Public Transit Riders' Perceptions and Experience of Safety: COVID-19 Lessons from Edmonton

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Findings

This study aims to understand who and under what circumstances is more likely to travel and feel safe using public transit in Edmonton, Canada, amidst the COVID-19 pandemic, by analyzing data from an online survey conducted during the summer of 2020. We provide empirical evidence that an individual better informed about the measures Edmonton Transit Service is taking to ensure physical distancing and meet the health and safety concerns of riders is more likely to feel safe using public transit. It is recommended that transit agencies continuously communicate with riders regarding ongoing efforts to promote the health and safety of all users.

QUESTIONS

Public transit ridership has plummeted in Edmonton, Canada, and even with the restoration of pre-COVID-19 level of service and start of K-12 and post-secondary schools, it has not exceeded half of what it was before the pandemic (Romero 2020). Similar trends could be observed in other North American cities (Transit 2020a), and in the first months of the pandemic, several surveys sought to answer who were the people who continued riding public transit. In US cities, these predominantly comprised women, people of color, low-paid workers, and those without access to a car (Transit 2020b). Canadian researchers conducted surveys in Toronto and Vancouver and reported that the riders who did not stop using public transit were more likely to be male, persons with a disability, people of color, and older than 50 years of age (Palm et al. 2020a, 2020b). Based on these reports, we hypothesized that a profile of a public transit rider during the COVID-19 pandemic in Edmonton will have similar socioeconomic characteristics.

At the same time, the pandemic has also introduced new requirements to the customer experience that public transit riders expect to receive. Even in the pre-COVID-19 world, transit vehicle occupancy and safety strongly influenced user satisfaction and customer loyalty (van Lierop and El-Geneidy 2016). Meanwhile, the pandemic put a focus on cleaning and sanitation practices and clear communication of the efficacy of measures that agencies take to ensure the health and safety of their patrons (de Cotret et al. 2020). We use that knowledge to hypothesize that riders place a high value on these efforts to feel safe using public transit in Edmonton during the COVID-19 pandemic.

METHODS

Data for this study came from an online survey with the members of the Edmonton Insight Community conducted between June 25th and July 8th, 2020. Given that it was a convenience sample survey, we compared it to the 2016 Canadian census for the City of Edmonton (Statistics Canada 2017) and found differences between all key demographics. This comparison and descriptive statistics for all variables are presented in Table 1. We used four logistic regression models in R statistical program to assess the respondent's likelihood to travel for any purpose in the next three months (model 1) and whether they will feel safe using public transit in the next three months (models 2, 3, and 4). We controlled for respondents' perceptions of safety in models 2 and 4, experience of using public transit in models 3 and 4, and demographic variables in all four models. In model 1 the dependent variable reflects respondents' answer to the question 'Thinking of the next three months, do you think you will need to travel?', while for models 2, 3, and 4 the dependent variable was based on the question 'How safe or unsafe would you feel using public transit (including Disabled Adult Transit Service (DATS)) in Edmonton in the next three months?'. The latter question was asked using a Likert scale, and we converted this variable into a binary variable by recoding 'very safe' and 'somewhat safe' answers as *'yes'*, while 'somewhat unsafe' and 'very unsafe' as '*no*'. Similarly, we recoded perceptions and experience variables by combining 'strongly disagree' and 'somewhat disagree' answers as '*disagree*', and 'somewhat agree' with 'strongly agree' into an answer of '*agree*'. Models 1 and 2 included both riders who continued riding transit during the pandemic and transit users who have not used transit since the pandemic, while models 3 and 4 used data of current riders only.

All models were checked for multicollinearity using Variance Inflation Factor (VIF), and variables that had a VIF larger than 5 were removed from the models. We also explored interaction effects among income, gender, age, education, type of employment, and car ownership variables in the modeling process, which didn't result in any significant discoveries. Finally, the descriptive power of each model was evaluated using McFadden's pseudo-R^2 statistic and given that it was more than 0.2 for model 1 and increased for each subsequent model, we can state that they succeeded to explain the variation in the data. In addition, we used *Akaike information criterion* (AIC) to compare the fitness of model 3 and model 4, it suggested that model 4 fitted the data better than model 3.

Table 1: Descriptive statistics

	Model 1: Need to travel in next 3 months	Model 2: Feel safe using PT (1)	Model 3: Feel safe using PT (2)	Model 4: Feel safe using PT (3)	Edmonton (2016 Census)
Population	1,182	1,133	236	214	932,546
Dependent variables					
Need to travel in next 3 months					
Yes	51%	NA	NA	NA	NA
No	49%				
Feel safe using PT in next 3 months					
Yes	NA	27%	48%	50%	NA
No		73%	52%	50%	
Demographics					
Age					
18-34 years old	23%	23%	23%	22%	NA[1]
35-54 years old	54%	54%	54%	56%	27.4%
55-74 years old	23%	23%	23%	22%	18.3%
Income					
Under $30,000	2%	2%	9%	8%	12.8%
$30,000 to $59,999	11%	11%	19%	19%	19.5%
$60,000 to $99,999	27%	27%	34%	34%	25%
Over $100,000	60%	60%	38%	39%	42.7%
Gender					
Female	52%	51%	53%	52%	50%
Male	47%	48%	44%	46%	50%
Other	1%	1%	3%	2%	NA[2]
Education					
High School	8%	8%	12%	12%	27.4%
College/Prof. School	28%	27%	31%	32%	32.7%
Undergraduate	40%	40%	36%	35%	18.5%
Post-graduate	24%	25%	21%	21%	6.5%
Employment					
Full-time	89%	89%	83%	84%	36.7%
Part-time	11%	11%	17%	16%	37.3%
Industry					
All other industries	34%	33%	41%	NA	73.8%
Health, Social Care	13%	12%	17%		12.1%
Professional, Science	22%	23%	13%		7.2%
Government	31%	32%	29%		6.9%

	Model 1: Need to travel in next 3 months	Model 2: Feel safe using PT (1)	Model 3: Feel safe using PT (2)	Model 4: Feel safe using PT (3)	Edmonton (2016 Census)
Access to car					
Yes	89%	89%	62%	64%	NA[3]
No	11%	11%	38%	36%	
Transit use in the past					
How often did you use transit before March 2020?					
Often (multiple times per week)	44%	45%	NA	NA	NA
Sometimes (a few times a month)	16%	16%			
Rarely (one/two times a month)	40%	39%			
Have you used public transit within the last three months?					
Yes	23%	21%	NA	NA	NA
No	77%	79%			
Perceptions					
I feel that I can physical distance myself while riding on the bus					
Disagree	NA	61%	NA	30%	NA
Neither agree, nor disagree		15%		21%	
Agree		24%		49%	
I would only take transit if there are rules around limited occupancy					
Disagree	NA	20%	NA	29%	NA
Neither agree, nor disagree		21%		28%	
Agree		59%		43%	
I am worried about coming in contact with people who take transit					
Disagree	NA	19%	NA	28%	NA
Neither agree, nor disagree		16%		24%	
Agree		65%		48%	
I am comfortable using paper tickets and transfers					
Disagree	NA	24%	NA	18%	NA
Neither agree, nor disagree		16%		15%	
Agree		60%		67%	
I am confident that ETS can maintain the scheduled service frequency while maintaining public health measures					
Disagree	NA	42%	NA	36%	NA
Neither agree, nor disagree		21%		22%	
Agree		37%		42%	
Experience					
I was aware of the measures ETS was taking to ensure physical distancing					
Disagree	NA	NA	11%	10%	NA
Neither agree, nor disagree			6%	5%	

	Model 1: Need to travel in next 3 months	Model 2: Feel safe using PT (1)	Model 3: Feel safe using PT (2)	Model 4: Feel safe using PT (3)	Edmonton (2016 Census)
Agree			84%	85%	
On the bus, the seating restrictions allowed for physical distancing					
Disagree	NA	NA	24%	22%	NA
Neither agree, nor disagree			16%	16%	
Agree			60%	62%	
I was able to practice physical distancing					
Disagree	NA	NA	22%	19%	NA
Neither agree, nor disagree			10%	12%	
Agree			68%	69%	
Most of the other riders were following physical distancing rules					
Disagree	NA	NA	36%	34%	NA
Neither agree, nor disagree			9%	9%	
Agree			55%	57%	

[1]Cannot make a direct comparison to the 2016 Canadian Census as age is grouped between 15 and 19 years.

[2]The 2016 Canadian Census did not give Canadians the option of responding to the sex question in a non-binary fashion.

[3] While the 2016 Canadian Census does not ask Canadians about vehicle ownership, the 2015 National Travel Survey observed 0.78 vehicles per person in the City of Edmonton (R.A. Malatest & Associates 2018).

FINDINGS

Table 2 summarizes the main findings of the study, with coefficients indicating the presence of the effect on the model, and average marginal effects (ME) quantifying it. We discuss demographic variables only for model 1 and focus on experience and perception variables of the other models, though demographic variables are reported for all models in Table 2. Model 1 looked at a respondent's likelihood to need to travel in the next 3 months based on their demographic features and history of transit use. We can be 99% confident that a rider between 55-74 years of age is 12% more likely to need to travel in the next three months, while a person without access to a car is 15% more likely to do so, holding all other variables constant. Similarly, we can be as confident that health and social care workers are 12% more likely to need to travel than other occupations in the next three months, while government employees are 7% more likely to have that need at a 95% confidence interval, all else equal.

Model 2 looked at an individual's perception of safety using public transit. As it shows, we can be 99% certain that a person who agrees that they can physical distance themselves while riding on the bus is 22% more likely to feel safe using public transit, while the recognition that ETS can maintain the scheduled service frequency while maintaining public health measures increases the likelihood of feeling safe for a rider by 11%, all else equal. Alternatively, the more concerned a person is with the rules around limited occupancy and coming in contact with people who take transit, the lower their likelihood to feel safe using public transit is.

Models 3 and 4 included only riders who used transit within the last three months. Given that ETS deployed a number of measures to ensure the safety of its riders, like overt cleaning activities, physical distancing signage and limited seating policy, as well as mandatory mask use (City of Edmonton 2020), in model 3, we controlled for the current riders' experience and saw that a person informed about the measures ETS was taking to ensure physical distancing, or who was able to practice physical distancing, or saw that other riders were doing so - is more likely to feel safe riding public transit. This means that ETS should continue communicating and enforcing ongoing health and safety measures to retain its riders. Model 4 highlights that when controlling for the experience of riders who used transit within the last three months, we see no significant difference between the effect of perception variables for this group and the rest of the sample in model 2. The only distinction is that current users in model 4 who neither agree, nor disagree that ETS can maintain the scheduled service frequency while maintaining public health measures, are 15% less likely to feel safe using transit in the next 3 months, ceteris paribus. These findings suggest that ETS does not have to develop different strategies that target current and potential riders but maintain the existing level of safety and cleaning practices and ensure that all Edmontonians are aware of them.

Table 2: Logistic regression models

	Model 1: Need to travel in next 3 months		Model 2: Feel safe using PT (1)		Model 3: Feel safe using PT (2)		Model 4: Feel safe using PT (3)	
	Coeff.	ME	Coeff.	ME	Coeff.	ME	Coeff.	ME
Sample size	1182		1133		236		214	
McFadden's pseudo R^2	0.21		0.36		0.26		0.42	
AIC	1348.7		915.24		301.59		237.01	
Demographics								
Age *(Ref. 18-34 years)*								
35-54 years	0.08	0.01	0.32	0.04	0.23	0.04	-0.39	-0.05
55-74 years	0.66***	0.12	0.64**	0.07	-0.03	0	-0.27	-0.03
Income *(Ref. < $30,000)*								
$30,000 to $59,999	-0.58	-0.11	-0.35	-0.04	0.09	0.02	-0.2	0
$60,000 to $99,999	-0.97	-0.18	-0.45	-0.05	-0.52	-0.09	-0.10	-0.01
Over $100,000	-0.99	-0.19	-0.23	-0.03	0.22	0.04	1.07	0.13
Gender *(Ref. Female)*								
Male	0.1	0.02	0.19	0.02	0.19	0.03	0.07	0.01
Other	0.12	0.02	-0.12	-0.01	0.74	0.13	-0.03	0
Education *(Ref. High School)*								
College/Prof. School	0.19	0.04	-0.53	-0.06	0.07	0.01	-0.15	-0.02
Undergraduate	0.06	0.01	-0.98***	-0.12	0.39	0.07	-0.03	0
Post-graduate	0.21	0.04	-0.87**	-0.10	-0.33	-0.06	-0.28	-0.04
Employment *(Ref. full-time)*								
Part-time	-0.1	-0.02	0.56*	0.07	-0.36	-0.06	0.13	0.02
Industry *(Ref. all other industries)*								
Food Services	-1.27	-0.24	-1.3	-0.15	0	0	NA	NA
Health, Social Care	0.66***	0.12	0.27	0.03	0.41	0.7		
Prof., Science, Tech.	0.28	0.05	0.16	0.02	0.83	0.14		
Government	0.38**	0.07	0.38	0.05	0.39	0.07		
Access to car *(Ref. Yes)*								
No	0.78***	0.15	-0.34	-0.04	0.01	0.02	0.4	0.05
Transit use in the past								
How often did you use transit before March 2020? *(Ref. Often)*								
Sometimes	-0.24	-0.04	-0.2	-0.02	NA	NA	NA	NA
Rarely	-1.4***	-0.26	-0.4*	-0.05				
Have you used public transit within the last three months? *(Ref. No)*								
Yes	1.67***	0.31	0.54**	0.06	NA	NA	NA	NA
Perceptions								

	Model 1: Need to travel in next 3 months		Model 2: Feel safe using PT (1)		Model 3: Feel safe using PT (2)		Model 4: Feel safe using PT (3)	
I feel that I can physical distance myself while riding on the bus (Ref. Disagree)								
Neither agree, nor disagree	NA	NA	0.81***	0.1	NA	NA	0.7	0.09
Agree			1.86***	0.22			1.53**	0.2
I would only take transit if there are rules around limited occupancy (Ref. Disagree)								
Neither agree, nor disagree	NA	NA	-1.01***	-0.12	NA	NA	-0.81	-0.1
Agree			-1.15***	-0.13			-1.77***	-0.22
I am worried about coming in contact with people who take transit (Ref. Disagree)								
Neither agree, nor disagree	NA	NA	-0.54**	-0.06	NA	NA	-0.6	-0.08
Agree			-1.67***	-0.2			-1.14**	-0.15
I am comfortable using paper tickets (Ref. Disagree)								
Neither agree, nor disagree	NA	NA	0.11	0.01	NA	NA	0.74	0.1
Agree			0.58**	0.07			1.5**	0.19
I am confident that ETS can maintain the scheduled service frequency while maintaining public health measures (Ref. Disagree)								
Neither agree, nor disagree	NA	NA	0.21	0.03	NA	NA	-1.16*	-0.15
Agree			0.98***	0.11			0.7	0.09
Experience								
I was aware of the measures ETS was taking to ensure physical distancing (Ref. Disagree)								
Neither agree, nor disagree	NA	NA	NA	NA	-0.69	-0.11	-1.21	-0.15
Agree					1.34**	0.22	1.03	0.13
On the bus, the seating restrictions allowed for physical distancing (Ref. Disagree)								
Neither agree, nor disagree	NA	NA	NA	NA	0.66	0.11	1.56**	0.2
Agree					1.03**	0.18	1.5**	0.19
I was able to practice physical distancing (Ref. Disagree)								
Neither agree, nor disagree	NA	NA	NA	NA	0.57	0.1	1.4	0.18
Agree					1.55***	0.26	1.53**	0.19
Most of the other riders were following physical distancing rules (Ref. Disagree)								
Neither agree, nor disagree	NA	NA	NA	NA	0.12	0.2	0.35	0.05
Agree					1**	0.17	0.72	0.09
Intercept	1.32*		-0.58		- 4.38***		-3.84**	

Confidence interval: *90%; **95%; ***99%

On the whole, our four models were successful in supporting the initial hypotheses. Model 1 shows that persons between 55-74 years of age, or healthcare, or government workers, are more likely to travel in the next three months, while a transit user who is better informed about the measures ETS is taking to ensure physical distancing is more likely to feel safe using public transit. It is recommended that transit agencies continuously communicate with riders regarding ongoing efforts to promote the health and safety of all users. This finding echoes previous research regarding the importance of an agency displaying and communicating its cleaning and sanitation practices to encourage Canadians to take transit again (de Cotret et al. 2020). When users are continuously informed and reminded about cleaning and sanitation efforts, riders are more likely to trust that transit agencies are meeting their health and safety concerns. Safety in transit is an important determinant of overall satisfaction (and loyalty) (van Lierop and El-Geneidy 2016), and therefore satisfying rider's concerns for personal safety is an essential step towards attracting riders back to transit safely before too much modal partition has happened (D'Angelo 2020).

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