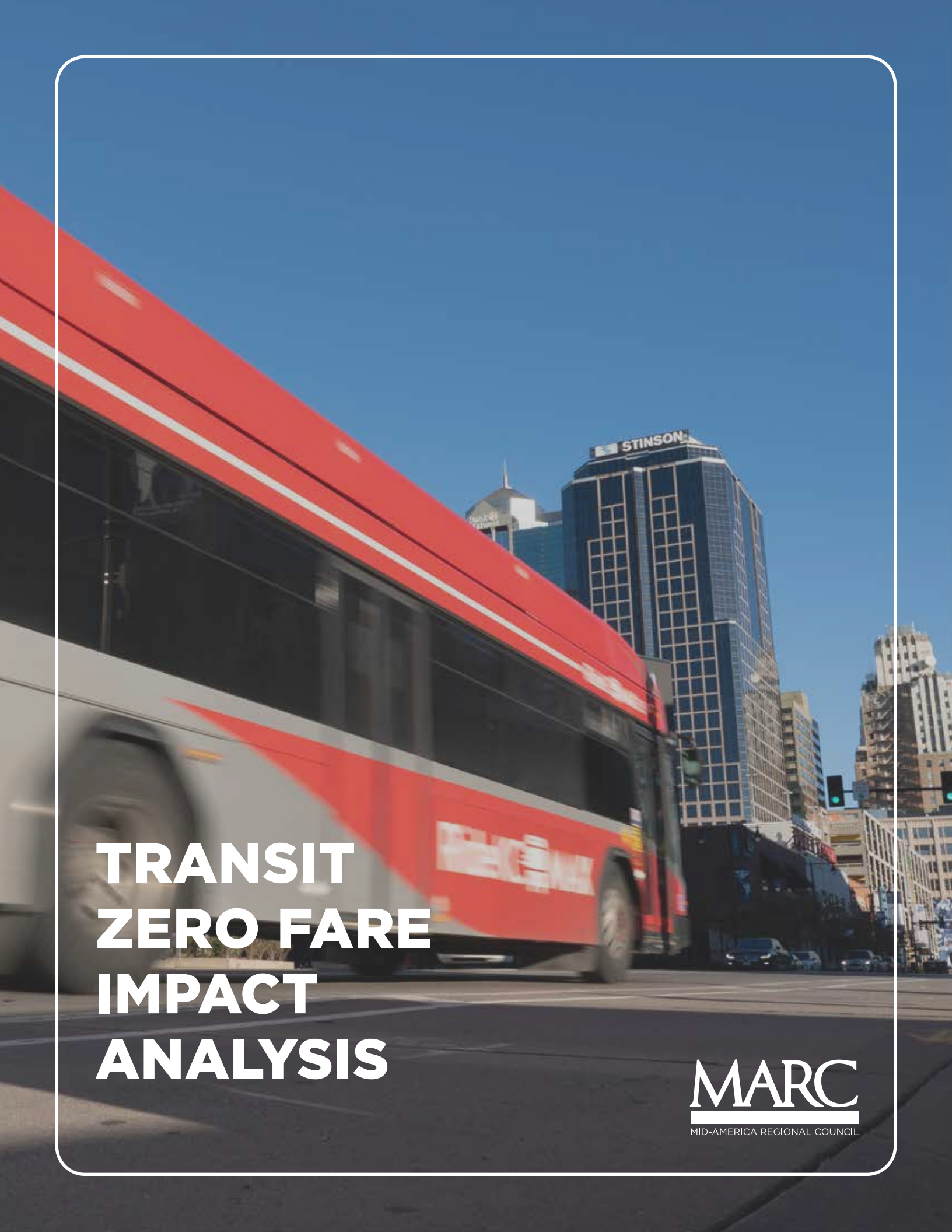

TRANSIT ZERO FARE IMPACT ANALYSIS

MARC
MID-AMERICA REGIONAL COUNCIL

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TABLE OF CONTENTS

INTRODUCTION

The Kansas City Area Transportation Authority (KCATA) and the City of Kansas City, Missouri, planned to suspend farebox revenue collection on bus routes at some point in 2020. The rationale for this included:

- To provide potential economic benefits to customers, especially low-income riders.
- To improve mobility and access to transit.
- To increase ridership.
- To increase efficiencies in KCATA operations including cash management and the onboarding process.
- To reduce fare disputes.

The intent was to implement zero fare not by reducing services but by identifying cost efficiencies and additional funding to offset any revenue loss.

The Center for Economic Information at the University of Missouri - Kansas City prepared an analysis of the potential benefits of a zero-fare program for KCATA in 2019. The final report was issued in February 2020. It concluded that a zero-fare transit program in the Kansas City region would provide significant economic benefit to the community and to transit customers.

When the COVID-19 pandemic reached the Kansas City area in March 2020, farebox collection was suspended on all area transit routes including flexible and paratransit services as a public health measure. Federal CARES Act funding was used to offset this revenue loss in 2020 and into 2021.

The Mid-America Regional Council (MARC), in partnership with the University of Kansas Transportation Center and University of Missouri - Kansas City Bloch School and with support from KCATA, analyzed the impacts of zero fare on a range of performance measures including economic impacts, opportunity costs, agency revenues and costs, operations, community impacts, and other policy considerations.

Study partners explored the following basic questions:

- Is there an economic benefit for individuals as well as the entire city, region and agency, to the proposed zero-fare program?
- What policy interventions are necessary to arrive at a sustainable zero-fare program that provides ongoing positive economic benefit?

Study partners considered various scenarios for future implementation of a zero-fare program generally as follows:

- A program that operates with no new public funding. Given the absence of new tax funding, is there a budget shortfall to be bridged via alternative measures such as transfer of revenue from other programs, service efficiencies or cost savings?
- A program that operates with dedicated new public funding such as taxes, parking fees, development fees, value capture, etc. Given new dedicated funding, a program may operate in conjunction with enhanced transit services.

Analysis included an effort to reach out to key stakeholders to:

- Gather input to help establish the full range of measures to be evaluated in the context of local and regional plans for transit service enhancements and expansion.
- Obtain perspectives and viewpoints from diverse audiences on qualitative and quantitative benefits, or any potential direct costs or opportunity costs of the program.
- Develop an audience with whom to communicate results.

Engagement included on-board surveys of riders and stakeholder interviews with 13 area leaders with knowledge of the zero fare deployment. These included a mix of local elected officials and local government and nonprofit executives. The primary purpose of the interviews was to identify additional evaluation factors for this report, if needed.

KEY FINDINGS

This study identified the potential for numerous benefits from suspended fare collection. While extenuating circumstances in 2020 — including decreased economic activity, transit service reductions and public health impacts of the COVID-19 pandemic — limited conclusive determination of the actual direct impacts of zero fare on ridership, on-time performance and other transit performance characteristics, the study team did find that:

- The net amount of lost fare revenue in 2020 was between $8 million and $10 million regionally, which was replaced by funding through the Federal CARES Act. In addition, while some costs related to fare collection were reduced or eliminated, they did not fully offset revenue losses or additional costs due to increased service demands. The annual net operating cost impacts reported by KCATA grew by $1.2 million due to increased ADA complementary paratransit service demands. Therefore, for the zero-fare program to be sustainable, either additional revenues or new cost savings must be found.
- When compared to other peer metro transit systems, RideKC ridership decreased less and recovered more quickly during the 2020 pandemic and economic contraction. Ridership dropped to 58% of pre-pandemic levels in May of 2020 but

recovered to 80% of its 2019 level by October 2020, while national transit ridership remained at 40% of pre-pandemic levels. A combination of zero fare and RideKC's higher share of transit-dependent riders compared to peer systems may have impacted these trends.

- Zero fare was a popular pandemic response measure among riders, with 88.3% of those surveyed either highly satisfied or satisfied with it in 2020.
- Security incidents declined by 39% from 2019 to 2020 and incidents per 100,000 riders declined by 17%.
- The annual economic impact of continuing suspended fares is likely to raise regional employment by 24 to 83 jobs, increase economic output by $4.2 million to $13.8 million and increase personal income in the community by $1.3 million to $4.6 million using MARC's econometric forecast model.
- Continuing zero fare could increase ridership on the existing fixed-route network anywhere between 20% and 60% according to national research; MARC's regional travel demand model suggests an estimated increase of 31% for the Kansas City region.
- MARC's travel demand model also suggests that increased ridership due to zero fare could result in annual reduction of approximately 7 thousand tons of carbon dioxide emissions, or 0.2% of regional transportation sector emissions.
- Community leaders interviewed for the study identified other qualitative impacts of zero fare such as increased access to work and educational enrichment activities for high school students and improved reliability to access health care and keep scheduled doctors' appointments for patients without access to private vehicles. These benefits are in addition to the direct economic benefits to customers of not having to pay a fare. This study did not attempt to quantify these indirect mobility improvement benefits, but the team recommends further assessment in the future.
- Community leaders were predominantly supportive of continued zero fare — albeit with some concerns about the opportunity cost of lost fare revenue — and were primarily interested in understanding impacts related to cost and funding, equity, service characteristics and ridership. These impacts should be reevaluated if zero fare is continued beyond the pandemic recovery as transit operations and the economy return to more typical levels.

POLICY IMPLICATIONS

Equity impacts

Potential equity impacts of suspended fair collection were important to a majority of stakeholders interviewed for this study. Given the demographics of KCATA's current riders, the primary beneficiaries of suspended fare collection in 2020 were people of color and people with low incomes. Nearly three-fourths of passengers reported not having a car available to them (72.4%). This implies a number of potential equity impacts depending on if or how the zero-fare program is continued.

If the program is continued, the main equity impacts are likely to derive from how lost fare revenues are recovered. If lost fare revenue is replaced by other locally generated sources such as sales taxes, the result is likely to be a slight transfer of revenues from higher income households to lower income riders, as discussed elsewhere in this report. If lost fare revenue is addressed by cuts in transit services, the benefits of no fare to riders may be offset by reduced service frequencies or coverage resulting in reduced access to jobs, education, healthcare and other opportunities. If suspended fares are also accompanied by new revenue sources sufficient to expand transit services, the equity benefits of the program are likely to increase.

While service changes in 2020 were only made in response to economic and public health impacts of the COVID-19 pandemic and lost fare revenues have been offset by new federal funds provided through the CARES Act and are anticipated to be covered by CRRSSA, the equity impacts of local revenue or service changes necessary

to continue the zero fare program should be investigated in more detail .

Likewise, if the program is planned to be discontinued by one or more of the RideKC partners or on one or more routes, the potential for disproportionate equity impacts should also be examined before any changes are made.

Financial impacts

Potential financial gains to the community are estimated to be relatively modest at the community level. That said, because transit riders are disproportionately people with lower income, the benefit is likely to be felt more significantly by that population.

A more germane issue lies with policies that will enable zero-fare operation at a sustainable level for KCATA. In Kansas City, Missouri, sufficient funds are collected from two unique sales taxes to support a zero-fare model in the city's service area. Currently, the contract between KCMO and KCATA places a cap on the amount of dollars, and requires KCATA to seek revenues that mitigate the burden of the city. If this revenue burden language is lifted and all funds from the two sales taxes are allocated to KCATA for transit in the city's service area, zero fare can be sustainable.

The situation outside of Kansas City, Missouri, is more complicated. The remaining jurisdictions that contract with KCATA each negotiate separately. The services in these areas are not underwritten by an existing sales tax like what is in place in Kansas City, Missouri. Thus, in order for zero fare to be sustainable in each of these other jurisdictions, they would need to agree to increased compensation of approximately $4MM collectively. But since they do not negotiate collectively, it is reasonable to assume each jurisdiction will need to devise a separate funding model. In theory, a bistate tax initiative that could cover all of KCATA's operating geography is possible, however, these have fared poorly historically, with the lone exception being Union Station in 1996.

A. SCOPE OF WORK AND METHODS

MARC and the university partners supported a quantitative assessment of the impacts of zero fare on as many performance measures as possible. Where quantitative data was not available, qualitative assessments were made. The study team drew comparisons between the period in 2020 when fare collection was suspended and equivalent periods in 2018 and 2019. Considerations were made to measure the impact of the pandemic on travel patterns. MARC used econometric and travel demand modeling tools to support this analysis.

To support its analysis, study partners considered:

- Current sources of revenue for KCATA operations including local, state and federal.
- Origin of revenue intended to replace fares. Available options currently include:
  - Funds imported into region through one-time infusion of federal revenue.
  - KCATA operational savings.
  - Direct transfers from other programs (city general revenues).
  - Philanthropical contributions.
  - Development fees and value capture.
  - Imposition of a local tax

The revenue intended to pay for the zero-fare program might originate from any or all the options above. Where possible, this study attempted to analyze potential differences in their impacts.

B. PARTNER ROLES

The Mid-America Regional Council (MARC) in partnership with the University of Kansas Transportation Center (KUTC) and University of Missouri Kansas (UMKC) City Bloch School and with support from KCATA analyzed the impacts of zero fare on a range of performance measures including economic impacts, opportunity costs, agency revenues and costs, operations, community impacts, and other policy considerations.

Team members from UMKC focused their analysis on community impacts and revenue/cost impacts.

KUTC provided support to better understand these same community impacts as well as operations and ridership implications of the program.

MARC provided modeling support through its travel demand model, coordinated work activities from various members, and led the process of finalizing the report to capture the results of the analysis.

C. DATA COLLECTION

MARC and the university partners used a set of relevant and available financial, operational, policy and survey data to conduct the impact analysis. The team supplemented this data with available comparative data for peer communities from sources such as the National Transit Database, case studies and a literature review.

Data collected for the study	Date	Responsible source or agency
GIS files of routes, stops and headways	2018-2020	KCATA
Ridership numbers	2018-2020	KCATA
Ridership numbers for peer systems (Before and during COVID-19) Compared to peers	2018-2020	MARC/UMKC/KUTC
Data from rider surveys		KCATA
Crosstab data from on-board rider surveys including ZIP Code data from 2020 survey		ETC/KCATA
Ridership demographic data (system wide and Prospect Max)		KCATA
Budget and expenditures, including grant reporting	2018-2020	KCATA
Reports on safety and security incidents	2018-2020	KCATA
Bus pass and transit stipend savings from employers and or potential to use the jobs accessibility analysis to examine the impact of access to major employers before/after.		MARC
Employment and wages from KCATA (Any employment and/or wage changes directly attributable to implementing zero fare.)		KCATA
Current sources of revenue for KCATA operations including local, state and federal. Origin of revenue intended to replace fares and allocated towards zero fare program. Options currently include: • Funds imported into region through one-time infusion of federal revenue. • KCATA operational savings • Direct transfers from other programs (city general revenues) • Philanthropical contributions. Development fees. Value capture. • Analysis of socio-economic data for groups which financially contribute to zero-fare program, vs. groups which benefit from program		KCATA/UMKC

D. STAKEHOLDER ENGAGEMENT

Analysis included an effort to reach out to key stakeholders to:

- Gather input to help establish the full range of measures to be evaluated in the context of local and regional plans for transit service enhancements and expansion.
- Obtain perspectives and viewpoints from diverse audiences on qualitative and quantitative benefits, or any potential direct costs or opportunity costs of the program.
- Develop an audience with whom to communicate results.

On-board surveys

KCATA conducts regular customer satisfaction surveys across RideKC services. KCATA recently surveyed customers using RideKC Bus, RideKC MAX, RideKC Flex, and RideKC Micro Transit services in fall 2020. RideKC Freedom and RideKC Streetcar are surveyed every other year. It was particularly important to KCATA to survey users in 2020 during the COVID-19 pandemic to better understand how and why users continued to use RideKC, in addition to continuing to monitor customer satisfaction and RideKC performance.

Stakeholder interviews

Over February and March, MARC staff conducted brief interviews of 13 area leaders with knowledge of the zero fare deployment. These included a mix of local elected officials and local government and non-profit executives. The primary purpose of the interviews was to identify additional evaluation factors for this report, if needed.

Engagement topics

Each stakeholder was asked the following questions:

1. What are your priorities for public transportation in greater Kansas City?
2. What are your impressions of how zero fare has been implemented in 2020?
3. Has zero fare impacted you, your organization or its customers, and if so, how?
4. What factors do you think we should consider as we evaluate the impacts of zero fare?
5. Which of these factors are most important to you?
6. How should public transportation priorities be funded in the future?

Summary and findings

Access to jobs was the most frequent public transit priority identified for question 1, followed by access to education and healthcare, economic development, expansion of services, sustainability of existing services and equity.

The majority of leaders interviewed expressed strongly positive impressions about implementation of zero fare in question 2, while three stated they held neutral opinions and one expressed concern about the opportunity cost of lost revenue and the potential impression the policy could give about the lack of need for transit funding.

The majority of leaders identified at least one positive impact from the program on themselves, their organization, or their constituents in question 3, while five were not aware of any direct impacts. None identified any actual negative impacts.

The leaders interviewed identified the following types of impacts as important to consider in question 4:

- Transit service measures such as on-time performance and security incidents
- Equity impacts of zero fare
- Ridership
- Cost and funding
- Return on investment (ROI)

The impacts identified as most important in question 5 were, in order:

- Cost and funding
- Equity
- ROI
- Service characteristics
- Ridership

Potential sources of funding to consider identified in question 6 included:

- Additional federal, state or county funding
- New sales taxes
- Development fees
- General fund revenues
- New parking fees

This information informed the evaluation of impacts conducted for this study.

E. REVENUE AND COST IMPACTS

This section of the report attempts to address the following study questions:

- What were the actual changes in revenue collected for all sources including farebox revenues, pass sales and other programs on KCATA services since fare collections were suspended?
- What sources and amounts of revenues were used to offset reductions in fare collections?
- What were the sources and amounts of any changes to KCATA capital or operating costs resulting from suspended farebox collections?

Revenue and cost impacts of a zero-fare model were examined at two levels, the city of Kansas City, Missouri, and the entirety of the KCATA region. At first, we began to explore impacts on both financial bottom lines of capital and operating accounts. However, capital accounts are funded from dedicated sources not impacted by fare/zero fare decisions. Thus, our analysis indicates there is no impact on capital, and more directly capital expenditures are funded currently and in full. So our analysis focused on operating accounts.

KCATA's regional financial model

KCATA enters into unique contractual agreements with governing entities to provide public transit services. The terms of the agreement for Kansas City are unique and different than they are for the government entities outside of the city limits. Each contract is negotiated separately. For this reason, there are differing implications for zero fare, or stated differently, it is not possible to generalize impacts from zero fare in one contract to other contracts.

Kansas City, Missouri, scenario

Our initial analysis examines the potential impact on revenues for a zero-fare model in Kansas City. We engaged in a series of conversations with financial leadership at KCATA, reviewed financial data on fixed service rates for KCMO service between May 1, 2019, and April 30, 2020, and reviewed public documents that serve as governing agreements between the two entities. We used this time period, as it provided the best assessment of revenues and expenses prior to the impact of the COVID-19 pandemic. During the 2019/2020 KCMO contract period, passenger revenue ($4.4 MM) recovered 9.4% of operating costs ($47.1 MM). Approximately 76% of service costs were accounted for by two taxes — a half-cent sales tax ($16.9 MM) and 3/8-cent sales tax ($18.7 MM). As is the case annually, KCATA only receives funding sufficient to break even, a balance of $20.7 MM remained between the two sales tax accounts. According to the city ordinance codifying the agreement between KCMO and KCATA, the balance of funds available ($20.7MM) may be held in a reserve for city transportation services in the future.

It is also important to note the same document that allows for holding excess tax dollars

in reserve also stipulates KCATA will seek to minimize costs through fare collection. A permanent shift to zero fare not accounted for in contract terms means KCATA can assume approximately 5 years of zero passenger revenue from fixed route through current reserves. Not accounting for changes in sales tax revenue due to the pandemic, there are sufficient funds available in the two sales tax revenue accounts to cover zero-fare transit in KCMO until 2024 (at which time the current transportation sales tax expires).

KCATA regionwide scenario

Our examination of zero fare for the entirety of the KCATA region looked at lost revenue and potential operational savings. The following table provides the 2019 revenue collection for all KCATA operations. Additionally, we provide cost savings and additional costs for zero fare in the region for both traditional service and paratransit service (estimates were provided by KCATA). Using the data, we estimated two overall impacts of zero fare, one without increases in paratransit service and one with increases in paratransit service.

Revenue

Pass sales	$3,115,860
Corporate pass	$562,478
Farebox collections	$4,010,841
Traditional paratransit	$651,400
Freedom On-demand	$622,300
TOTAL	**$8,962,879**

Traditional service projections

Cost savings	$934,650
Additional cost	$457,943

Paratransit projections

Cost savings	$-
Additional cost	$1,723,578

Estimates

Impact of zero fare:

Without paratransit Increase:	$ 8,486,172
With paratransit Increase:	$10,209,750
Without paratransit Increase with KCMO subsidy:	$4,086,172
With paratransit Increase and KCMO subsidy:	$5,809,750

Based on our analysis, adoption of zero fare and a return to 2019 ridership would result in an approximate financial loss between $8MM and $10MM annually. In the previous discussion, we identified a potential source of funds capable of overcoming shortfalls in the near term in Kansas City. These funds can only be used in the KCMO service area. Considering the potential to use reserves for Kansas City, KCATA could potentially limit annual financial losses from zero fare to a range of approximately $4MM to $5.8MM annually.

F. COMMUNITY IMPACTS

This section of the report attempts to address the following study questions:

- What was the net impact of suspended fare collection to the regional economy?
- What employment impacts resulted from suspended fare collection?
- How closely did actual benefits compare to those projected in the Center for Economic Information report? Were there segments of the community that benefited more significantly from suspended fare collection.
- What air quality impacts resulted from suspended fare collection?
- What changes resulting from suspended fare collection occurred to boarding times, on-time performance and/or system speeds for KCATA bus services?
- What changes resulting from suspended fare collection occurred in the number of fare-related disputes and other on-board safety and security incidents between drivers and passengers for KCATA bus services?

Economic impacts

Offering zero fare to existing riders essentially increases their real disposable income by the amount of the lost revenue, or $9M. What kind of impact might this have on the communities in which they live and work?

We simulated the impact by first examining how this extra income might be spent. This we based on the Consumer Expenditure Survey by household income conducted by the Bureau of Labor statistics. Higher income households spend a lower share of their income due to both savings and taxes, while lower income households spend more than their money income due to transfer payments. The spending patterns also differ by income, with lower income households spending more on housing and higher income households spending more on pensions.

Expenditures by major category	All consumer units	Less than $15,000	$15,000 to $29,999	$30,000 to $39,999	$40,000 to $49,999	$50,000 to $69,999	$70,000 to $99,999	$100,000 to $149,999	$150,000 to $199,999	$200,000 and more
Food	13%	15%	15%	14%	15%	14%	13%	13%	12%	11%
Alcoholic beverages	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Housing	33%	41%	39%	36%	35%	34%	32%	31%	30%	30%
Apparel and services	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Transportation	17%	16%	16%	18%	18%	19%	18%	18%	17%	14%
Healthcare	8%	9%	11%	10%	10%	9%	9%	8%	7%	6%
Entertainment	5%	4%	4%	4%	4%	4%	5%	5%	5%	6%
Personal care products and services	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Reading	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Education	2%	3%	2%	1%	1%	1%	2%	2%	3%	4%
Tobacco products and smoking supplies	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Miscellaneous	1%	1%	2%	1%	2%	2%	1%	1%	1%	1%
Cash contributions	3%	2%	3%	3%	2%	3%	3%	3%	3%	5%
Personal insurance and pensions	11%	2%	3%	5%	7%	9%	11%	14%	16%	18%
Total expenditures	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Consumption expenditures as % of total money income	66%	>100%	>100%	>100%	>100%	81%	69%	59%	52%	37%

Because bus riders have lower incomes than average, we used the expenditure pattern for a lower-income household group ($15,000-$29,999) to simulate the additional $9M in income provided bus riders from reducing bus fares to zero.

After allocating the $9M across expenditure categories, these values were input into the Policy Insight model from Regional Economic Models, Inc. (hereafter, the REMI model) using its consumer spending policy variable. This was done at a more detailed level than shown above (75 categories of expenditures) for increased precision. Cash contributions and pensions are not included in the consumer spending variable, essentially treating them as savings.

The REMI model is a dynamic computable general equilibrium model with over 1,000 equations solved simultaneously. It is built around an input-output model that describes the purchases of each industry from other industries. Unlike a traditional I/O model, however, prices are flexible in the REMI model, so that an increase in demand provokes a price increase that partially reduces that demand over time. As a result, the REMI model does not use static multipliers to estimate economic impact. Instead, the impact varies over time. The impact measures reported below are the average impact over a 6-year period.

Additionally, the REMI model makes a distinction between an increase in local sales vs. an increase in local demand. An increase in income produces an increase in demand for goods and services, only some of which is purchased locally. Sales are the portion of demand that is satisfied locally. The proportion of local demand that is satisfied locally, called the Regional Purchase Coefficient (RPC), is estimated by REMI for each region for each of the 70 industries in the model.

MARC translated the $9M in income into expenditure demand by category using the Consumer Expenditure Survey above and input those additions to consumer spending into the REMI model. This yields the following impacts on the community:

Gross economic impact of zero fare transit due to:	**Spending increase by bus riders**
Jobs	83
Economic output (sales in thousands of 2018 dollars)	$13,816
Community personal income (thousands of 2018 dollars)	$4,592

Based on the assumptions above, the lowering of transit fares to $0 is estimated to generate additional spending in the community that, everything else equal, would raise employment by 83 jobs, economic output by $13.8 million and personal income in the community by $4.6 million.

This is the expected gross economic impact of a zero-fare policy. However, the costs of providing this service still exist. To calculate a net economic impact estimate, we must

take into account where the money to finance the service is likely to come from.

If it were to come from outside the region, from the federal government or a national philanthropy, for example, then the cost to the region would be essentially zero and the net economic impact would equal the gross economic impact. Unfortunately, such zero-cost solutions to the funding gap created by zero fare transit are likely to be short-term in nature. In the long run, the money needed to fund this service is ultimately most likely to come from local taxpayers.

To simulate this, we assume that residents are taxed by an amount to offset the loss of fare revenue, i.e., by an amount totaling $9 million. This reduces their incomes by the same amount, reducing their expenditures. But unlike lower income households that make up the bulk of the transit riders, the average resident does not consume all their income. Some of that income would have gone to pay other taxes, and some would have gone toward savings, social security and pensions. As shown in the table above, the average household only spends about 66% of its income on consumption of goods and services. This means that, on average, the negative impact on local spending from raising taxes on the average household can be expected to be about one-third less than the reduction in income.

The REMI model does not directly model these differences in the average propensity to consume out of income by household income group. Therefore, MARC input the expected change in expenditures directly, reducing consumer spending by approximately $6 million (66% of the $9 million assumed to be paid by taxpayers) according to expenditure pattern of the average household.

Subtracting the impact of this lost spending by the average household from the impact of the additional spending by transit riders, yields the following estimate of the net economic impact of zero fare transit.

Net economic impact of zero fare transit due to:	Spending increase by bus riders	Spending reduction by taxpayers	Net impact
Jobs	83	-59	24
Economic output (sales in thousands of 2018 dollars)	$13,816	-$9,658	$4,158
Community personal income (thousands of 2018 dollars)	$4,592	-$3,261	$1,331

Taking into account that the costs of zero fare transit must still be paid, there is still a net benefit to the community. We estimate it will add 24 jobs, $4.2 million in sales and $1.3 million in income to area residents.

One might argue that this net benefit calculation is too conservative, that the slight

increase in cost to the average consumer will be too small to be noticed. After all, $9 million spread out over more than 210,000 Kansas City, Missouri, households or 833,000 metro households works out to less than $1 per week or $1 per month, respectively. At such low rates, rather than consumption changing, it may be more reasonable to suggest that savings will be reduced. In this case, since spending isn't reduced, the net benefit would again be the same as the gross benefit. Indeed, this may be a good estimate of the short-run impact.

On the other hand, one might argue that taxpayers would reduce their spending by the full amount of the lost income, not 66%. In this case, the increase in spending by transit riders would be exactly offset by a reduction in spending by average consumers and there would be no net benefit. Over the long run, though, we would expect consumers to adjust their behavior to the new tax level in the way the historical data suggests, even if the amount of adjustment were small. For this reason, we believe that simulating the impact of a tax increase by reducing the actual spending of the average consumer by 66% of that increase to be the most reliable assumption.

The estimates above do not take into account the increased ridership from zero fare. If people decide to ride the bus, then it is because they benefit. However, the aggregate value of these benefits are not estimated here.

Operational impacts

To evaluate the operational impacts of zero fare implemented by KCATA in 2020, the research team has considered and performed the following tasks. These tasks are presented along with their methodology and results that provides better understanding of the impacts of zero fare on KCATA's system-wide and route operations.

Identifying operational factors

This task evaluated transit performance due to the suspension of fares. Among many operational factors, on-time performance (OTP) has been considered as a crucial factor to understanding the impact of zero fare on KCATA's system and route service performance. The type of fare collection method is one of the factors that affect OTP. Dwell time was also considered to understand the impact of zero fare collection on OTP and more information can be found in the third task of this section. Dwell time is the time interval between the vehicle's opening and closing of doors to serve passengers at the bus stop.

Analyzing OTP of KCATA

On-Time Performance (OTP) is an important measure of the level of transit service and operational effectiveness of the transit system. OTP is usually expressed as a percentage, with higher percentage meaning more vehicles on time. To evaluate the operational effectiveness of the KCATA system, average monthly OTP data from March through November between 2018 and 2020 is presented in the table below. This data was also compared to the OTP of the peer transit agencies and is presented in the Peer Transit Agencies section.

KCATA System-wide On-Time Performance (OTP)

	2018			2019			2020		
	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late
April	1.66%	88.69%	9.64%	1.61%	87.36%	11.03%	2.53%	89.73%	7.74%
May	1.68%	86.99%	11.33%	1.68%	86.87%	11.44%	1.37%	87.96%	10.66%
June	1.91%	86.43%	11.66%	1.73%	85.52%	12.74%	1.47%	87.22%	11.31%
July	1.79%	87.58%	10.63%	1.95%	85.83%	12.22%	1.45%	87.58%	10.97%
August	1.59%	86.41%	11.99%	1.97%	84.82%	13.21%	2.02%	88.81%	9.17%
September	1.53%	85.72%	12.75%	1.91%	84.74%	13.35%	2.34%	88.44%	9.23%
October	1.95%	85.76%	12.30%	2.13%	87.29%	10.57%	1.96%	88.90%	9.13%
November	1.76%	86.31%	11.94%	2.26%	87.17%	10.57%	2.22%	89.32%	8.46%

Understanding impact of Dwell time on OTP

There are many factors that can affect OTP. Some of these factors include, but not limited to, traffic congestion, detours, passenger load, fare collection method, weather and crashes. These factors cause the delays affecting the operations of the system. Analyzing the delays before and after fare suspensions is an essential step in understanding the agency's operational impacts. Typically, dwell time is the time spent during passenger boarding or alighting, on-board fare collection, passengers using a wheelchair lift or any other idling time on any route which causes delays and thus affecting OTP. Due to the unavailability of KCATA dwell data, average dwell times for multiple scenarios from various literature reviews has been considered in this study. The table below presents the average dwell times based on type of fare collection methods and other considerations.

Time	**Purpose**
5 seconds	Average stop dwell time when no passenger alights or board
2.75 seconds	Additional time per passenger during alights or boards
5.1 seconds	Average boarding time per passenger who use on-board cash fare payment than who buy their tickets off-board
3.5 to 5.1 seconds	Longer with on-board fare collection methods per passenger
5.3 seconds	Average boarding time for electronic fare collection method
6.9 seconds	Average boarding time for cash method
1.8 seconds	Average boarding time for ticket vending machine method

Ridership impacts

The impacts of ridership due to the suspension of fares by KCATA were analyzed and results are presented in this section. This analysis was performed by considering some of the potential issues that might result due to the fare suspension. These considered issues are presented below along with methodology and results of the ridership impacts due to the zero-fare program.

Issues:

- What changes occurred to ridership on KCATA routes and other services?
- How did these changes compare with other peer systems' or national ridership statistics during the COVID-19 pandemic?

Methodology

The KUTC team was tasked with analyzing the changes in ridership that occurred since the zero-fare policy was implemented by KCATA. and comparing ridership trends to peer cities. To analyze these trends, the KUTC team collected monthly ridership data from KCATA, and five agencies identified as peers for a span of three years (2018-2020). This data was further refined to obtain a final dataset including monthly ridership data for the eight-month period of April-November in each year included in the study. These months were chosen to control for the effects of COVID-19. Additionally, December was excluded from the study due to a lack of available data. The identified ridership pattern between 2018 and 2020 are presented in the results section.

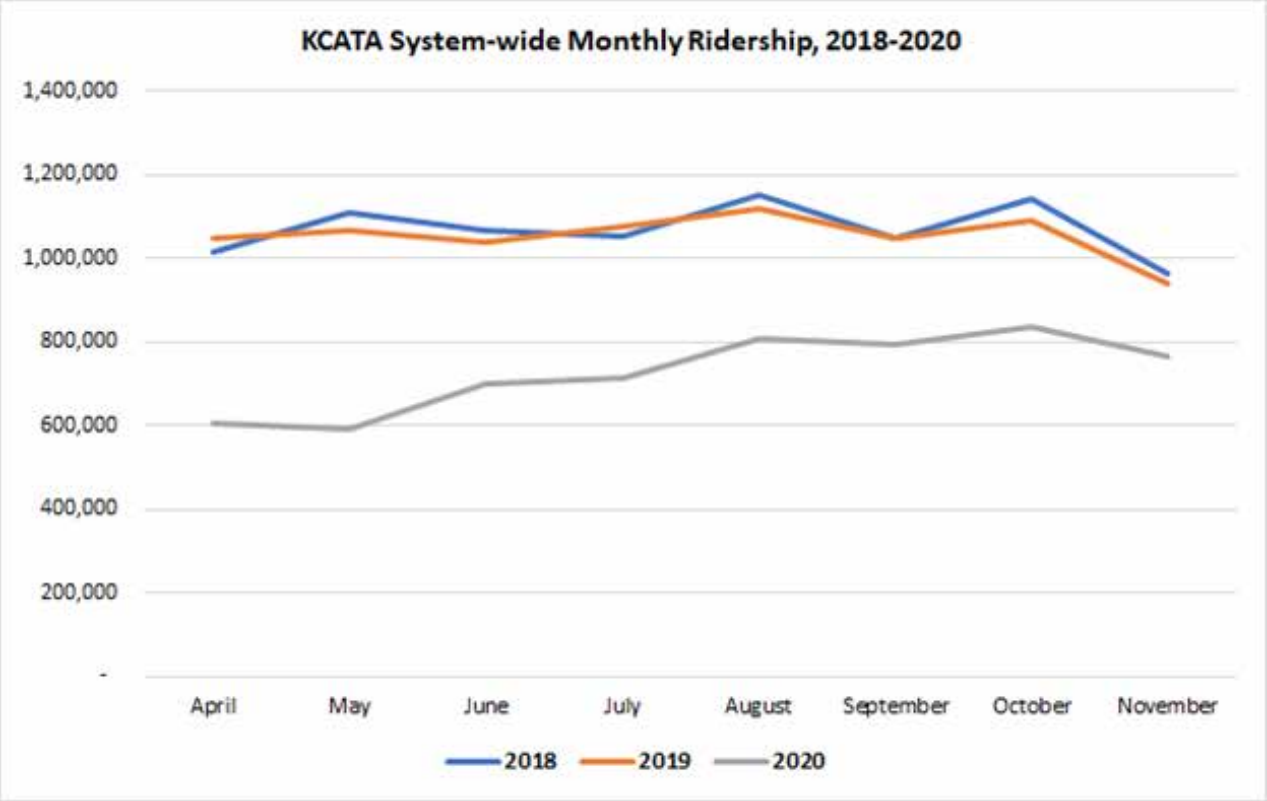
The research team then analyzed monthly changes in ridership occurring on each route operated by KCATA. First, average daily ridership was calculated for each route for the two-year period of 2018-2019. Next, the team calculated the percent change in average daily ridership in 2020 from the 2018-2019 average. Routes were then divided into high, medium, and low performing categories based on the percent of ridership they retained. Finally, these routes were overlayed with demographic data and mapped to show spatial patterns of route performance.

A detailed discussion of the system-wide ridership retained in 2020 which is expected due to the implementation of zero fare program is discussed in the Peer Cities Section of this report.

Results and discussion

Systemwide analysis

The ridership trends during the study analysis period is presented below. Though ridership decline was expected in 2020 due to COVID-19, monthly ridership in 2020 is consistent to the ridership pattern observed in 2018 and 2019.



Route level analysis

The results of KCATA route level analysis showed that most routes (38%) retained less than a third of their 2018-2019 ridership in 2020. Our analysis found evidence that the demographics such as median household income, vehicle access, and race had an impact on route performance. The lowest performing routes were commuter routes that serve populations with higher median household incomes, high vehicle access, and a higher percentage of white residents. Conversely, the highest performing routes served areas with lower median household incomes, less access to vehicles, and a higher percentage of non-white residents. Based on these results, the routes that retained riders during the COVID-19 pandemic were those that serve transit dependent populations. However, it is still unclear the extent to which zero fare impacted ridership. Detailed route level analyses by weekdays and weekends are presented in the Appendices of this report.

Impacts of suspended fares on ridership demographics, experiences and satisfaction

The study team also attempted to address the following research questions:

- What quantitative or qualitative inferences can be drawn about ridership impacts of suspended fare collection during the pandemic?

- What changes occurred resulting from suspended fare collection to ridership demographics on KCATA routes and other services?
- What impacts did riders report for their experience with suspended fare collections regarding their use of and satisfaction with KCATA services?

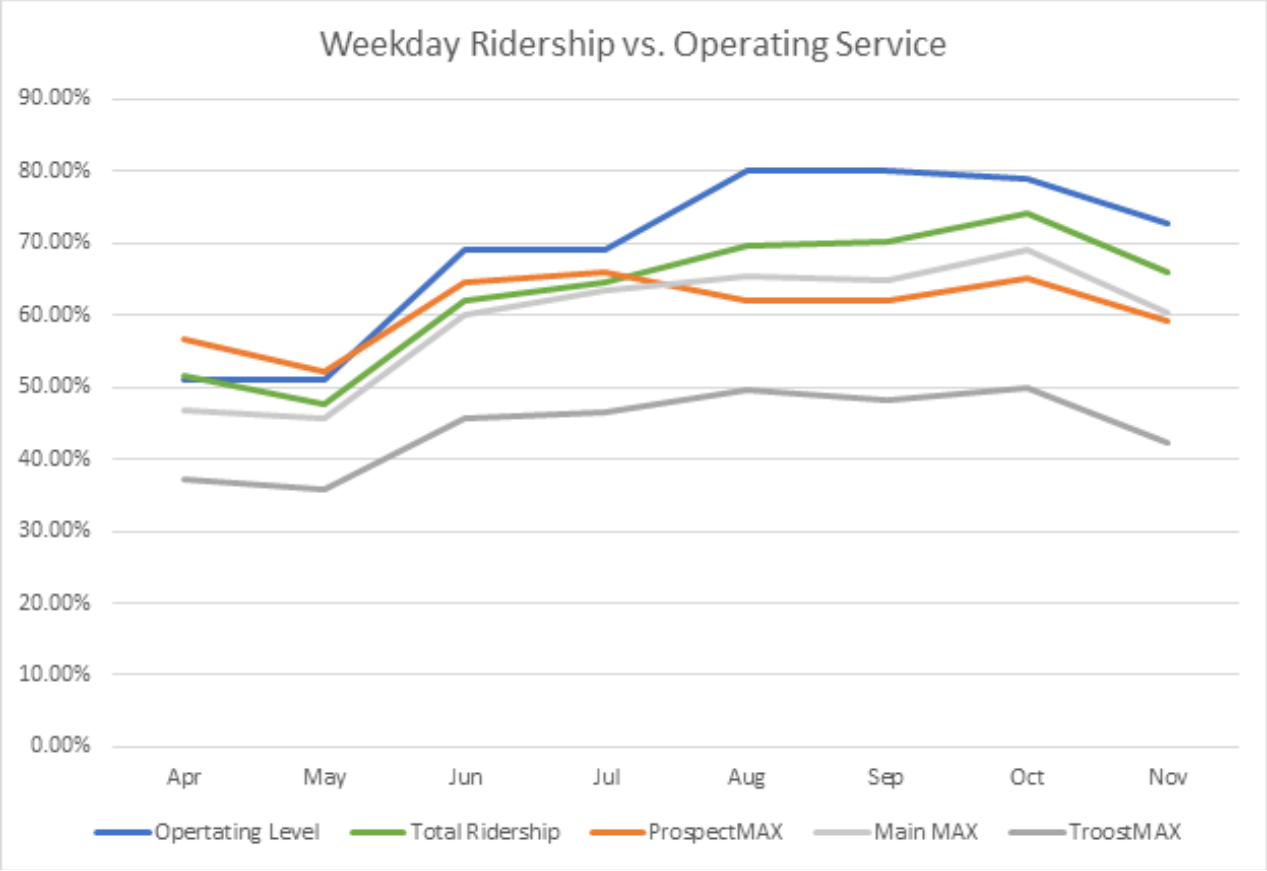
No conclusions or findings were made around these issues. The team was not able to make inferences on zero fare due to inability to control for other variables. Only one year of travel survey data was available, so the demographic changes or rider experience changes could not be assessed.

Existing ridership

The RideKC annual ridership was 12,044,179 in 2019 and 8,706,721 (excluding December data) in 2020. Ridership dropped significantly during the COVID-19 pandemic. A year-over-year look at ridership levels shows that May of 2020 was 58% of total ridership when compared to May of 2019. Since October of 2020, RideKC ridership has gradually recovered to 80% of its 2019 level. Comparatively, national ridership still remains at 40% of 2019 levels by this same time.

KCATA implemented the Zero Fare policy across its system starting on April 12, 2020. KCATA adjusted the operating services in accordance with the ridership decreases observed during the early stages of the pandemic. The monthly ridership in 2020 and the operating service levels are shown in figure xx. Prospect MAX and KC Streetcar are the two routes that already operated fare-free before the pandemic, and have continued to do so. The monthly ridership of Prospect MAX is shown in figure xx. During the summertime of 2020, the weekday transit ridership of Main and Troost MAX both tracked closely with the return of services. These two MAX lines tracked more closely with the total transit weekday ridership and have recovered ridership at a faster rate than Prospect MAX and

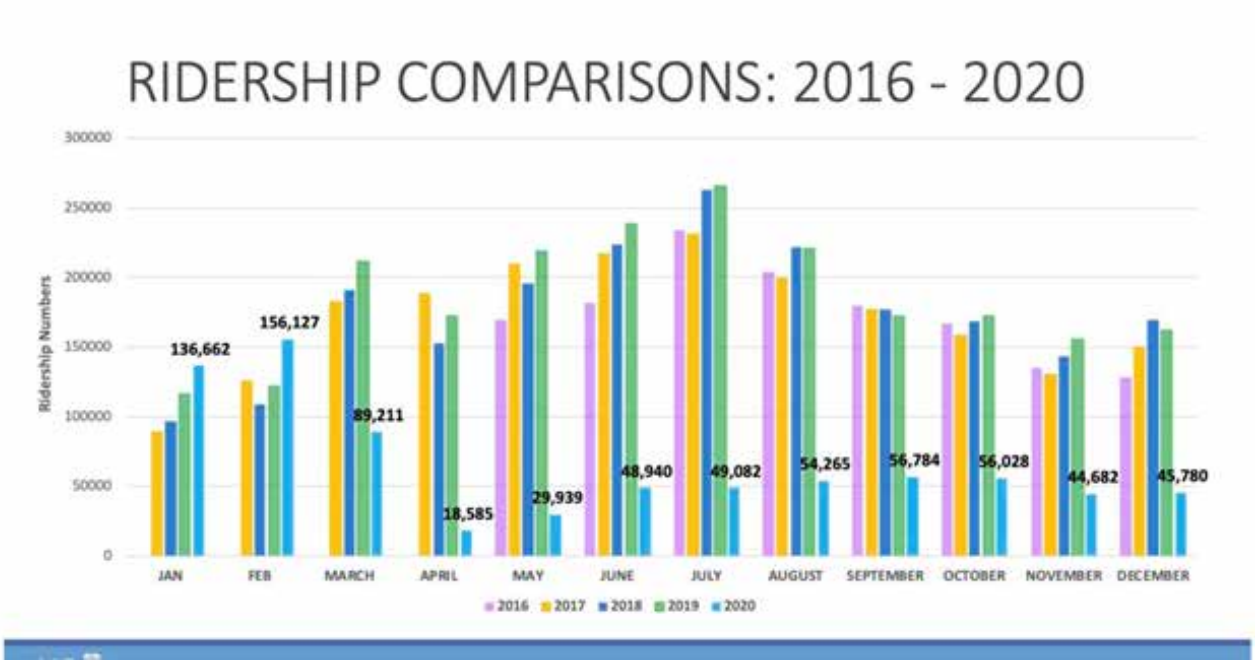
Streetcar. Thus, the zero-fare policy appears to be having an impact on faster ridership recovery along routes not previously operating with zero fare.



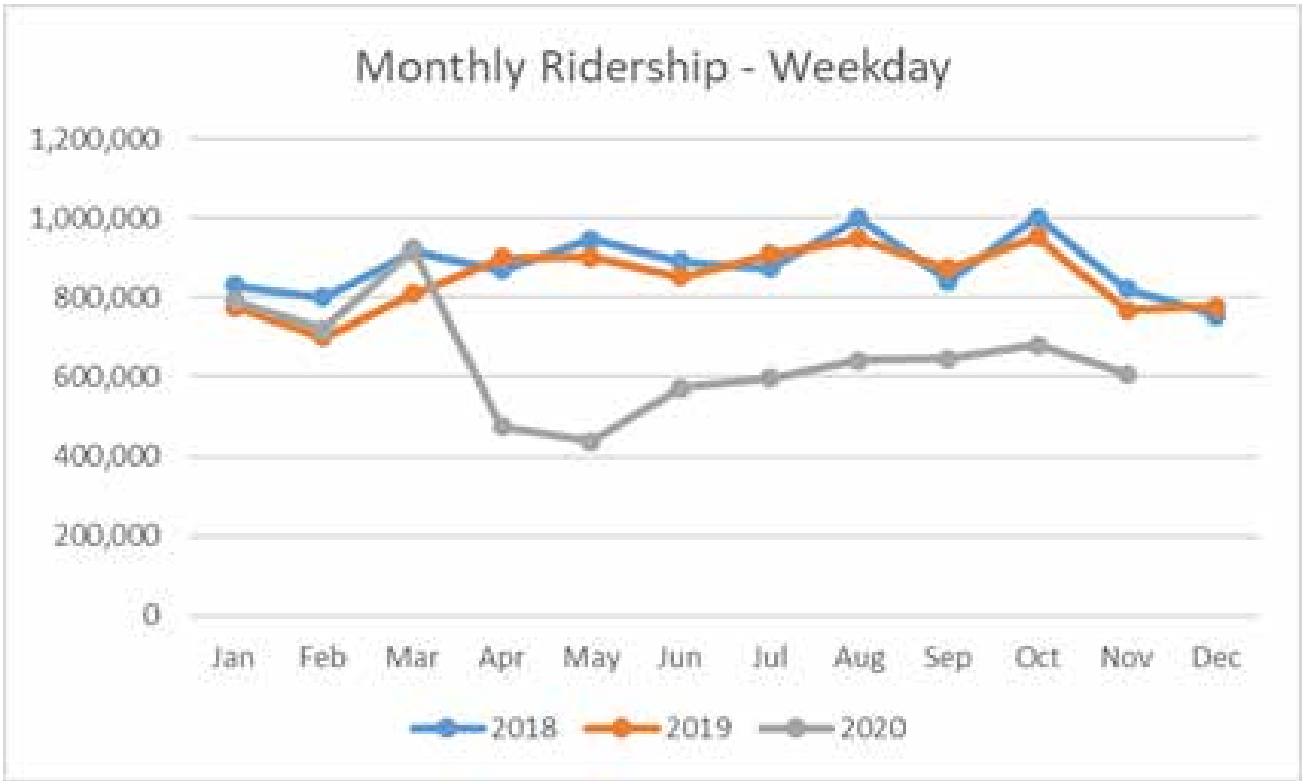
Notes: Service Operating Level: KCATA's major service reduction occurred on April 12. If service prior to that date is considered as 100% service (about 2,185 weekday platform hours, although this varies slightly between several markups prior to that point), these are percentages for each markup period after that:

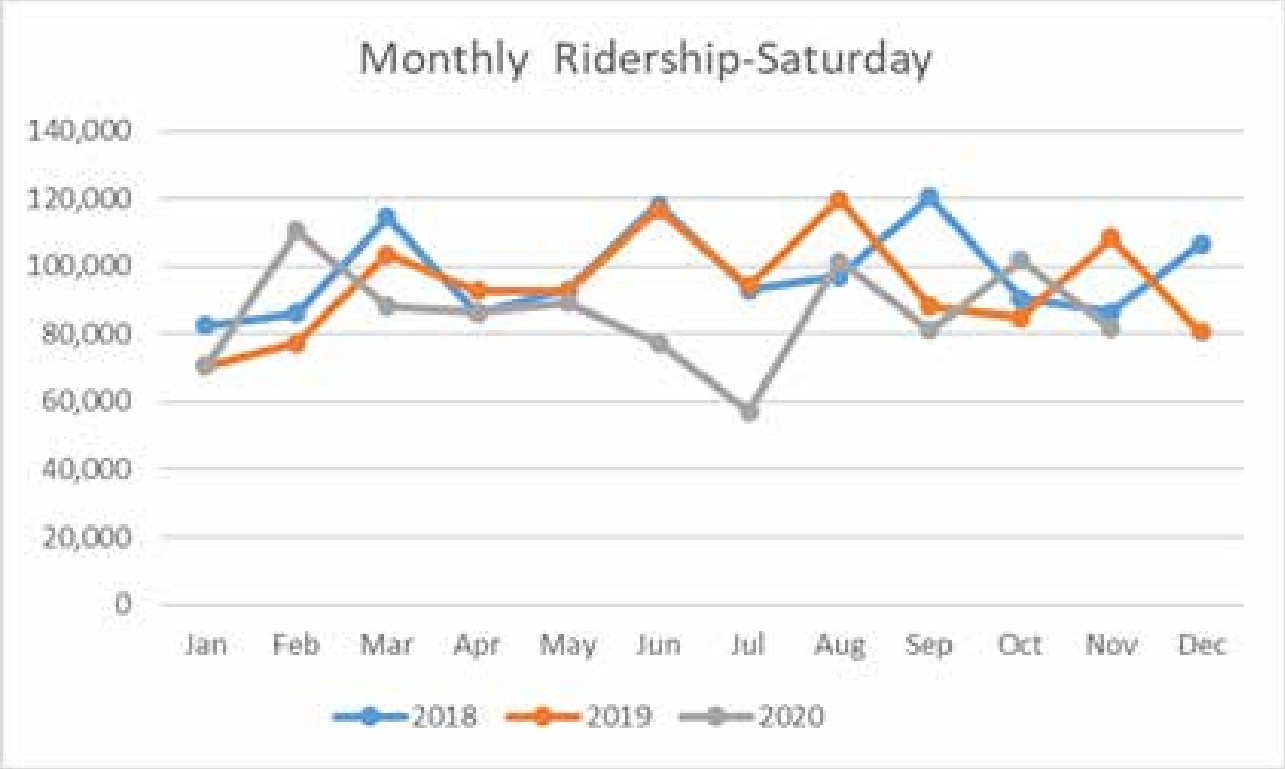
Start	End	% of platform hours compared to before 4/12/20
4/12/2020	5/30/2020	51.1%
5/31/2020	8/1/2020	69.2%
8/2/2020	10/3/2020	80.1%
10/4/2020	11/22/2020	79.0%
11/23/2020	12/13/2020	72.9%
12/14/2020	1/2/2021	69.9%

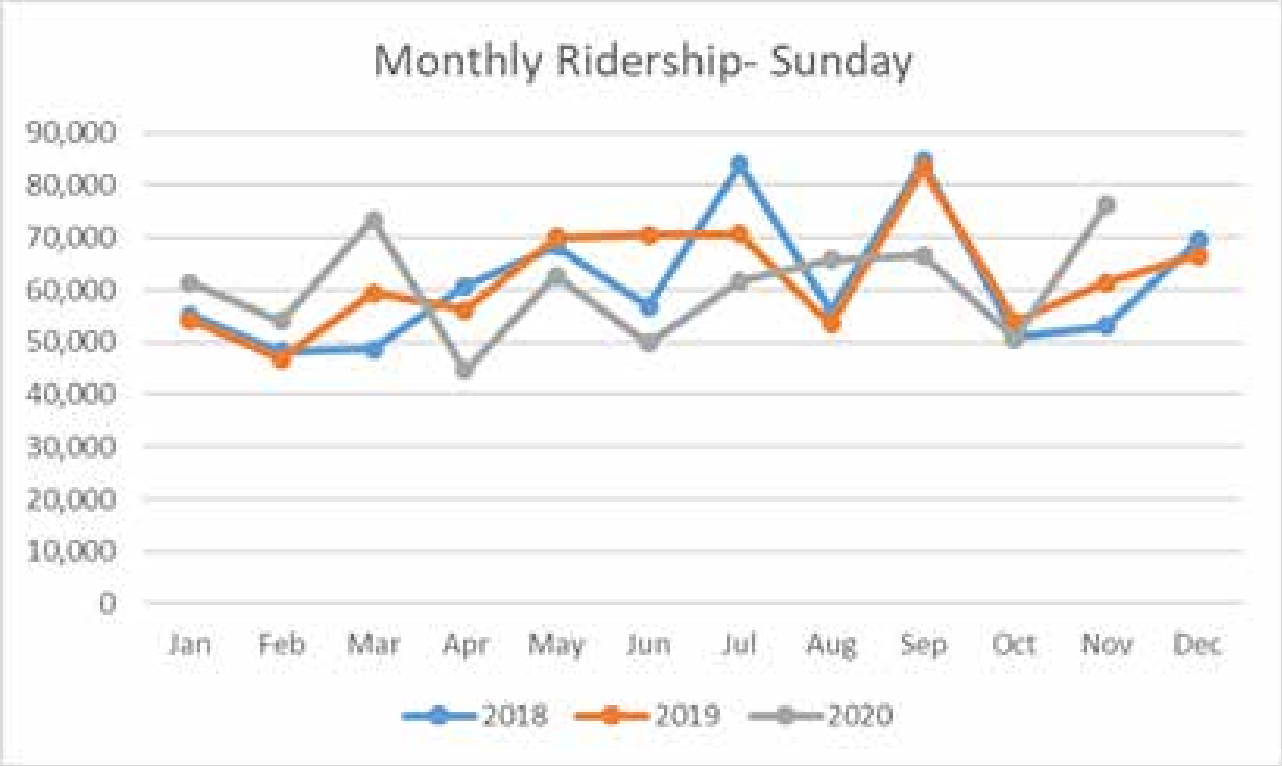
Ridership level = percent current month ridership compared to March 2020 ridership



The average weekday ridership was 39,877 in 2019 and 30,190 in 2020. The COVID-19 pandemic impact has significantly affected ridership for transit services. The average ridership reduction in 2020 was 24% on weekdays and less than 10% on weekends. The monthly total ridership from 2018 to 2020 is shown in table xx.

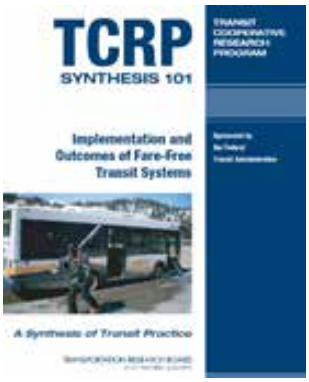



Monthly Ridership-Saturday
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2018
2019
2020


Monthly Ridership- Sunday
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2018
2019
2020

Ridership forecast literature review

The scope of work for this analysis includes literature review describing initiatives of similar nature around the country.



One report the study team reviewed was TCRP's "Implementation and Outcomes of Fare-Free Transit Systems". (Link: https://cvtdbus.org/wp-content/uploads/2018/09/2012-07-TCRP-fare-free-report.pdf)

This report concludes that 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. The most recent institution of fare-free public transit service that occurred in Corvallis, Oregon, in 2011 resulted in a 43% increase in ridership within two months, with no increase in service hours. Overall, ridership increases ranged from 25 to 63%.

The report also includes additional costs which may be attributable to implementation of the zero-fare policy, including addition of buses, delays on schedule, additional needed staff, etc.

RESULTS OF SYSTEM-WIDE FARE-FREE PUBLIC TRANSIT EXPERIMENTS

Service Area	Dates of Demonstration	Population of Service Area	Results
Asheville, North Carolina	08/06–11/06	70,000	58.5% increase in ridership; some problem riders, schedule adherence suffered, retained an increase of 9% in ridership after demonstrations.
Austin, Texas	10/89–12/90	500,000	Credited for ridership increases of 30%–75%; reports of disruptive teenagers and driver complaints. Increased operating costs, but successful in promoting ridership.
Chelan–Douglas Counties, Washington	12/91–09/00	100,000	Ridership exceeded forecasts by a factor of 4. Policy ended when state funding source was eliminated by voters.
Denver, Colorado (off-peak hours only)	02/78–01/79	1,500,000	Reported increases in ridership of 36% to 49%, although inconclusive because of changes in service made during experiment; decreased schedule reliability, crowding.
Mercer County, New Jersey (off-peak hours only)	03/78–02/79	300,000	Ridership increases of 25%–30%; 45% of buses ran late, extra buses required, driver complaints, problem riders.
Milton, Canada	06/07–12/07	54,000	Ridership increased 63%; some increased rowdiness among young passengers, but 99% of customers "satisfied" or "very satisfied."
Salt Lake City, Utah	October 1979	910,000	13% increase in ridership.
Topeka, Kansas	May 1988	120,000	Ridership increased 86% and 6% increase in ridership was retained after demonstration.

Cost considerations: The following table shows a comparison of various systems, comparing savings from eliminating the fare collection function, lost revenue, the one-time fee for implementing fare-free policy, etc.

PROJECTED COSTS OF IMPLEMENTING A FARE-FREE POLICY

Transit Agency and Year of Analysis	Savings from Eliminating Fare Collection Functions	Costs of Lost Revenue, New Service, and Additional Vehicles and Facilities	Estimated Cost of Implementing Fare-Free Policy
Lane Transit–Eugene, Oregon (2008)	$100,000–$500,000	$5 million in lost fares	$4.5–$5 million in net new costs per year
Muni–San Francisco, California (2008)	$8,400,000	$112 million in lost fares $72 million for increased service $512 million in capital expenses	$184 million in net new operating expenses per year
Tri-Met–Portland, Oregon (1998)	(not provided, but possibly accounted for in costs column)	$41 million in lost fares $8 million for increased service $5 million for additional vehicles	$49 million in new operating expenses per year
Hamilton, Canada (2008)	(not provided, but possibly accounted for in costs column)	$900,000 in lost fares $30 million for additional service	$30.9 million in additional operating expenses per year

Ridership forecast using MARC travel demand model

The 2016 base MARC travel demand model was used for this analysis. The estimated daily ridership from the model is 61,946. RideKC weekday ridership in 2018 was 41,369.

	Passages		Survey Sample	
Local Bus	44829	78%	1819	79%
	0	0%		0%
Express	885	2%	61	3%
BRT	11502	20%	422	18%

- Mode choice theory
- Model assumption elastic parameters: fare, headway, service type, vehicle….

Running the model with zero fare

Controlling for observed COVID-related impacts, the model projects a potential ridership increase of 31% with implementation of a region-wide zero-fare policy.

	Based Model	Adjusted Base	Zero Fare Scenario
Peak Local Fare (125)	125	150	0
Offpeak Local Fare (125)	125	150	0
Daily Express Fare (250)	250	300	0
Peak BRT Fare (250)	250	150	0
Offpeak BRT Fare (250)	250	150	0
Total Ridership (daily)	**61,947**	**66,809**	**88,039 (+31%)**

Recommended Transit Elasticity Values

	Market Segment	*Short Term*	*Long Term*
Transit ridership WRT transit fares	Overall	−0.2 to −0.5	−0.6 to −0.9
Transit ridership WRT transit fares	Peak	−0.15 to −0.3	−0.4 to −0.6
Transit ridership WRT transit fares	Off-peak	−0.3 to −0.6	−0.8 to −1.0
Transit ridership WRT transit fares	Suburban commuters	−0.3 to −0.6	−0.8 to −1.0
Transit ridership WRT transit service	Overall	0.50 to 0.7	0.7 to 1.1
Transit ridership WRT auto operating costs	Overall	0.05 to 0.15	0.2 to 0.4
Automobile travel WRT transit costs	Overall	0.03 to 0.1	0.15 to 0.3

Note: WRT = With Respect To

Bus headway elasticities by service level and time period.

	Peak Hours			Off-Peak Hours			Weekends			All Hours			Aggregate Value		
Service Level[a]	Mean	SD	No. of Cases	Mean	SD	No. of Cases	Mean	SD	No. of Cases	Mean	SD	No. of Cases	Mean	SD	No. of Cases
High	−0.27	±0.14	2	−0.19	±0.09	3	−0.22	-	1	−0.25	-	1	−0.22	±0.10	7
Medium	NA	NA	NA	−0.49	±0.20	3	−0.43	±0.16	3	NA	NA	NA	−0.46	±0.18	6
Low	−0.58	-	1	−0.71	±0.11	3	NA	NA	NA	−0.51	±0.20	6	−0.58	±0.19	10
Aggregate value	−0.37	±0.19	3	−0.46	±0.26	9	−0.38	±0.17	4	−0.47	±0.21	7	−0.44	±0.22	23

[a]Levels of service classified as follows: high, <10-min headways; medium, 10- to 50-min headways; low, >50-min headways.

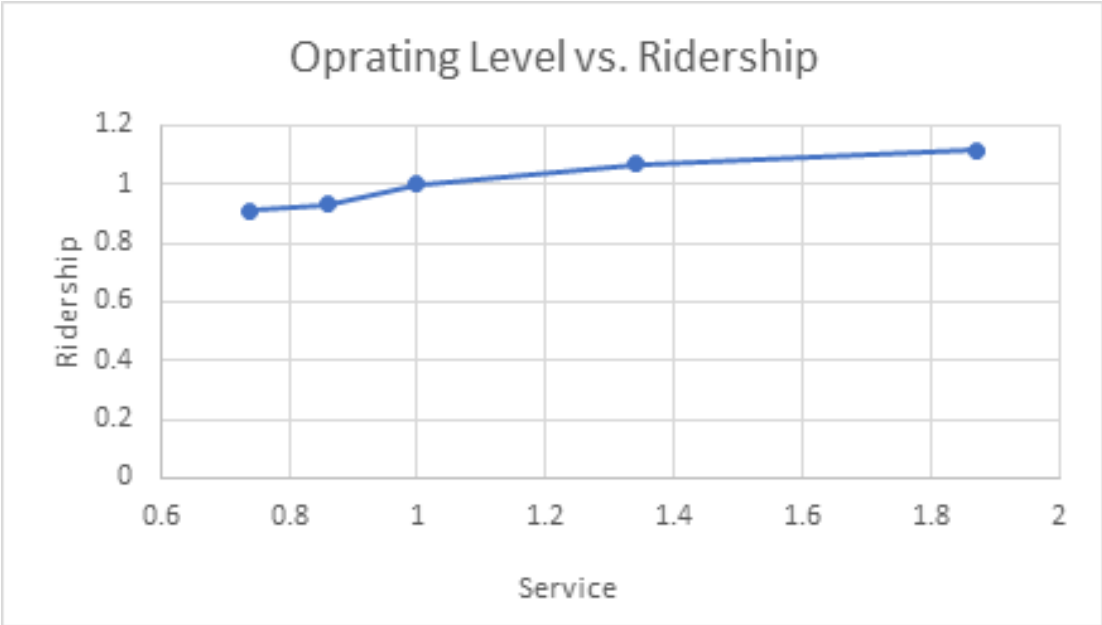
"Transit Price Elasticities and Cross-Elasticates "Journal of Public Transportation, Vol.7, No, 2,2004

Model testing

Since April 12, 2020, KCATA implemented service reductions to correspond with the reduction of ridership. To test the operating service elasticity, the model sensitivity tests were conducted by five separate model runs. The model service cut (increase/decrease frequency for every route in the system) and the ridership estimation are shown in the table below. This table shows a range of model forecasted ridership decreases of 91.1% of ridership with 73.7% of 'normal' services to an increase of 117.8% of ridership with 187.2% of 'normal' services.

Note: The operation testing is just regionwide model testing. Different routes can see elasticity vary.

Service level (compare to base model)	**Ridership**	**Increase/decrease**
73.7%	56,450	91.1%
85.9%	57,757	92.9%
100%	61,947	100.0%
113.4%	66,260	106.9%
187.2%	72,950	117.8%


Oprating Level vs. Ridership
Ridership
1.2
1
0.8
0.6
0.4
0.2
0
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Service

G. PEER TRANSIT AGENCIES COMPARISON

To better understand the impact of zero fare implementation on KCATA system performance, particularly operations and ridership, the KUTC research team compared KCATA data with seven other peer transit agencies across the country. To identify the peer agencies for this analysis, the Mid-America Regional Council provided the KUTC team with a list of agencies identified as peers in previous analyses. Additionally, the research team reached out to transit agencies that had implemented zero fare programs. The KUTC team then reached out to each of the identified agencies and requested the following:

- Data requested:
  - Monthly ridership data (bus routes only)
  - Monthly level of on-time performance
- Does your agency have any fare equity programs (fare capping, no penalty fare evasion, expanded access to fare media, etc.)?
- Is your agency considering implementing a fare free policy?

The final selection of peer agencies includes the MARC identified peers that responded to KUTC's data request as well as two agencies that had implemented a fare-free policy. Seven peer transit agencies considered for this study analysis include Milwaukee County Transit System (MCTS), Southwest Ohio Regional Transit Authority (SORTA), Nashville Metropolitan Transit Authority (MTA), Indianapolis Public Transportation Corporation (IndyGo), Missoula Urban Transportation District (MUTD), Intercity Transit (intercity) located in Olympia, WA and Capital Metropolitan Transportation Authority (Cap Metro) located in Austin.

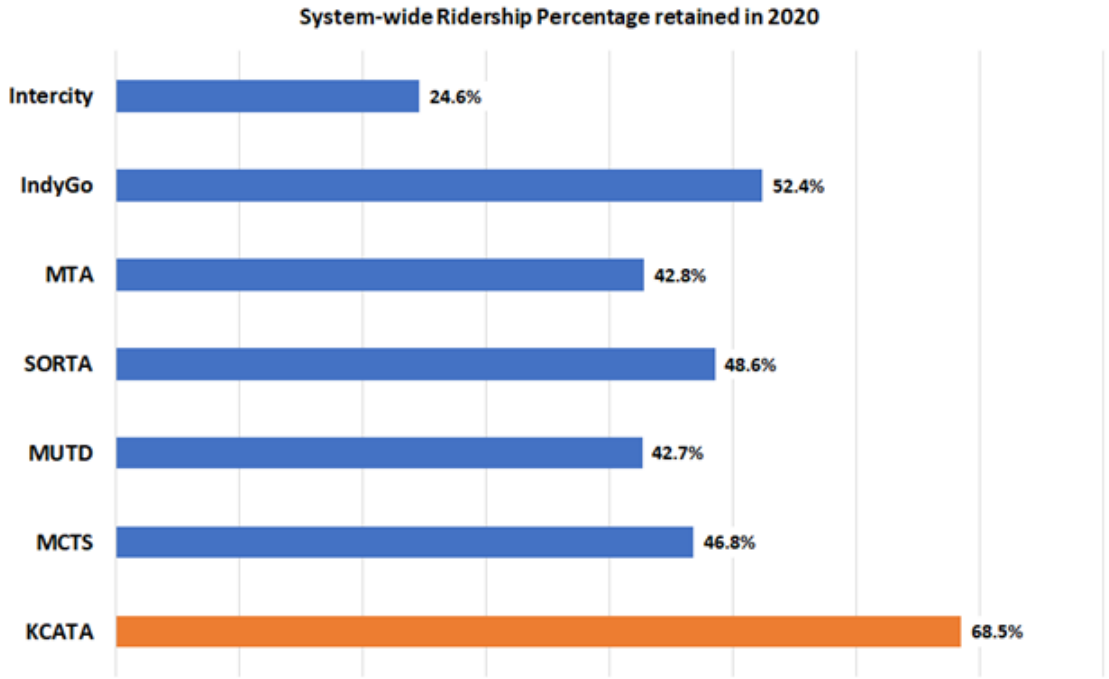
Among seven agencies considered, the OTP data from MCTS, SORTA, MTA, IndyGo and Cap Metro were used to compare and analyze operational impacts of KCATA. The ridership data from MCTS, MUTD, SORTA, MTA, IndyGo and Intercity were used to compare and analyze the ridership performance of KCATA system in 2020.

KCATA on-time performance (OTP) was calculated as percentage points difference in 2020 compared to the average of 2018 and 2019. This percentage points difference was used to compare with peer transit agencies as shown below in the table. This comparison is used to determine and understand the KCATA operational effectiveness due to the fare suspension in 2020.

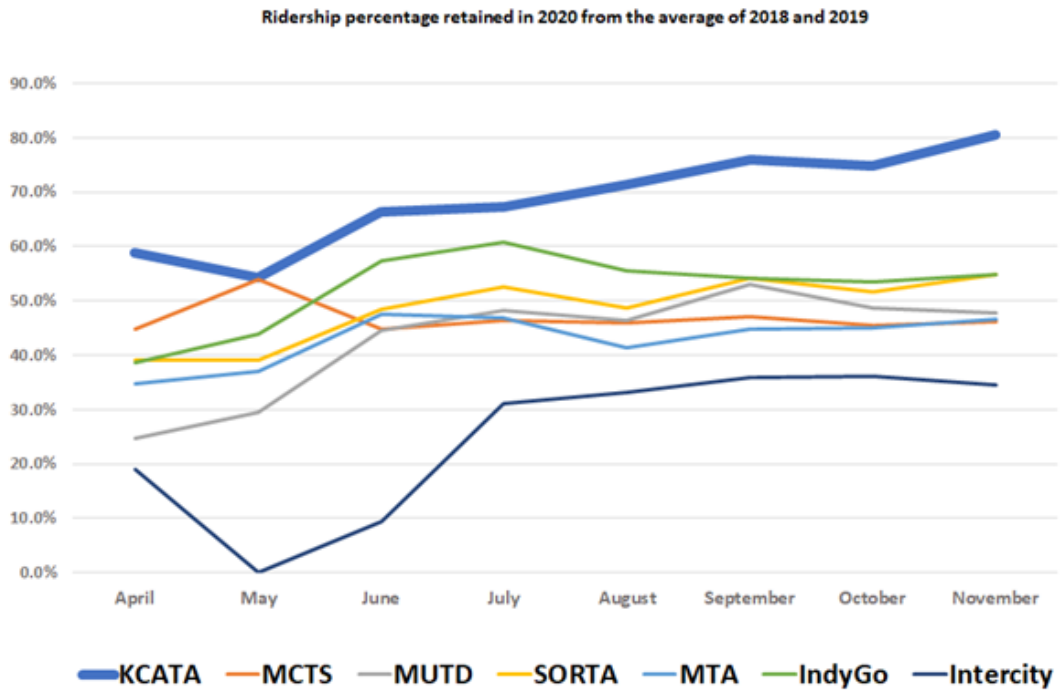
OTP percentage points difference in 2020 compared to the avg. 2018 and 2019

	KCATA	MCTS	SORTA	MTA	IndyGo	Cap Metro
April	1.7%	1.3%	4.1%	9.1%	-0.5%	1.8%
May	1.0%	0.9%	4.2%	6.8%	-0.5%	3.0%
June	1.3%	0.0%	0.4%	7.5%	-2.5%	2.0%
July	0.9%	1.2%	3.8%	5.7%	-0.5%	1.0%
August	3.2%	1.7%	7.1%	10.1%	2.5%	2.3%
September	3.2%	3.6%	7.9%	9.1%	3.0%	4.7%
October	2.4%	1.6%	7.2%	6.3%	1.5%	5.1%
November	2.2%	1.5%	5.1%	5.7%	1.0%	NA

Additionally, KCATA system-wide ridership performance was compared with other peer transit systems. This involved aggregating the monthly ridership data and comparing the systemwide 2020 ridership retainment from the average of 2018 and 2019 ridership to other peer agencies as shown below.

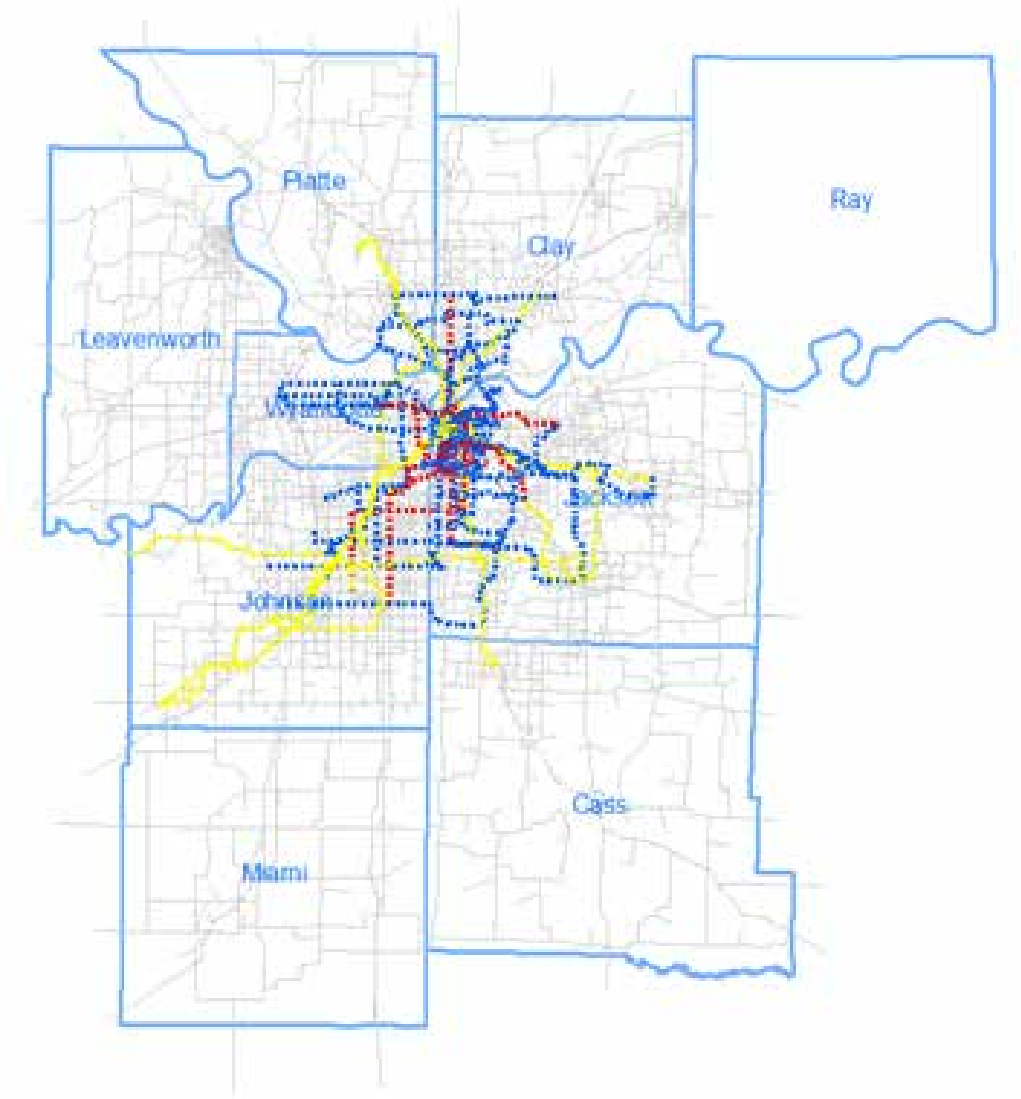


The results of our systemwide analysis showed that KCATA outperformed their peers in terms of ridership retained in 2020 from the 2018-2019 average. None of the peer agencies analyzed had implemented zero-fare policies. However, it is not clear based on the results of this analysis whether KCATA's performance was caused by the implementation of the zero-fare policy. Therefore, additional analysis is necessary to control for intervening variables, such as COVID-19.


Ridership percentage retained in 2020 from the average of 2018 and 2019
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
April
May
June
July
August
September
October
November
KCATA
MCTS
MUTD
SORTA
MTA
IndyGo
Intercity

H. ENVIRONMENTAL IMPACT

The potential transit ridership increase should have a positive impact on the environment and climate change-related impacts. Increasing transit ridership should reduce vehicle miles traveled (VMT) and vehicle hours traveled (VHT) region-wise, provide a low emissions alternative to driving, and thus reduce greenhouse gas emission. Figure xx illustrates the transit system in the MARC model. Vehicle miles traveled and vehicle hours traveled are summarized in table xx.



According to FTA, switching to riding public transportation is one of the most effective actions individuals can take to reduce their carbon footprint. For the average U.S. single occupancy vehicle trip, the estimated carbon dioxide emissions per passenger mile are approximately 0.964 pounds. Based on the model assumption and the results, without expansion of the transit system, the expected carbon dioxide emissions reduction is shown in Table xx for each one of the impacted counties. Implementing the zero-fare policy in Kansas region is expected to reduce the Carbine Dioxide Emission by 7,061 tons per

year, which represents less than 1% of the total CO2 emission from transportation sector regionwide.

	BASE SCENARIO		ZERO-FARE SCENARIO		SAVINGS		CO2 emission
County	**VMT**	**VHT**	**VMT**	**VHT**	**mile**	**hours**	**reduction (lbs)**
Clay, MO	5,628,583	136,334	5,623,096	136,183	-5,488	-151	-3,149
Jackson, MO	15,313,066	409,594	15,271,208	408,016	-41,858	-1,577	-23,736
Johnson, KS	11,819,428	360,355	11,807,295	359,891	-12,133	-464	-7,004
Platte, MO	3,377,572	73,192	3,376,475	73,207	-1,097	15	-604
Wyandotte, KS	4,553,948	108,108	4,544,368	107,943	-9,580	-165	-4,198
TOTAL	**40,692,598**	**1,087,583**	**40,622,442**	**1,085,240**	**-70,156**	**-2,342**	**-38,691**

Average U.S. single occupancy vehicle: 0.964 pounds CO2/passenger mile-67,630

Estimated carbon dioxide emissions saving (without system expansion):

- Daily: -38,691
- Year: -14,122,084

MARC

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