Multimodality and Active Living: Connectivity of the Bus Rapid Transit with Pedestrian and Bicycle Facilities

Mintesnot Woldeamanuel, PhD
Craig Olwert, PhD
California State University Northridge

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Introduction

- Imagine your city has a very good public transit system. In fact, driving makes you stressed. But the transit stop is 4 miles away from your home….
- Imagine you don't have a car and love to use your bike, but not for excessively longer trips…
- Imagine you live within quarter of a mile from the transit stop. But you think the walk to the transit station is not worth it due to the less connected road networks (no direct access) and cracked sidewalks along the way…

Figure 2: Evolution of street patterns since 1900 showing gradual adaptation to the car (M. Southworth, 1997)

	Gridiron (c. 1900)	Fragmented parallel (c. 1950)	Warped parallel (c. 1960)	Loops and lollipops (c. 1970)	Lollipops on a stick (c. 1980)
Street patterns					

Introduction

ALL OF THE ABOVE CAN BE INFLUENCING FACTORS FOR UNIMODALITY – WHICH MEANS CAR

Introduction

- The paradigm is LESS DRIVING (health, economic, social and environmental effects of driving)
- However, the level of attractiveness of automobile is hard to bit…
- So the new push is encouraging multimodality

Multimodality defined

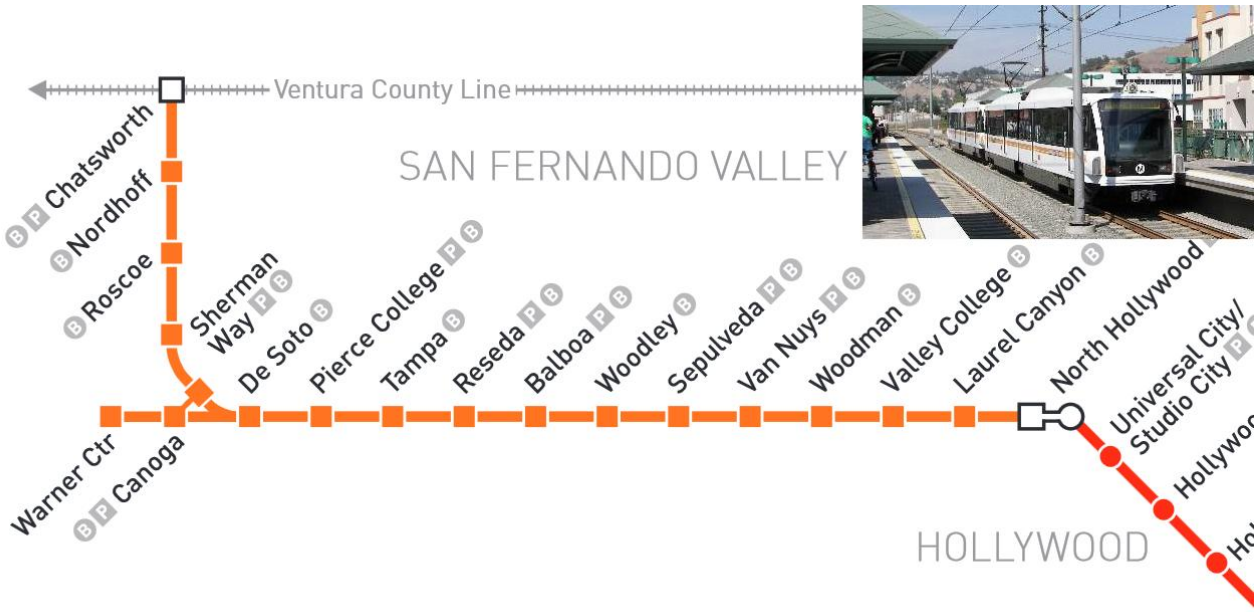
- Multimodal transportation refers to the movement of people (or goods) that involves two, or more, travel modes to a destination.
- TravelBlending, TravelSmart, CombinedTrips etc…
- To encourage multimodality, END-OF-TRIP and IN-BETWEEN-TRIP facilities are very important

Objectives of the study

- To investigate whether, and how, BRTs adopt a multimodal approach when planning and implementing.
- To examine how pedestrians, cyclists, taxi and car users are linked to the BRT system.
- To demonstrate that the combination of different modes can enhance an urban mobility and the overall quality of trips for its users.

Focus

- The focus of this research is to evaluate the current transportation infrastructure around stations of the Metro Orange Line and to see if it is designed in such a way that it promotes multimodality.



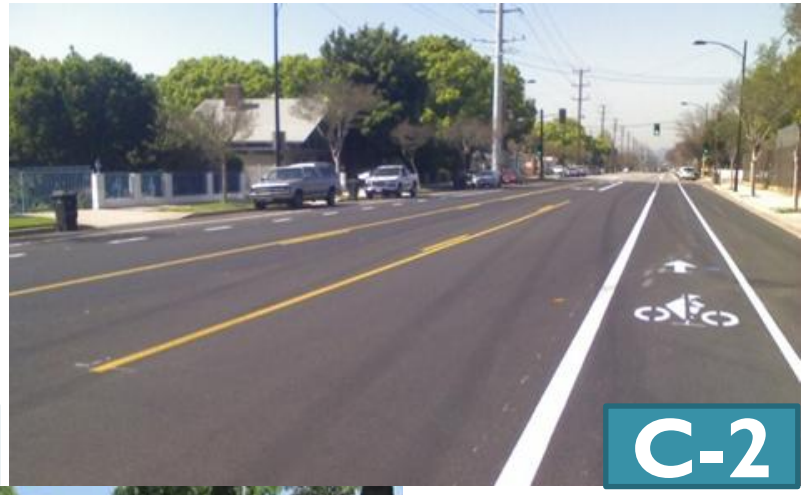
Orange line- SFV Los Angeles

Data

- **Sidewalk assessment**
  - Availability
  - Walkability
  - ADA compliance
- **Bicycle assessment** (access to bike lanes)
  - Availability
  - Class type
- **Parking assessment**
  - Availability (car and/or bike)
  - Types (paid or free)
- **Other public transit connections**
  - Availability
  - Number of connections per station
- **Taxi & Kiss-n-ride**
  - Availability

I- Sidewalk 1-5 Grading Scale

II- Bike lane class



III- Parking

- # of car parking at stations and # of bicycle lockers and racks at stations

VI- Bus connectivity

- # of bus routes connected to the BRT route

V- Taxi and Kiss-n-ride

- Availability of loading/unloading places

Stations	Sidewalk quality	Bike lane quality	Number of bike-rack spaces	Number of bike lockers	Number of parking spaces	Availability of kiss-n-ride/taxi stations	# of regular bus & rail connection	Multimodality Index (MI)
Chatsworth	4	2.5	16	16	610	1	9	17.67
Nordhoff	3.375	2.5	12	8	0	0	2	6.93
Roscoe	4	2.5	12	8	0	0	2	8.07
Sherman Way	3.975	2.5	12	16	191	1	2	13.50
Warner Center	4.5	2	6	0	0	0	11	7.57
De Soto	2.88	1.2	12	8	0	0	4	2.82
Canoga	4	3	24	32	288	1	2	27.56
Pierce College	3.25	1.5	12	8	373	1	2	8.30
Tampa	3.25	1.5	12	8	0	1	1	7.02
Reseda	3.625	2.5	6	16	522	1	2	12.28
Balboa	4	2.75	12	20	270	1	5	15.93
Woodley	3.167	2.75	8	16	0	0	2	7.42
Sepulveda	4.333	1.5	12	12	1205	1	2	12.99
Van Nuys	3.75	2.5	12	8	776	0	8	13.38
Woodman	2.5	2.5	12	8	0	0	3	5.64
Valley College	2.883	2.5	8	8	0	0	5	5.95
Laurel Cyn	4	2	8	8	0	0	3	5.87
North Hollywood	4	1	8	0	952	1	12	10.55

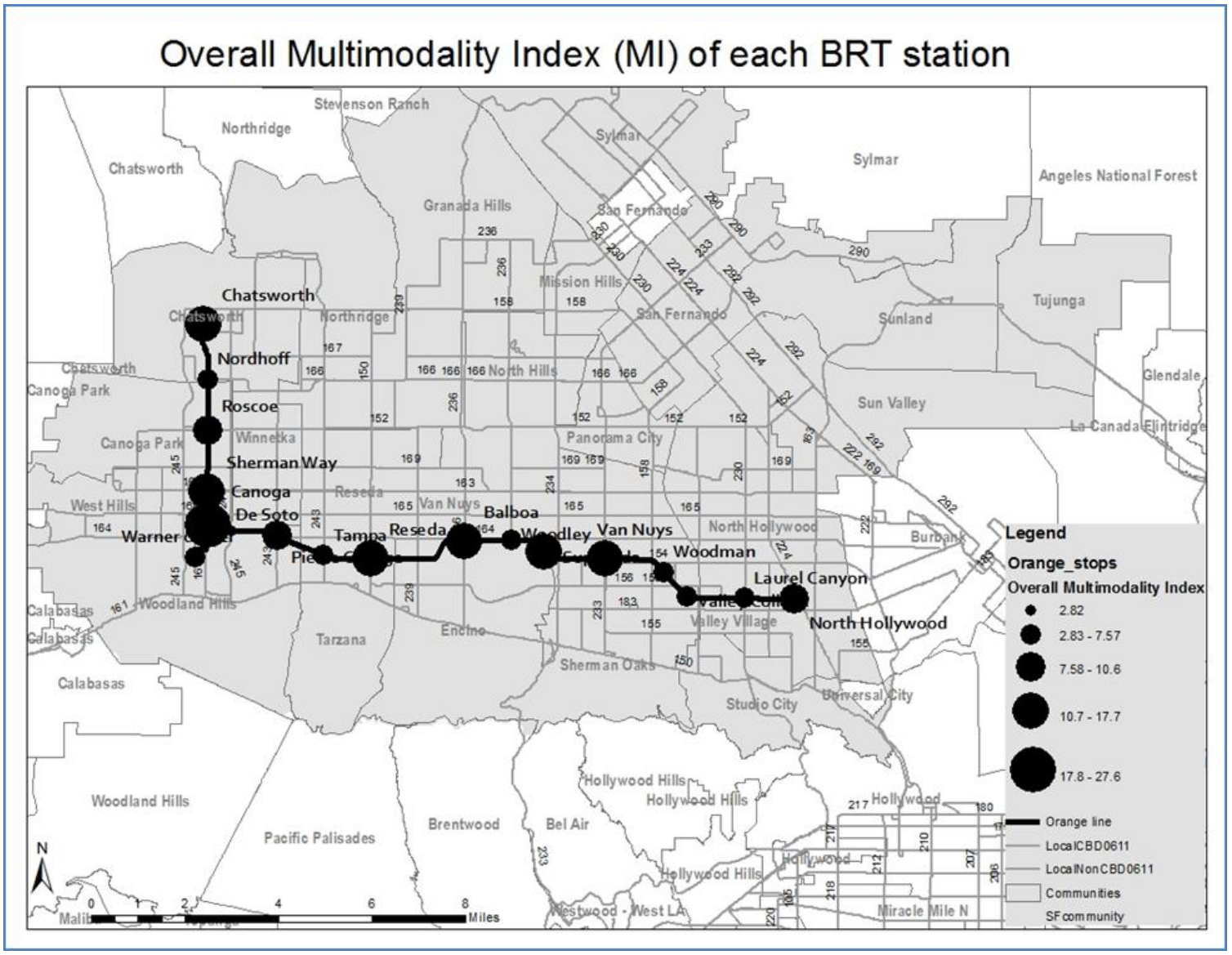
Method

- **Standardized score for sidewalk** = ([sidewalk score] - [mean of distribution])/ [standard deviation]
- **Standardized score for bike lane** = ([bike lane score] - [mean of distribution])/ [standard deviation]
- **Standardized score for parking** = ([no. of parking space] - [mean of distribution])/ [standard deviation]
- **Standardized score connection** = ([no. of bus connections] - [mean of distribution])/ [standard deviation]
- **Standardized score for kiss-n-ride** = ([kiss-n-ride] - [mean of distribution])/ [standard deviation]
- **Standardized score for bike racks** = ([no. bike rack spaces] - [mean of distribution])/ [standard deviation]
- **Standardized score for bike lockers** = ([no. of bike lockers] - [mean of distribution])/ [standard deviation]

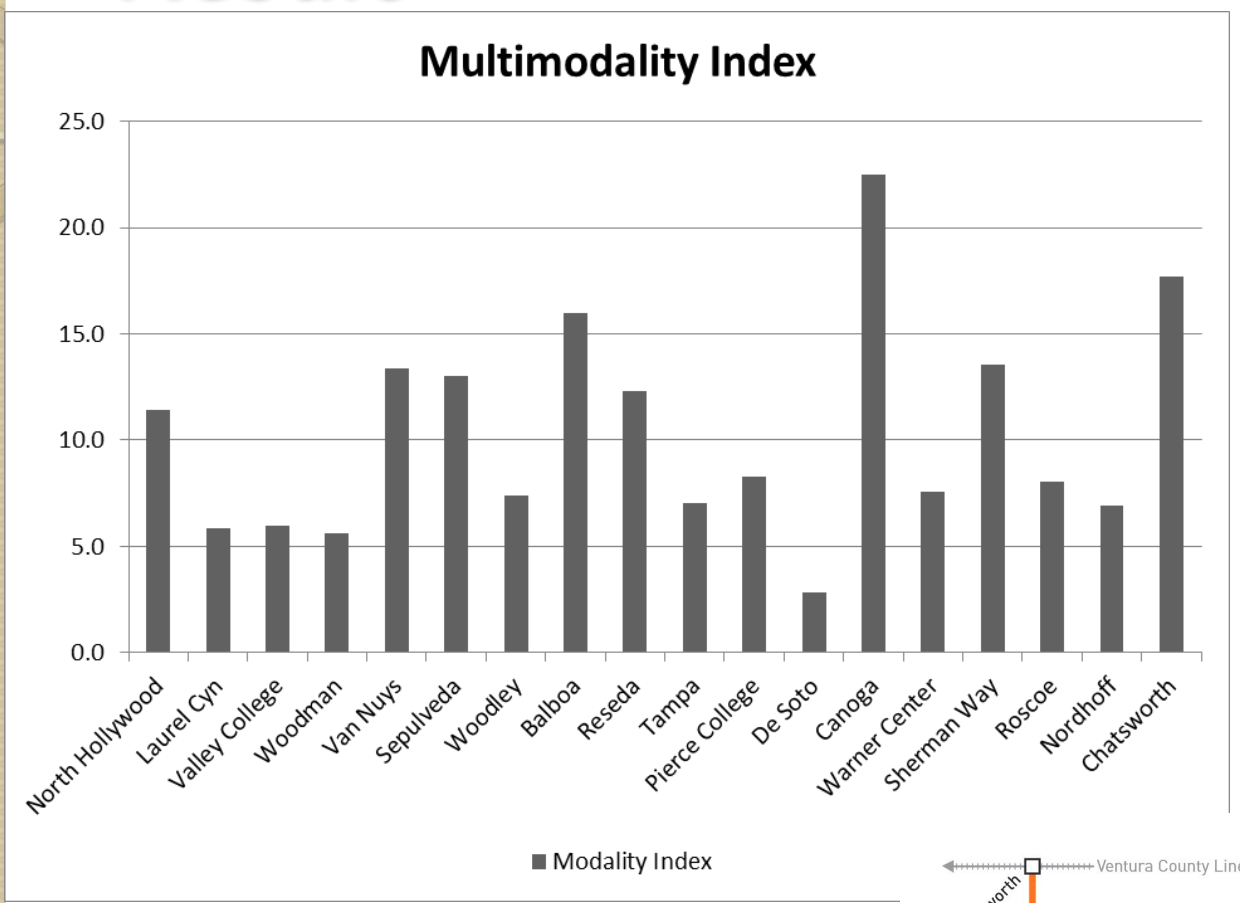
Method

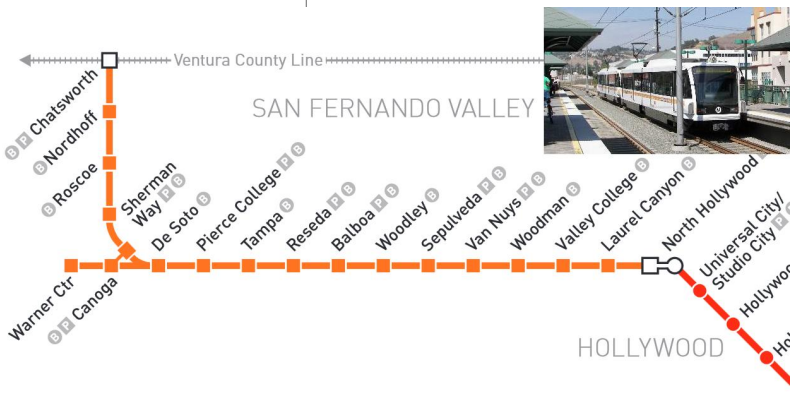
- **Overall Multimodality Index (MI)** = standardized sidewalk score+ standardized bike lane score + standardized parking score + standardized bus connectivity score + standardized kiss-n-ride score + standardized bike rack score + standardized bike locker score

Result


Overall Multimodality Index (MI) of each BRT station
Chatsworth
Nordhoff
Roscoe
Sherman Way
Canoga
De Soto
Tampa
Reseda
Balboa
Van Nuys
Woodman
Laurel Canyon
North Hollywood
Legend
Orange_stops
Overall Multimodality Index
2.82
2.83 - 7.57
7.58 - 10.6
10.7 - 17.7
17.8 - 27.6
Orange line
LocalCBD0611
LocalNonCBD0611
Communities
SFcommunity
Miles

Result


Multimodality Index
25.0
20.0
15.0
10.0
5.0
0.0
North Hollywood
Laurel Cyn
Valley College
Woodman
Van Nuys
Sepulveda
Woodley
Balboa
Reseda
Tampa
Pierce College
De Soto
Canoga
Warner Center
Sherman Way
Roscoe
Nordhoff
Chatsworth
Modality Index


Ventura County Line
SAN FERNANDO VALLEY
Chatsworth
Nordhoff
Roscoe
Sherman Way
De Soto
Pierce College
Tampa
Reseda
Balboa
Woodley
Sepulveda
Van Nuys
Woodman
Valley College
Laurel Canyon
North Hollywood
Universal City/ Studio City
Warner Ctr
Canoga
HOLLYWOOD

	Multimodality Index
Multimodality Index	1
Households with one or more people 65 years and over:	-0.213522732
No vehicle available	0.153249792
1 vehicle available	-0.170791418
2 vehicles available	-0.448115437
Owner occupied	-0.167482289
Renter occupied	-0.097163658
In labor force:	-0.177903488
Not in labor force	-0.542105784
Not Hispanic or Latino: - White alone	-0.277312846
Not Hispanic or Latino: - Black or African American alone	-0.392036233
Not Hispanic or Latino:- Asian Alone	0.110911549
Hispanic or Latino:	0.131768403
Hispanic other	0.139189151
Median contract rent	0.006993437
Median value (dollars)	-0.312361473
Median household income in the past 12 months (in 2010 inflation-adjusted dollars)	0.011951596

- In areas where multimodality index is low, high percentage of those in labor force
- In areas where the median property value is high, multimodality index is low.
- In an area where there are the majority African American, the multimodality index is low

Conclusion and recommendation

- Not all BRT stations have a multimodality features.
- Multimodality is an important key feature for BRT stations to encourage the use of the Bus Rapid Transit system.
- End-Of-Trip facilities and In-Between-Trip facilities.
- Road diet around stations- to make room for multimodal facilities.