# Plan for the day

- Review
- Public transportation
  - Why do so few people use public transportation?
  - What could we do to encourage additional transit use?
  - Should we subsidize transit fares?
  - Should we build subways, light rail, or busses?
- Course Review

# Review questions

- What is the worst case outcome for autonomous vehicles?
- What is the best case outcome for autonomous vehicles

# PUBLIC TRANSPORTATION

# Very few commuters use public transportation

| Country | Mass Transit | Drive |
|---|---|---|
| Canada | 12% | 74% |
| USA | 5% | 88% |

# In US and CA, which cities have highest transit share?

| City | MSA Share Mass Transit | City Proper Share Mass Transit |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |
| 8. | | |
| 9. | | |
| 10. | | |
| 11. | | |
| 12. | | |

# Even in big cities, few people use mass transit

| City | MSA Share Mass Transit | City Proper Share Mass Transit |
|---|---|---|
| New York City | 30% | 57% |
| Toronto | 23% | |
| Montreal | 22.2% | |
| Ottawa | 20% | |
| Vancouver | 18% | |
| San Francisco | 15% | |
| DC | 14% | |
| Winnipeg | 13% | |
| Halifax | 12% | |
| Boston | 12% | |
| Chicago | 11% | 25% |
| Quebec City | 11% | |

# Why do so few commuters use mass transit?

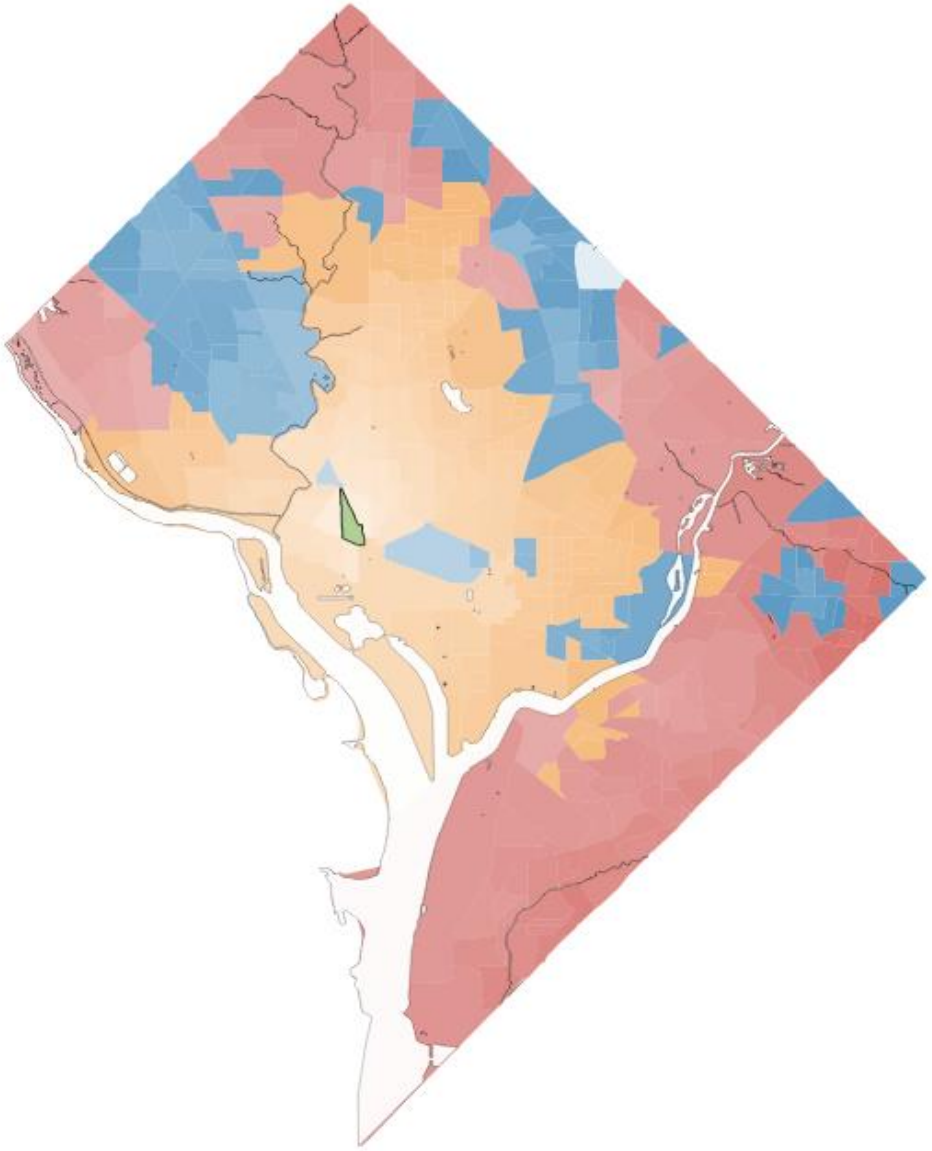
# Because it costs more!

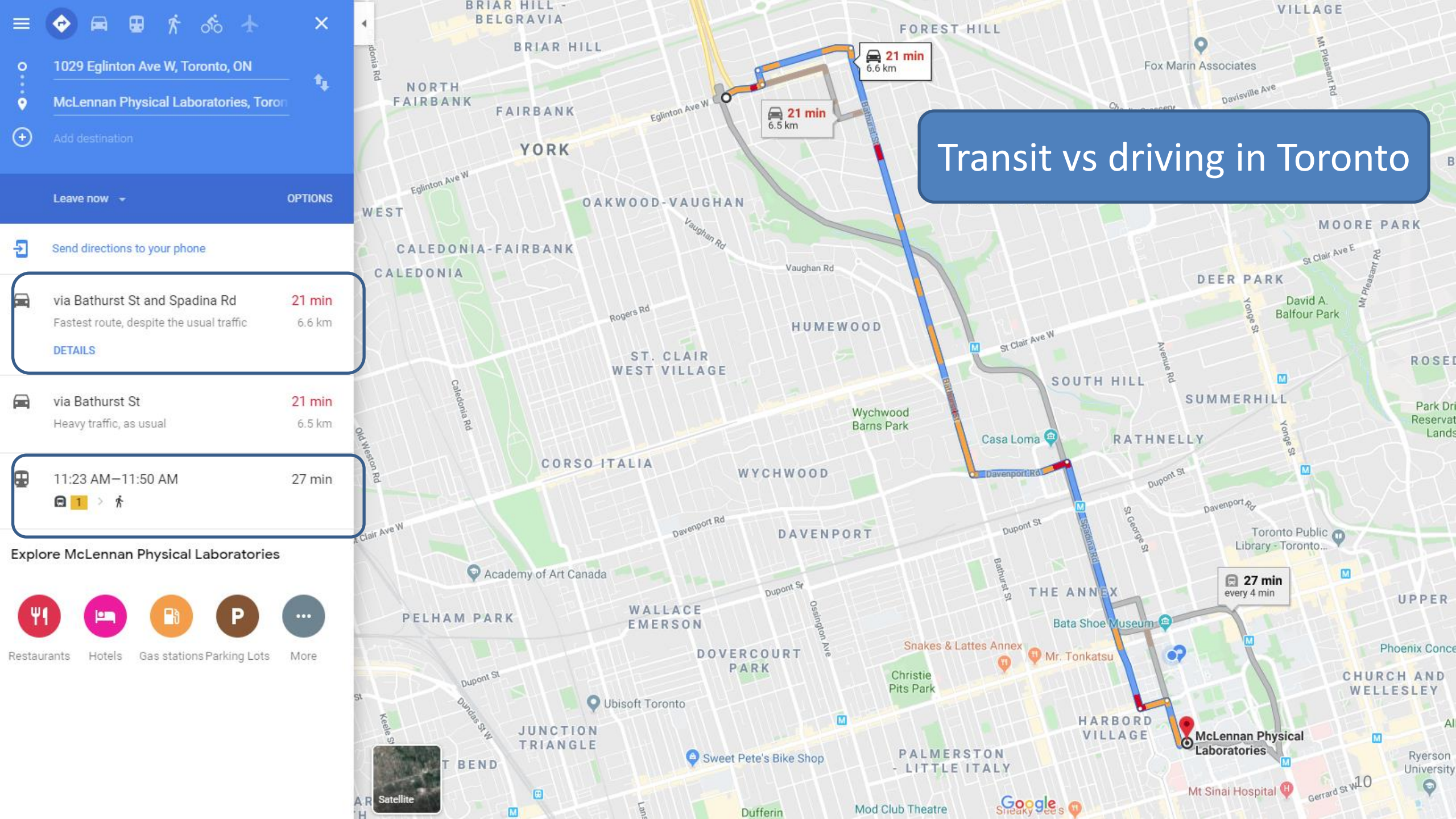
**Table 11–2** Example of Modal Choice

| | Automobile | Bus | Rail |
|---|---|---|---|
| *Access cost (walk and wait)* ($) | 0.00 | 5.76 | 11.52 |
| $T_a$: Access time (minutes) | 0 | 24 | 48 |
| $d_a$: Marginal disutility per minute ($) | 0.24 | 0.24 | 0.24 |
| *In-Vehicle cost* ($) | 12.00 | 13.50 | 9.00 |
| $T_v$: In-vehicle time (minutes) | 80 | 90 | 60 |
| $d_v$: Marginal disutility per minute ($) | 0.15 | 0.15 | 0.15 |
| *Total time cost* ($) | 12.00 | 19.26 | 20.52 |
| *Monetary cost* ($) | 4.00 | 3.00 | 3.00 |
| TOTAL COST | 16.00 | 22.26 | 23.52 |
| **Assumptions** | | | |
| Wage per minute ($) | 0.30 | | |
| Auto operating cost per mile ($) | 0.20 | | |
| Length of trip (miles) | 20 | | |

# Best way to get around DC from DuPont Circle

- Walk: 0.2% (#65C81E)
- Bike: 36.9% (#F5C73C)
- Transit: 19.2% (#4384C4)
- Drive: 43.7%(#D04F46)




1029 Eglinton Ave W, Toronto, ON
McLennan Physical Laboratories, Toron
Add destination
Leave now
OPTIONS
Send directions to your phone
via Bathurst St and Spadina Rd
21 min
Fastest route, despite the usual traffic
6.6 km
DETAILS
via Bathurst St
21 min
Heavy traffic, as usual
6.5 km
11:23 AM–11:50 AM
27 min
1
Explore McLennan Physical Laboratories
Restaurants
Hotels
Gas stations
Parking Lots
More
Satellite
21 min
6.6 km
21 min
6.5 km
27 min
every 4 min
Transit vs driving in Toronto
BRIAR HILL - BELGRAVIA
BRIAR HILL
FOREST HILL
VILLAGE
Fox Marin Associates
NORTH FAIRBANK
FAIRBANK
YORK
OAKWOOD-VAUGHAN
WEST
CALEDONIA-FAIRBANK
CALEDONIA
HUMEWOOD
ST. CLAIR WEST VILLAGE
MOORE PARK
DEER PARK
David A. Balfour Park
SOUTH HILL
SUMMERHILL
RATHNELLY
Casa Loma
Wychwood Barns Park
CORSO ITALIA
WYCHWOOD
DAVENPORT
Academy of Art Canada
PELHAM PARK
WALLACE EMERSON
DOVERCOURT PARK
JUNCTION TRIANGLE
Ubisoft Toronto
Sweet Pete's Bike Shop
PALMERSTON - LITTLE ITALY
THE ANNEX
Bata Shoe Museum
Snakes & Lattes Annex
Mr. Tonkatsu
Christie Pits Park
HARBORD VILLAGE
McLennan Physical Laboratories
Toronto Public Library - Toronto...
CHURCH AND WELLESLEY
Mt Sinai Hospital
Ryerson University
Mod Club Theatre
Dufferin
Eglinton Ave W
Vaughan Rd
Rogers Rd
St Clair Ave W
Davenport Rd
Dupont St
Bathurst St
Spadina Rd
Yonge St
St George St
Avenue Rd
Caledonia Rd
Old Weston Rd
Dundas St W
Keele St
Ossington Ave
Davisville Ave
Mt Pleasant Rd
St Clair Ave E
Gerrard St W
10

# How do you get more people to ride transit?

**Table 11–2** Example of Modal Choice

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# Should we subsidize public transit?

- In 2018 TTC received $584 million from city --- about $1.08/ride
- Our subsidy is relatively low
  - LA receives 3 USD per ride
  - NYC receives ~1.50 USD per ride
- TTC fares cover 73% of operating costs
  - NYC covers 47%
  - MTR (Hong Kong) covers 124%

# Should we subsidize public transit?

# Bus vs. rail

# What is a possible solution? Trackless trams!

# Why does it cost so much to build transit in Canada and USA?

- It is really expensive to build transit in North America
  - Toronto-York-Spadina Extension: $3.184 billion for 8.6 km and 6 stations
  - Ontario Line: $10.9 billion for 15.5 km and 15 stations
  - Scarborough: 3.48 billion for 6.2 km and 1 station
- But other countries build for much less
  - Median cost: <$300 million per kilometer (Paris)
  - Stockholm, Seoul, and Madrid: $100—150 million per kilometer

# Why does it cost so much to build transit in Canada and USA?

- We don’t know for sure
- Hypotheses
  - Over build: Stations way bigger/fancier
  - Too many workers: 4x what is used on similar jobs in Asia, Australia, and Europe
  - Procurement methods
  - Politics: Add other costs to transit project. Street reconstruction etc.

# COURSE REVIEW

# Why do cities exist?

# How do we define cities?

# Why do firms cluster? What explains large cities?

# Are cities too big or too small?

# Why are cities different sizes?

# Why is housing (per sq ft) cheaper in the suburbs?

# Why are homes smaller downtown?

# Why are buildings taller downtown?

- Monocentric city model helps explain differences
  - Within a city
  - Across cities
- Also highlights role of transportation costs in city form

# What is urban sprawl?

# What causes socially inefficient urban sprawl?

# How do we avoid inefficient urban sprawl?

# What are the problems with rent control?

# Why is rent control popular?

# How can you reduce problems from rent control?

# Should you buy or rent?

# It depends!

# How do we know there is too much traffic congestion?

# What do economists want to do about it?

# How do you add tolls so that drivers like them?

# What are other solutions to congestion?

- Raise cost of parking
- Gas tax
- Vehicle kilometers traveled tax
- Sales tax
- Driving restrictions
- And more

# Will autonomous vehicles make things better?

# Why do so few people ride transit?

# What kind of transit should we build?

# Should we subsidize transit fares?

# THANK YOU