YOU CAN'T ALWAYS GET WHAT YOU PAY FOR

Toward a rapid assessment of public transit from multiple perspectives in North American cities

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INTRODUCTION

- Public transit agencies must provide service that enables riders to reach destinations easily, safely, quickly, and affordably, while being financially sustainable

- Do agencies that are more expensive provide better quality of service to their riders? Or, do some agencies provide good service that is affordable?

- We developed indicators to capture the points of view of transit riders, transit agencies, and society at large

- We used multicriteria decision making analysis to study how agencies in large North American cities deal with trade-offs and conflicting goals

- Most agencies provide service that is relatively affordable but lower quality. While some agencies provide excellent service, it is rather expensive. Two agencies provide good and affordable service

- Our findings indicate that paying high fares does not translate into high service quality

METHODOLOGY

- Any metropolitan area in North America with over 3 million people was included (see Figure 1)

- Only main transit service provider was analyzed and must operate *two* modes. Commuter rail was not analyzed

- We used publicly available data (NTD; CUTA; GTFS) to construct indicators. Indicators were normalized

- Rider or service quality indicator consisted of average accessibility, average headway (AM peak and evening), and a comfort proxy

- Transit agency indicator was farebox recovery ratio — total fares divided by total operating cost

- Society indicator was ridership divided by service area population

CITIES AND AGENCIES

- Heavy rail
- Light rail/streetcar
- Bus

Seattle — Population 3.1M, King County Metro, Ridership 101M
Toronto — Population 5.5M, TTC, Ridership 535M
Montreal — Population 3.7M, STM, Ridership 417M
San Francisco — Population 3.3M, SFMTA, Ridership 155M
Chicago — Population 8.6M, CTA, Ridership 514M
Washington, D.C. — Population 4.5M, WMATA, Ridership 409M
Boston — Population 4.2M, MBTA, Ridership 350M
New York — Population 18.3M, NYCT, Ridership 3.6B
Los Angeles — Population 12.2M, LACMTA, Ridership 467M
Dallas — Population 5.1M, DART, Ridership 66.8M
Atlanta — Population 4.5M, MARTA, Ridership 128M
Houston — Population 4.9M, Metro, Ridership 72.7M
Miami — Population 5.5M, MDT, Ridership 99.1M
Philadelphia — Population 5.4M, SEPTA, Ridership 301M

FIGURE 1 Cities, agencies, and modes analyzed. Population is of metropolitan areas, and ridership is only from analyzed modes of specified agencies. *Sources: NTD 2014, CUTA 2014*

SERVICE QUALITY INDEX

Average **accessibility** to jobs by transit at AM peak

Average **headway** at 8-9 a.m. & 9-10 p.m. (all modes)

Passenger km divided by revenue km

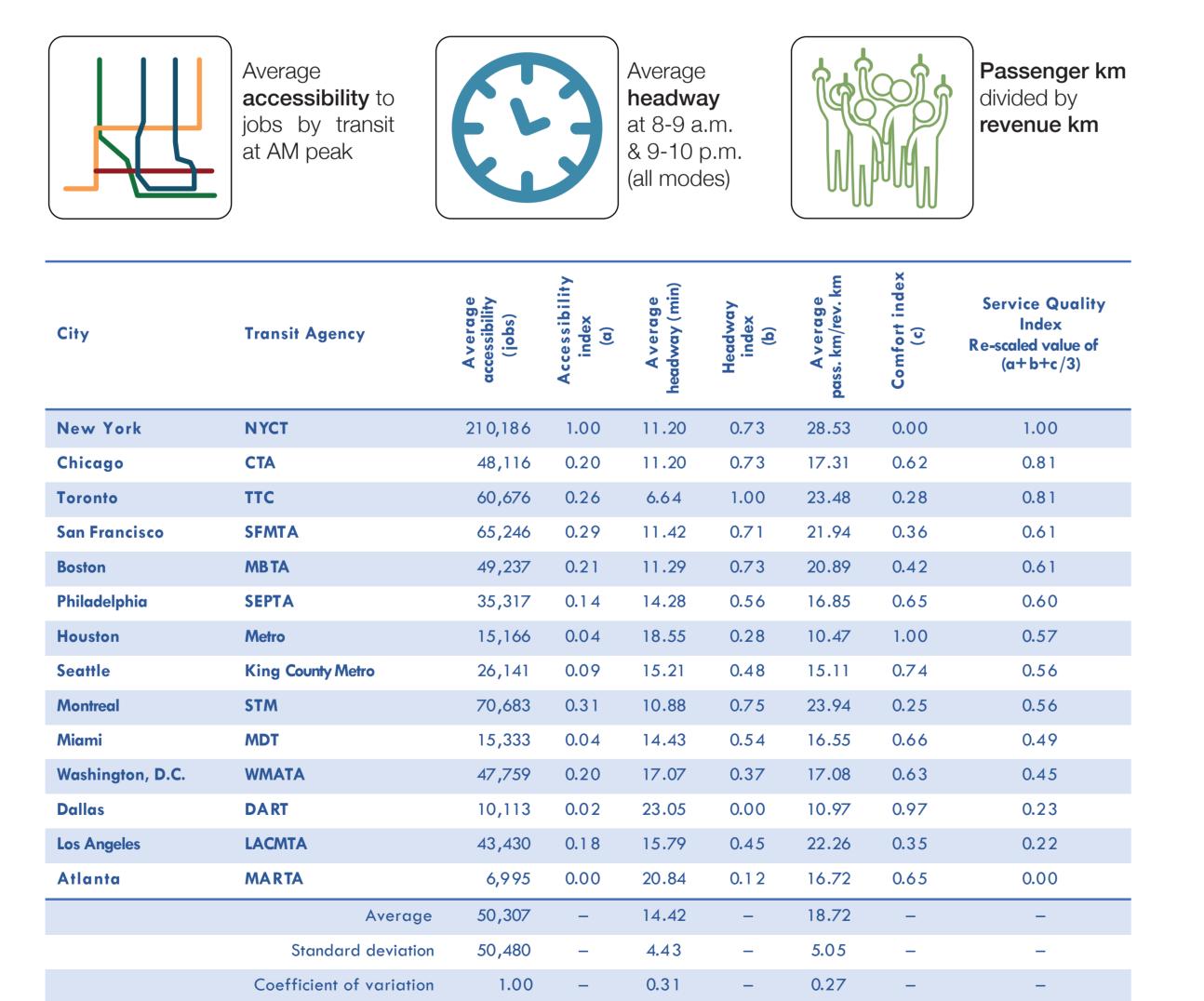| City	Transit Agency	Average accessibility (jobs)	Accessibility index (a)	Average headway (min)	Headway index (b)	Average pass.km/rev.km	Comfort index (c)	Service Quality Index Re-scaled value of (a+b+c/3)
New York	NYCT	210,186	1.00	11.20	0.73	28.53	0.00	1.00
Chicago	CTA	48,116	0.20	11.20	0.73	17.31	0.62	0.81
Toronto	TTC	60,676	0.26	6.64	1.00	23.48	0.28	0.81
San Francisco	SFMTA	65,246	0.29	11.42	0.71	21.94	0.35	0.61
Boston	MBTA	49,237	0.21	11.29	0.73	20.89	0.42	0.61
Philadelphia	SEPTA	35,317	0.14	14.28	0.56	16.85	0.65	0.60
Houston	Metro	15,166	0.04	18.55	0.28	10.47	1.00	0.57
Seattle	King County Metro	26,141	0.09	15.21	0.48	15.11	0.74	0.56
Montreal	STM	70,683	0.31	10.88	0.75	23.94	0.25	0.56
Miami	MDT	15,333	0.04	14.43	0.54	16.55	0.66	0.49
Washington, D.C.	WMATA	47,759	0.20	17.07	0.37	17.08	0.63	0.45
Dallas	DART	10,113	0.02	23.05	0.00	10.97	0.97	0.23
Los Angeles	LACMTA	43,430	0.18	15.79	0.45	22.26	0.35	0.22
Atlanta	MARTA	6,995	0.00	20.84	0.12	16.72	0.65	0.00
	Average	50,307	–	14.42	–	18.72	–	–
	Standard deviation	50,480	–	4.43	–	5.05	–	–
	Coefficient of variation	1.00	–	0.31	–	0.27	–	–

TABLE 1 Service quality index was calculated by averaging and rescaling accessibility index, headway index, and comfort index. *Sources: NTD 2014, CUTA 2014, GTFS (fall 2014), Access Across America (Owen and Levinson, 2014)*

AFFORDABILITY INDEX

Monthly unlimited fare → Hourly minimum wage → **Affordability index** Hours to earn monthly fare

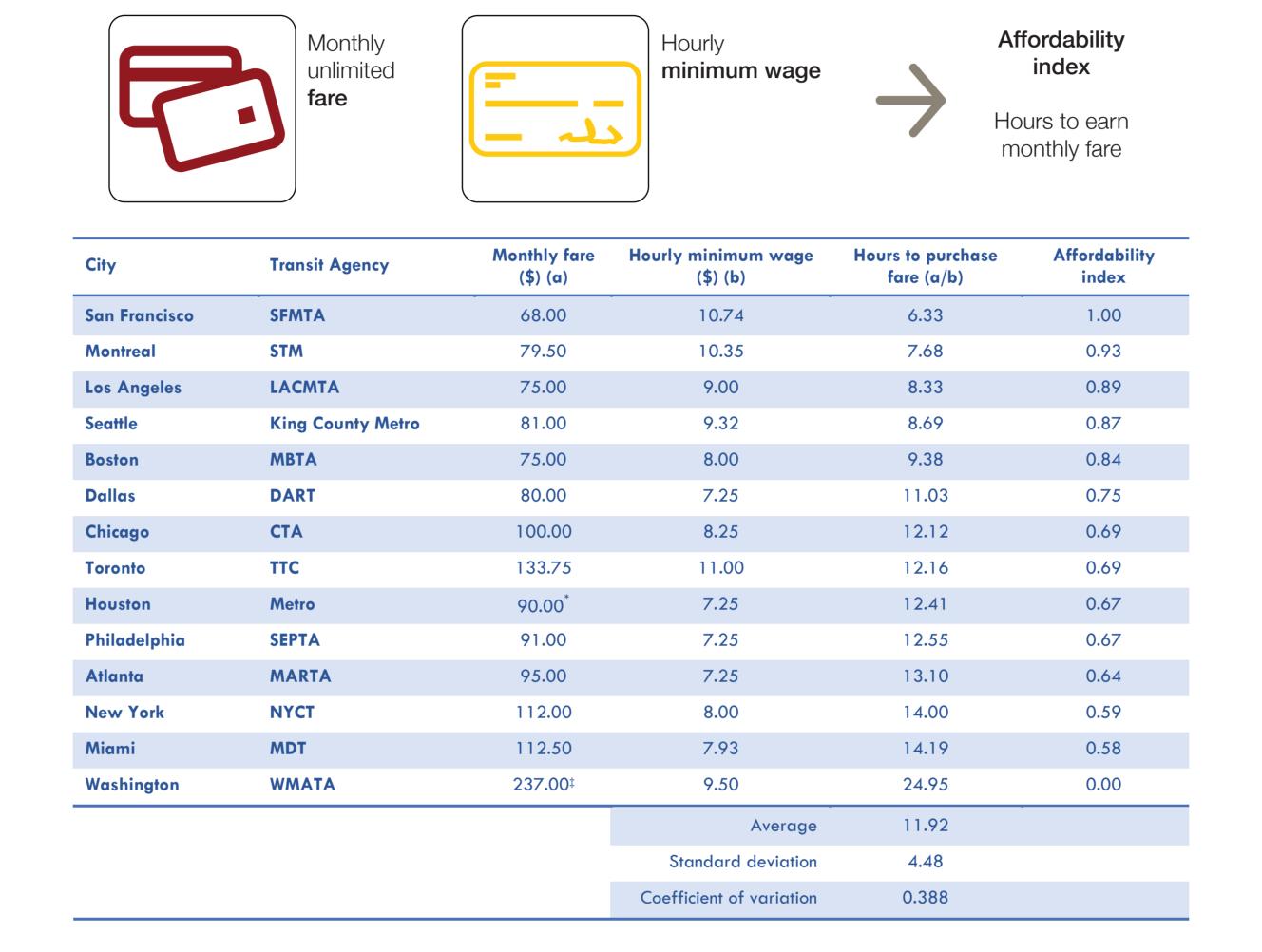| City	Transit Agency	Monthly fare ($) (a)	Hourly minimum wage ($) (b)	Hours to purchase fare (a/b)	Affordability index (c)
San Francisco	SFMTA	68.00	10.74	6.33	1.00
Montreal	STM	79.50	10.35	7.68	0.93
Los Angeles	LACMTA	75.00	9.00	8.33	0.89
Seattle	King County Metro	81.00	9.32	8.69	0.87
Boston	MBTA	75.00	8.00	9.38	0.84
Dallas	DART	80.00	7.25	11.03	0.75
Chicago	CTA	100.00	8.25	12.12	0.69
Toronto	TTC	133.75	11.00	12.16	0.69
Houston	Metro	90.00*	7.25	12.41	0.67
Philadelphia	SEPTA	91.00	7.25	12.55	0.67
Atlanta	MARTA	95.00	7.25	13.10	0.64
New York	NYCT	112.00	8.00	14.00	0.59
Miami	MDT	112.50	7.93	14.19	0.58
Washington	WMATA	237.00‡	9.50	24.95	0.00
	Average			11.92	
	Standard deviation			4.48	
	Coefficient of variation			0.388	

TABLE 2 Affordability index was defined as hours of minimum wage work (pre-tax) to earn a monthly unlimited fare pass. *Houston Metro does not offer monthly unlimited passes, so daily unlimited fare ($3.00) was multiplied by 30 days. ‡WMATA has many monthly passes (by mode, maximum trip price, etc.), this fare offers unlimited 30-day travel. *Sources: APTA 2014, Government of Canada, Doyle 2014*

SOCIETY AND AGENCY INDICES

Society index — Ridership per capita

Agency index — Farebox recovery ratio

Transit Agency	Ridership per capita	Society Index	Transit Agency	FRR	Agency Index
NYCT	427.65	1.00	TTC	0.71	1.00
STM	215.28	0.48	STM	0.56	0.75
SFMTA	192.88	0.42	NYCT	0.51	0.67
TTC	190.43	0.42	WMATA	0.48	0.62
CTA	150.09	0.32	CTA	0.44	0.55
WMATA	110.01	0.22	MBTA	0.40	0.49
SEPTA	89.76	0.17	SEPTA	0.36	0.41
MBTA	86.04	0.16	King County Metro	0.33	0.36
MARTA	79.71	0.14	MARTA	0.31	0.33
LACMTA	54.09	0.08	MDT	0.28	0.27
King County Metro	49.57	0.07	SFMTA	0.26	0.25
MDT	39.70	0.05	LACMTA	0.25	0.23
DART	27.42	0.02	DART	0.15	0.06
Metro	19.67	0.00	Metro	0.12	0.00
Average	123.74			0.37	
Standard deviation	108.45	–		0.16	–
Coefficient of variation	0.88	–		0.44	–

TABLE 3 Society index was derived by dividing annual ridership by population within service area of transit agency. This is the benefit to society by providing sustainable and collective transport. The agency index was calculated using farebox recovery ratio—the amount of operating cost covered by fare revenue, a measure of financial efficiency. *Sources: NTD 2014, CUTA 2014*

AFFORDABILITY TRADE-OFFS

1. New York
2. Los Angeles
3. Chicago
4. Toronto
5. Miami
6. Philadelphia
7. Dallas
8. Houston
9. Washington, D.C.
10. Atlanta
11. Boston
12. Montreal
13. San Francisco
14. Seattle

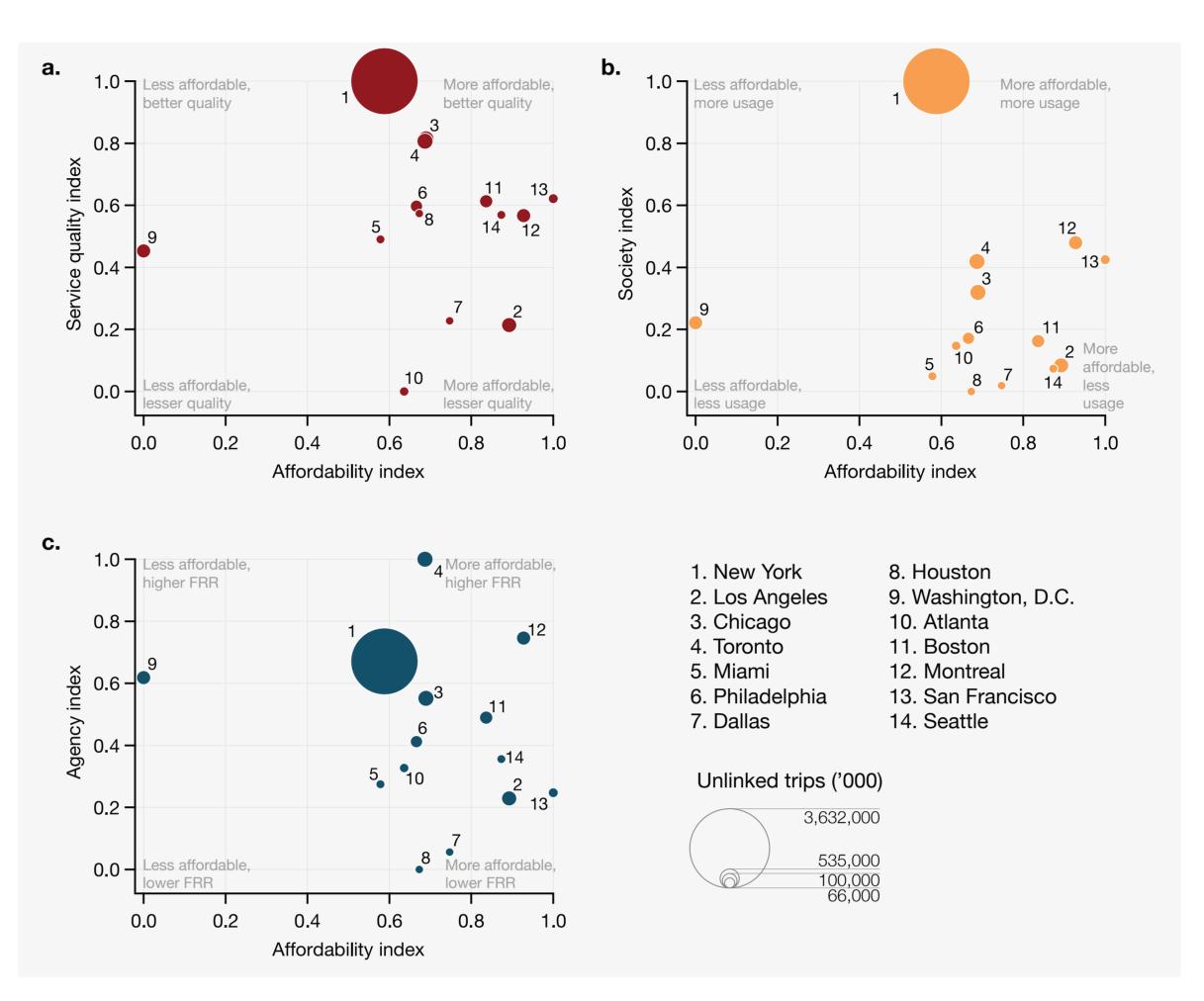Unlinked trips ('000): 3,632,000 / 535,000 / 100,000 / 66,000

FIGURE 2 a, Affordability and service quality, agencies with the high quality service are somewhat less affordable that agencies with lower quality service. b, Affordability and society index (ridership per capita), some affordable transit agencies have low usage. c, Affordability and agency index (FRR), cost recovery does not require unaffordable fares.

PERFORMANCE AND AFFORDABILITY

1. New York
2. Los Angeles
3. Chicago
4. Toronto
5. Miami
6. Philadelphia
7. Dallas
8. Houston
9. Washington, D.C.
10. Atlanta
11. Boston
12. Montreal
13. San Francisco
14. Seattle

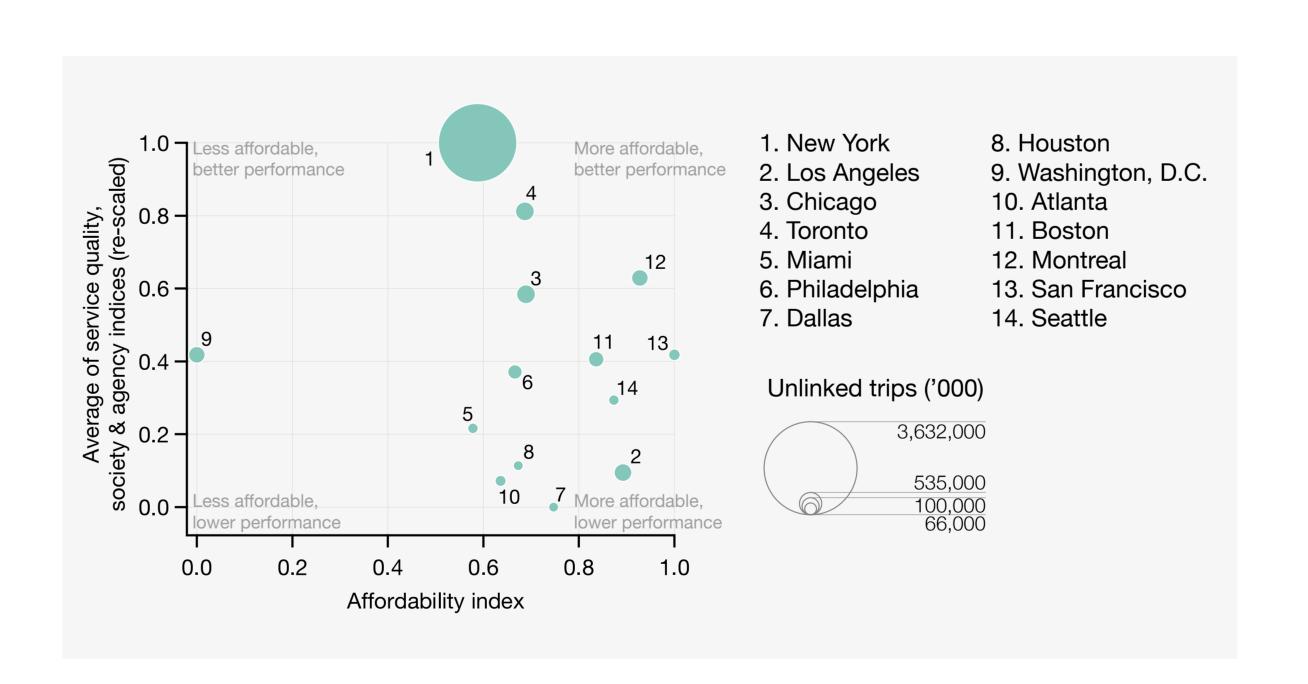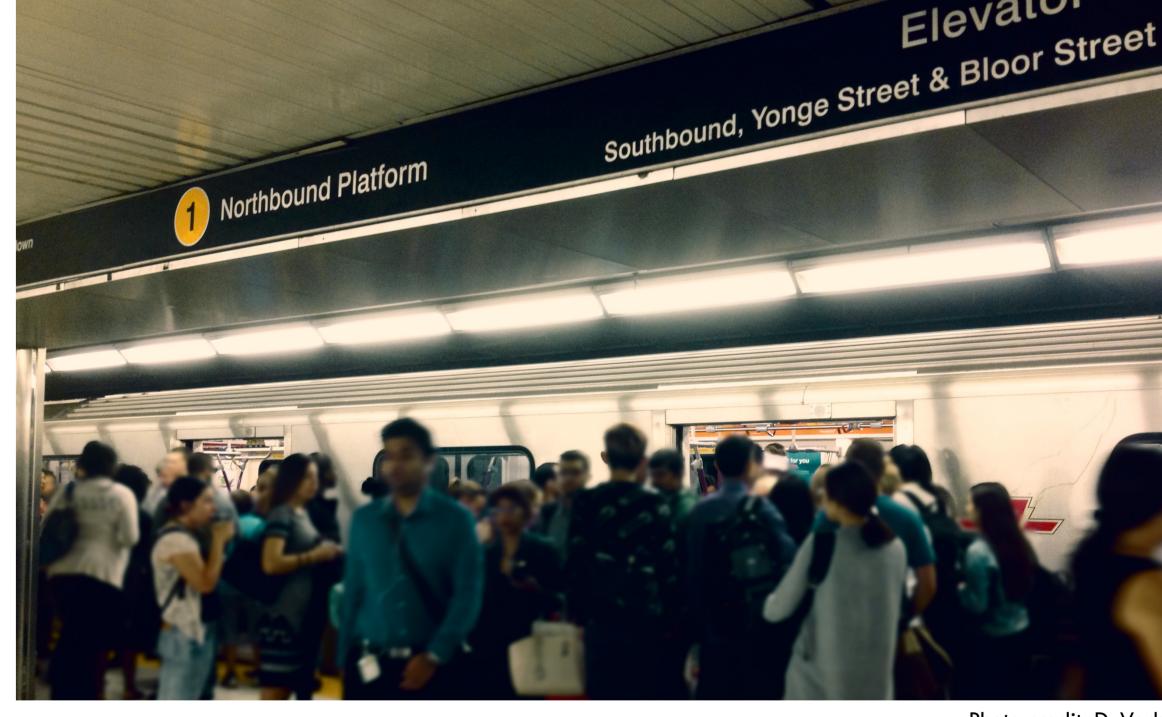Unlinked trips ('000): 3,632,000 / 535,000 / 100,000 / 66,000

FIGURE 3 Affordability and final composite indicator. Agencies like NYCT (New York), TTC (Toronto), and CTA (Chicago) provide excellent service that is somewhat expensive to minimum wage earners. The STM (Montreal) and SFMTA (or Muni in San Francisco) provide good and affordable service. SEPTA (Philadelphia), MBTA (Boston), and King County Metro (Seattle) provide adequate service that is also relatively affordable. MDT (Miami), Metro (Houston), MARTA (Atlanta), and DART (Dallas) provide poorer service that is less affordable, while LACMTA (LA Metro) provides poorer yet more affordable service. Finally, WMATA (Washington, D.C.) provides service that is expensive and performs low on the composite service indicator.

CONCLUSIONS

- Transit agencies range widely in the service they offer

- Affordability does not predict service quality—expensive agencies do not necessarily offer greater service quality and vice-versa

- Our methodology provides a simple and replicable framework for evaluating service quality and affordability

RECOMMENDATIONS

- Transit agencies should collect and make more data, like passenger loading, next-arrival information and other amenity details, publicly available

- Affordability and service needs constant monitoring to ensure transit is serving marginalized riders

- Future studies should consult different stakeholders to capture different indicators and weigh them accordingly

Photo credit: D. Verbich

ACKNOWLEDGMENTS

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