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TRANSPORT FINDINGS

How far do People Travel to Reach Light Rail Stations?

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Findings

Transit station catchment areas have been shown to vary across urban contexts, transit systems, feeder modes, and trip legs. This study examines Light Rail Transit (LRT) catchment area through different feeder modes in Montréal, Canada. Using Wave 6 of the Montréal Mobility Survey, we analyze home-based trips by walking, transit, and car to the Réseau express métropolitain (REM), a newly opened LRT system. Results show that feeder-mode distances for REM differ from those reported in previous studies for other transit systems and regions. These findings help better understand catchment areas for LRT systems to enable better ridership predictions and planning.

1. QUESTIONS

Transit catchment areas describe the spatial extent around transit stations that draws in users. Understanding these catchment areas is essential for ridership prediction, station planning, and transit-oriented development, as inappropriate thresholds may bias demand estimation and affect how planning policies are applied. Studies have shown that access distances vary across bus, metro, and rail systems, and are affected by different feeder modes such as walking, public transit, cycling, and car (El-Geneidy et al. 2014; Vijayakumar et al. 2011; Wang et al. 2016). O'Sullivan and Morrall (1996) showed that applying bus-stops thresholds to Light Rail Transit (LRT) underestimates walking distances significantly, suggesting the necessity of calculating system-specific thresholds. Li et al. (2022) further illustrated that metro catchment areas differ between access and egress. The goal of this research is to understand the catchment area for a newly operated LRT system in Montréal, Canada, by different modes of access and egress, and across sociodemographic groups.

2. METHODS

The Réseau express métropolitain (REM) is a 67-kilometer LRT system that started operation in 2023 in Montréal, Canada. We use data from Wave 6 of the Montréal Mobility Survey (MMS), a bilingual survey that was collected in February and March 2026. The MMS collects REM use, travel behavior, and sociodemographic characteristics (Wu et al. 2026). REM users reported details of their most recent commute trip using it, including home and work/school location. Network distance is calculated from home, work, or school to the corresponding REM station using the dodgr package in R on a walking graph (Padgham 2019), which provides a consistent and comparable measure across travel modes.

The survey reports all non-REM modes used during the trip without specifying which leg, so we infer the mode for each leg using a priority of car, transit, bicycle, and walk. A single reported mode is assigned to both legs. For multimode trips with car, car is assigned to the home leg, and the remaining higher-priority mode is assigned to the egress leg. For trips without car use, the higher-priority mode is assigned to the longer leg. Lower priority modes are dropped if more than two modes are included. We cap walking at 30 minutes at speed 1.25m/s (Bastos et al. 2014). Walk-only trips exceeding the threshold are dropped, and mixed-mode trips are reassigned to a higher-priority reported mode. Bicycle trips are removed because of the small sample in winter. We then trim each leg-mode group at its 98th percentile to remove outliers, resulting in 969 access and 878 egress observations. To assess the plausibility of the mode assignment, we manually review all 25 unique combinations of reported modes, legs, and assigned modes. For each combination, we ensure that the assignment is consistent with participants' responses and reasonable given the observed distances for home-based trips.

Complementary cumulative distribution functions (CCDF) are constructed with a curve fitted using log-logistic: $y = \frac{1}{1+\left(\frac{x}{\alpha}\right)^{\beta}}$, where y is the proportion of users travelled at distance x meters or further, α represents the distance where the curve reaches 50%, and β is the steepness of the curve. Finally, we compare the mean access and egress distances across sociodemographic groups and use pairwise t-tests to identify whether each group differs from reference categories.

3. FINDINGS

Figure 1 shows that REM users who walk live closer to stations, while transit and car users are more dispersed around the REM line. Figure 2 further shows that distance thresholds differ by feeder modes and trip legs. Walking has the shortest catchment, with a mean of 968 meters for access from home, and 785 meters for egress to work or school, and the 75th percentile reaches 1,167 meters and 1,062 meters for egress, respectively. Transit connections have longer mean distances, at 5,322 meters for access and 3,597 for egress. Their 75th percentiles are 7,085 meters and 4,601 meters. Car users travel the long distances with a mean of 7,704 meters and a 75th percentile of 9,917 meters on access, while 3,760 meters and 2,688 meters on egress. These 84 records on egress mainly come from participants who indicate only cars as main mode.

Access and egress distances are asymmetric. Across all three modes, users travel further on the home leg than the egress leg. Transit is the main connection for both ends, with 545 access and 447 egress observations (Table

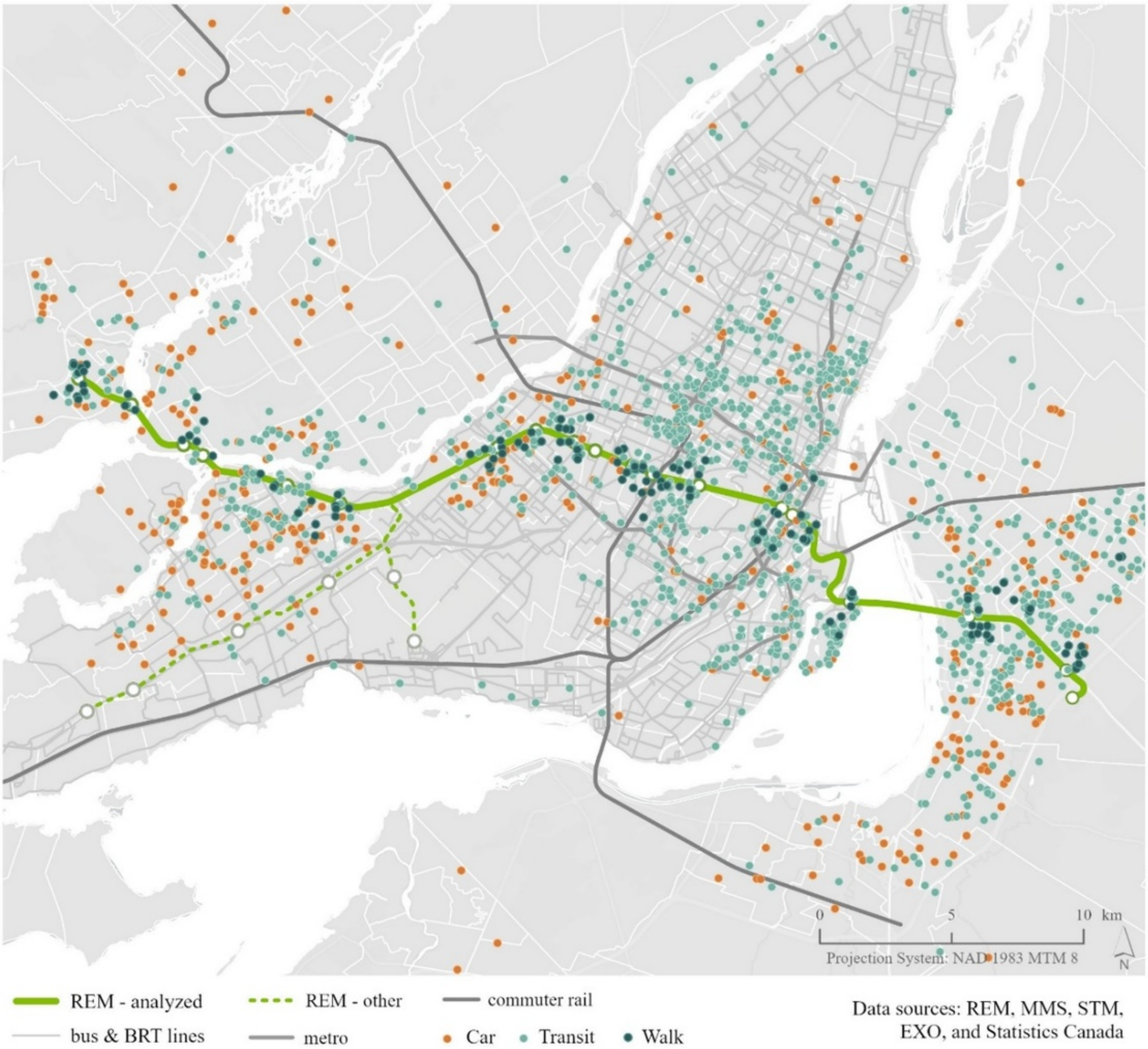

Figure 1. Home locations of home-based trips by mode among REM users

1). Walking is more common on egress, while car is more common on access as the mode assignment assumes cars being more accessible on home legs. This pattern shows users are willing to travel further on the home side of the REM commute trips.

Our findings show that REM catchment areas are mode-specific, leg-specific, and vary across user groups. Walking remains the shortest feeder mode, and its 75th percentile distance reaches 1,167 meters for access and 1,062 meters for egress, with access distances longer than reported for commuter rail in Montréal, suburban light rail transit stations in Calgary, and metro in Beijing, ranging from 613 to 1102.84 meters (El-Geneidy et al. 2014; O'Sullivan and Morrall 1996; Wang et al. 2016). For users connected through public transit, the 75th percentile reaches 7,085 meters, which exceeds the 6,515 meters for bus stops in Beijing (Wang et al. 2016). The average is also longer than the 1.7 kilometers reported for rail-to-bus transfers in Seoul (Eom et al. 2019).

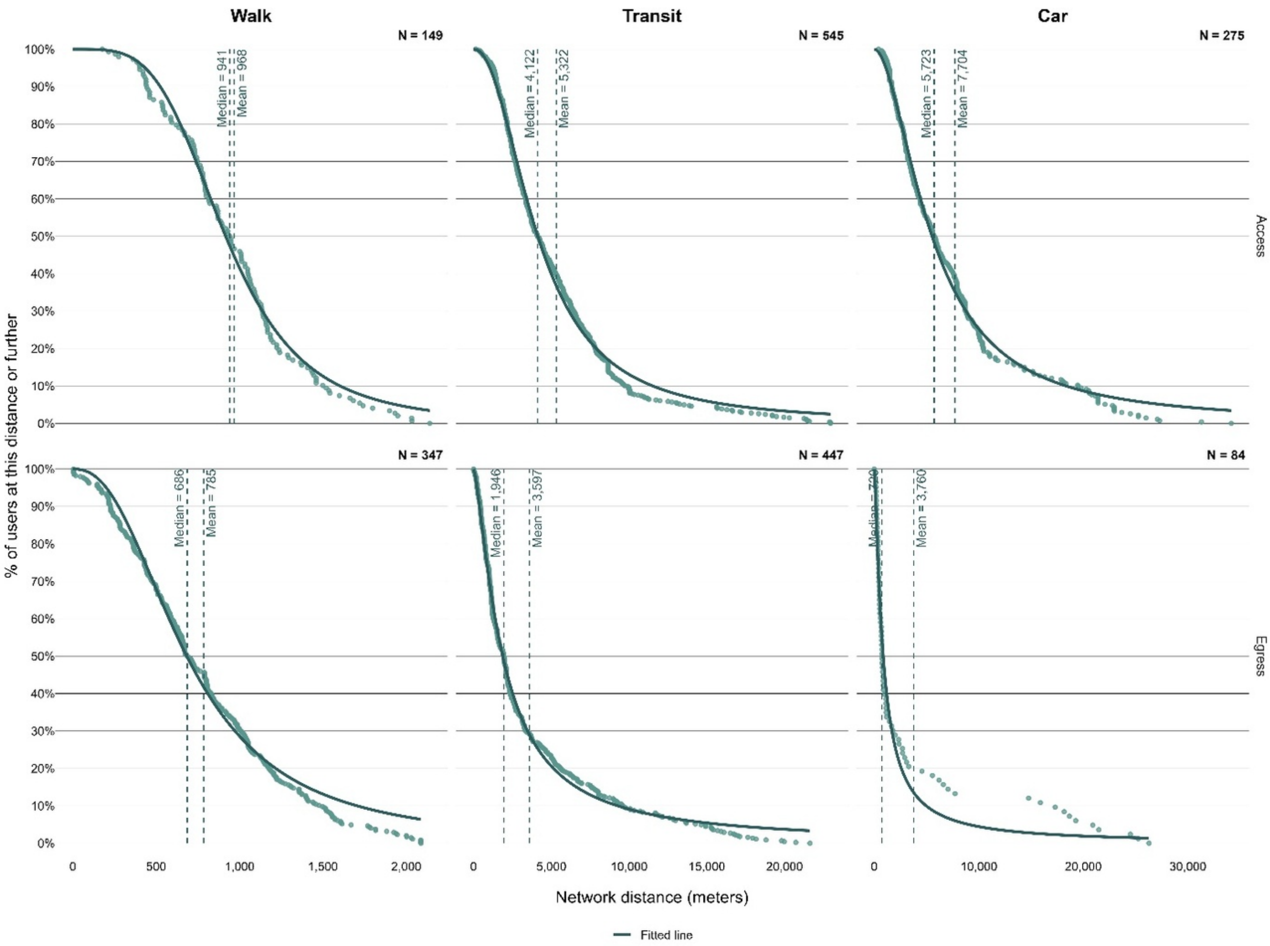

Figure 2. Access and egress distance decay curves by mode among REM users

And the access distance for car users is 7,704 meters, slightly shorter than 7.93 kilometers for the commuter train in Montréal (Vijayakumar et al. 2011) and below 9,214 for metro in Beijing (Wang et al. 2016). Additionally, the asymmetry between access and egress is consistent with Li et al. (2022), who showed differences in distance across modes between trip legs in the Nanjing Metro system.

The difference between REM and previously studied transit systems, such as bus, metro, and commuter rail, indicates that REM has a broader spatial reach, particularly for walking and transit feeder modes. The comparison between the REM and another LRT system further shows that these differences are not a feature of LRT systems generally. Instead, they more likely reflect REM's role as a regional connector, suggesting both the direction and magnitude of these differences are context dependent. Our findings suggest that the identified catchment thresholds could serve as a planning reference while requiring professionals to adapt them to different urban contexts and indicate that fixed catchment assumptions may misestimate the actual catchment areas and true demand. Future work should test these patterns using additional waves of the MMS and other regional LRT systems to assess generalizability.

Table 1. Network-based access and egress distances to REM stations by mode

	Access			Egress		
	Walk	**Transit**	**Car**	**Walk**	**Transit**	**Car**
Network distance						
Mean	968	5,322	7,704	785	3,597	3,760
Median	941	4,122	5,723	686	1,946	720
SD	407	4,147	6,584	479	4,341	6,754
75th percentile	1,167	7,085	9,917	1,062	4,601	2,688
85th percentile	1,401	8,662	14,316	1,312	7,603	6,848
Maximum	2,140	22,952	34,143	2,087	21,628	26,268
n	149	545	275	347	447	84
Mean network distance by population group						
Gender						
Woman (ref)	1,020	5,469	7,110	773	3,606	3,398
Man	919	5,254	8,548	770	3,648	4,229
Age						
18-34 (ref)	958	5,161	8,176	856	3,597	4,131
35-64	989	5,616	6,986	**681****	3,645	3,558
65+	846	4,526	8,418	949	2,756	2,358
Household Income						
Less than $60k (ref)	832	4,415	5,610	881	4,146	696
$60k to $120k	1,042	4,887	7,491	755	3,696	5,910
More than $120k	939	**5,858***	7,993	787	3,398	3,151
Household vehicle access						
0 (ref)	1,065	4,586	5,223	794	4,752	175
1	999	5,304	7,472	789	3,715	5,251
2+	877	5,693	7,926	767	**3,110***	3,282
Household size						
1 (ref)	867	4,823	4,497	642	3,654	363
2	1,004	4,589	7,885	834	3,343	3,888
3	956	4,978	7,615	783	4,226	1,173
4	981	6,244	8,247	790	2,869	5,533
5+	984	5,572	7,338	833	4,610	4,643

* p<0.05 ** p<0.01 *** p<0.001

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DATA AVAILABILITY

The data and code used in this study are available at https://github.com/TRAM-Transportation-Research-at-Mcgill/lrt-distance-decay.

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REFERENCES

Bastos, A. M. C., J. R. R. da Cunha, and J. P. C. da Silva. 2014. "Estimation of Pedestrian Walking Speeds on Footways: [1]." *Proceedings of the Institution of Civil Engineers* 167 (1): 32–43. https://doi.org/10.1680/muen.12.00048.

El-Geneidy, A., M. Grimsrud, R. Wasfi, P. Tétreault, and J. Surprenant-Legault. 2014. "New Evidence on Walking Distances to Transit Stops: Identifying Redundancies and Gaps Using Variable Service Areas." *Transportation* 41 (1): 193–210. https://doi.org/10.1007/s11116-013-9508-z.

Eom, J. K., J. Choi, M. S. Park, and T.-Y. Heo. 2019. "Exploring the Catchment Area of an Urban Railway Station by Using Transit Card Data: Case Study in Seoul." *Cities* 95. https://doi.org/10.1016/j.cities.2019.05.033.

Li, X., Z. Liu, and X. Ma. 2022. "Measuring Access and Egress Distance and Catchment Area of Multiple Feeding Modes for Metro Transferring Using Survey Data." *Sustainability* 14 (5): 2841. https://doi.org/10.3390/su14052841.

O'Sullivan, S., and J. Morrall. 1996. "Walking Distances to and from Light-Rail Transit Stations." *Transportation Research Record: Journal of the Transportation Research Board* 1538 (1): 19–26. https://doi.org/10.1177/0361198196153800103.

Padgham, M. 2019. "Dodgr: An R Package for Network Flow Aggregation." *Transport Findings*. https://doi.org/10.32866/6945.

Vijayakumar, N., A. El-Geneidy, and Z. Patterson. 2011. "Driving to Suburban Rail Stations, Understanding Variables That Affect Driving Distance and Station Demand." *Transportation Research Record: Journal of the Transportation Research Board* 2219: 97–103. https://doi.org/10.3141/2219-12.

Wang, Z.-j., F. Chen, and T.-k. Xu. 2016. "Interchange between Metro and Other Modes: Access Distance and Catchment Area." *Journal of Urban Planning and Development* 142 (4): 04016012. https://doi.org/10.1061/(ASCE)UP.1943-5444.0000330.

Wu, H., R. Anabtawi, T. Carvalho, et al. 2026. *Riding the Expansion: Impacts of the REM across Six Waves of the Montréal Mobility Survey: Progress Report 2019–2026*. Transportation Research at McGill, McGill University, Canada.