



Effect of Transport Choice on Perceived Health: A Case Study of Metropolitan Areas in Texas and California

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Introduction

❖ Car-centric nature of transportation planning in the US cities with multi-lane highway systems, lack of quality public transportation systems, and large-capacity parking spaces

❖ The prevalence of car commuting



physically inactive lifestyles, health problems of weight control, muscular and cardiorespiratory fitness, heart disease, and diabetes

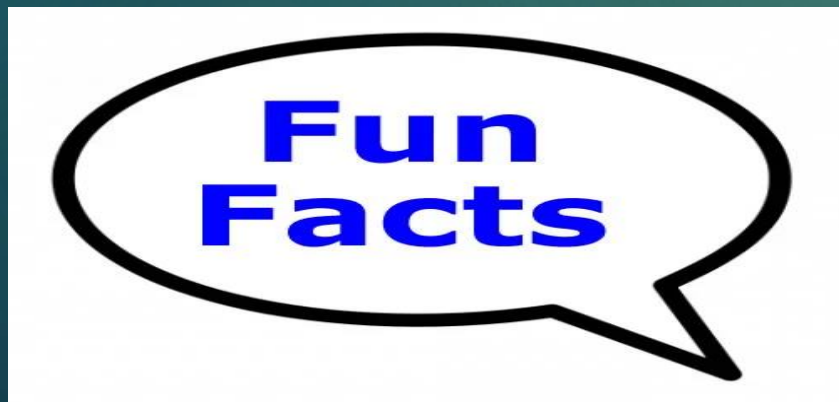
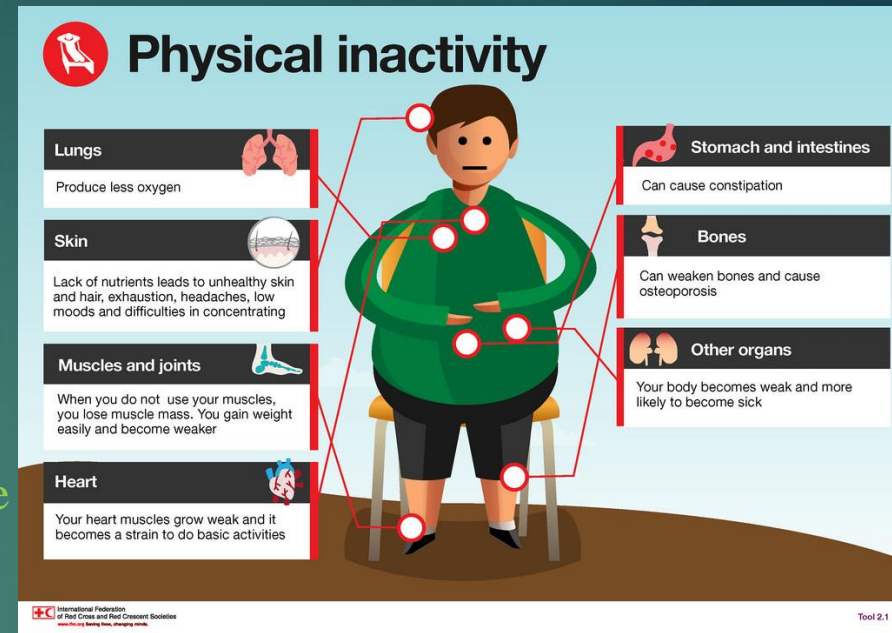


Introduction

Physically inactive lifestyle: one of the main health issues threatening most of the societies

- ✓ 30.3 million Americans (9.4% of the U.S population) had **diabetes** in 2015 [American Diabetes Association]
- ✓ 93.3 million American adults had **obesity** in the same year

Minimum weekly physical activity of **150-minute moderate** intensity or **75-minute vigorous** intensity Recommendation by : WHO, AHA, HHS



Utah and Arkansas with **15.7%** and **32.5%** have the lowest and highest rates of physical inactivity in U.S.

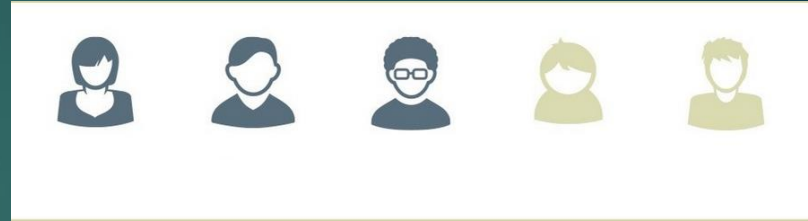
Previous Studies

The effects of active mode and public transit on **Physical Health**

Reduction in Obesity, Blood Pressure, Diabetes and other Cardiovascular diseases by
(Samimi et al. 2009),
(Lachapelle&Frank 2209),
(Humphreys et al. 2013), (Sener et al. 2016), (Flint et al. 2016),
(Bennett et al. 2017)

The effects of active mode and public transit on **Perceived Health**

The greater usage of active and public transit travel, the higher likelihood of perceived physical wellbeing, and perception of mental health by *(Bopp et al. 2013), (Langerudi et al. 2015),*
(Ermagun&Levinson 2017),
(Tajalli&Hajbabaie 2017)



Research Gaps

- ❖ Almost no study to consider both aggregate (metropolitan level) and disaggregate (individual level) data.
- ❖ The first study to compare the effects of transport choice on perceived health in different types of metropolitan areas (in terms of bikeability, walkability, access to public transit)



Purpose of Study

- ❑ How physical and perceived health measures are related to travel options for different U.S. metropolises.
- ❑ **Physical Health Analysis: 10 U.S. metroplexes (6 in CA and 4 in TX)**
- ❑ **Perceived Health Analysis: 4 U.S. metropolitan areas (2 in each state)**



Data

- **National Environmental Public Health Tracking Network, (CDC 2015)**
 - Percent of workers over 16 years using active transportation and public transit
 - crude rates of obesity, diagnosed diabetes, high blood pressure, and coronary heart disease

- **National Household Travel Survey (NHTS 2017)**



Type of NHTS Data	Example
Socio-demographics	Gender, Age, Education, Income
Transport Options	Bike, Walk, Bus, Train, Car
Physical Activity	Light, Moderate, Vigorous, Weekly Number of Bike, Walk Trips
Health	General Perceived Health

Physical Health Analysis

Metroplex	Active (Walking /Biking)	Public Transit	Car	Obesity	Diabetes	High Blood Pressure	Coronary Heart Disease
Texas							
Austin-Round Rock, TX	1.53	2.47	75.46	27.24	7.87	23.89	3.92
Houston-The Woodlands-Sugar Land, TX	1.07	2.66	78.90	33.57	11.83	31.22	5.34
San Antonio-New Braunfels, TX	1.06	2.61	78.41	34.64	12.82	30.14	5.80
Dallas-Fort Worth-Arlington, TX	0.76	1.76	80.01	32.82	10.36	29.78	5.11
California							
San Francisco-Oakland-Hayward, CA	3.31	15.70	59.76	20.41	9.04	26.05	4.64
Sacramento-Roseville-Arden-Arcade, CA	2.20	2.70	74.69	25.02	9.37	29.52	5.33
San Jose-Sunnyvale-Santa Clara, CA	1.91	3.58	75.52	19.58	8.43	24.05	4.11
Los Angeles-Long Beach-Anaheim, CA	1.85	6.25	72.80	23.99	10.37	26.82	5.08
San Diego-Carlsbad, CA	1.61	3.18	76.05	23.23	8.86	25.65	4.91
Riverside-San Bernardino-Ontario, CA	1.18	1.59	76.33	29.28	10.35	28.61	5.45

Physical Health Analysis

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- Generally, higher Active/Public travel in CA than in TX
- Austin, lowest rate of all health measures in TX
- DFW has lower rates of Active Travel and Public Transit and higher vehicle trips.
- San Francisco, highest rate of Active/Public travel and lowest use of private vehicles (60% compared with 75% in other areas)
- So, San Francisco has lower rates of obesity, diabetes, blood pressure and heart disease than LA and Sacramento

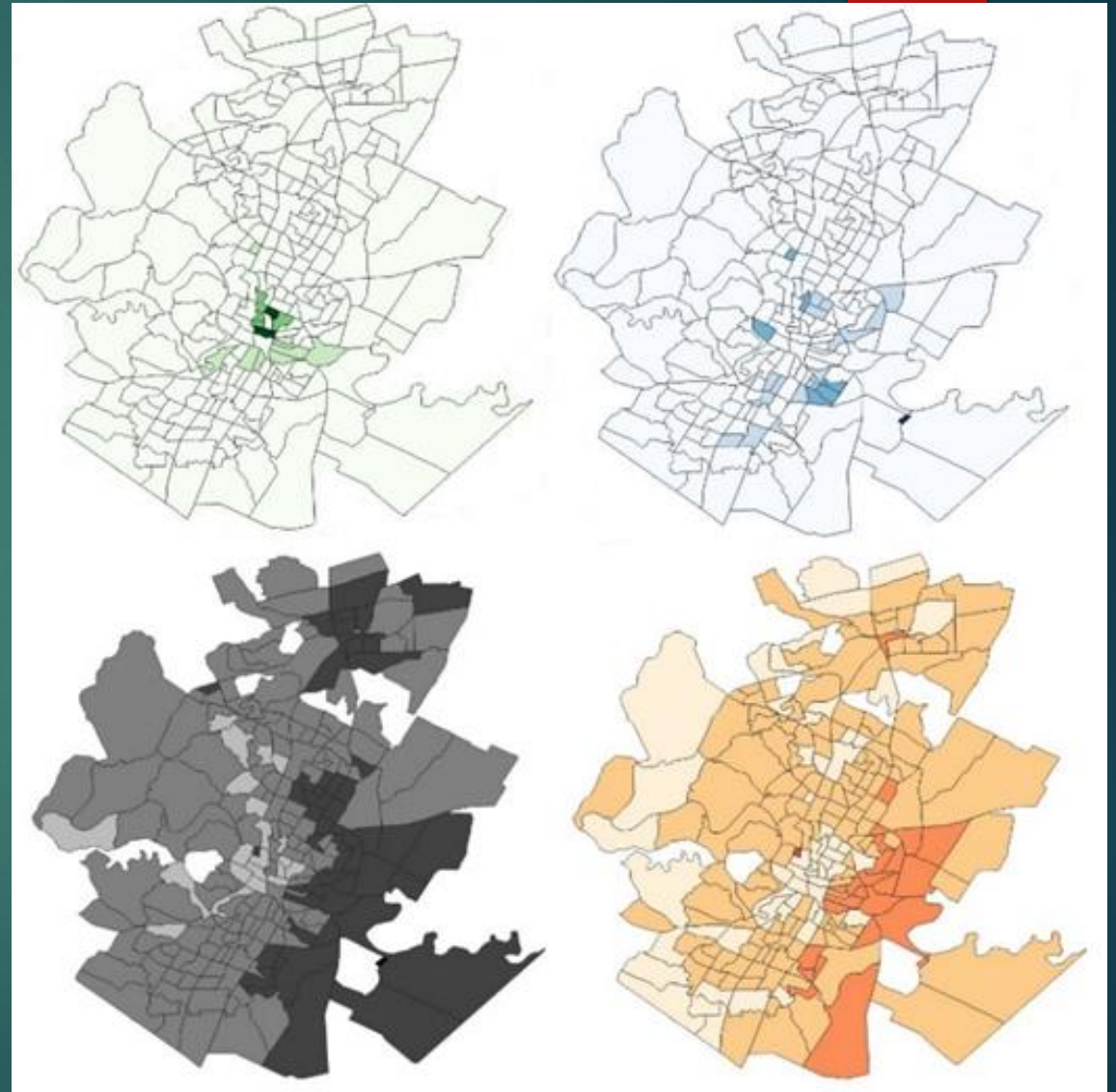


Physical Health Analysis

Spatial distributions (through ArcGIS) between the transport options and health measures in Austin as sample city

Areas with lower obesity rates tend to have lower diabetes.

Areas with higher rates of active commuting and public transit have the lowest percentages of obesity and diabetes



Perceived Health Analysis

- ❖ Selection of DFW and Austin from Texas, and LA , and San Francisco from California
- ❖ DFW and LA: Most populated and vehicle-based metropolitan areas in TX, and CA
- ❖ Austin and San Francisco: Most walkable/bikeable cities in TX and CA



Perceived Health Analysis

Variable	Description	Austin		DFW		San Francisco		LA	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Gender	1: male/2: female	1.52	0.50	1.52	0.57	1.51	0.57	1.51	0.63
Age	Individuals's age in years	48.59	18.04	46.10	21.63	46.58	21.28	46.73	21.53
Household size	1: size=1 person in household/ 2: two persons in household/ 3: 3 or more persons in household	2.57	1.39	2.80	1.39	2.66	1.27	2.80	1.43
Education level	5 categories of education from NHTS (1 to 5)	3.63	1.16	2.93	1.74	3.39	1.78	3.12	1.74
Household income level	11 categories of household income from NHTS (1 to 11)	7.02	2.52	6.51	3.34	7.71	3.52	6.59	3.70
Household vehicle	0: no vehicle in household/ 1: one vehicle in household/ 2: two vehicles in household/ 3: 3 or more vehicle in household	2.14	1.03	2.23	1.10	2.02	1.17	2.19	1.20
Hispanic	1: Hispanic or Latino/ 2: Otherwise	1.87	0.34	1.87	0.38	1.91	0.42	1.78	0.48
LMPA	Count of times of light or moderate physical activity per week	3.82	2.64	3.72	2.71	4.00	2.72	3.75	2.73
VPA	Count of times of vigorous physical activity per week	4.73	2.35	1.57	3.40	4.73	2.56	4.65	2.31
Medical Condition	1: if a person has medical condition/ 2: Otherwise	1.95	0.22	1.93	0.25	1.93	0.25	1.91	0.28
Teleworking	Count of days worked from home in last month	4.74	5.21	4.45	5.82	4.13	4.44	4.77	5.84
Bike	Frequency of bicycle use for travel 1: daily/ 2: a few times a week/ 3: a few times a month/ 4: a few times a year/ 5: never	4.46	0.95	4.63	0.76	4.23	1.15	4.39	0.95
Walk	Frequency of walking for travel 1: daily/ 2: a few times a week/ 3: a few times a month/ 4: a few times a year/ 5: never	3.38	1.42	3.62	1.38	2.42	1.37	2.80	1.35
Bus	Frequency of bus use for travel 1: daily/ 2: a few times a week/ 3: a few times a month/ 4: a few times a year/ 5: never	4.64	0.80	4.78	0.59	4.07	1.22	4.50	0.94
Train	Frequency of train use for travel 1: daily/ 2: a few times a week/ 3: a few times a month/ 4: a few times a year/ 5: never	4.81	0.44	4.63	0.68	3.59	1.18	4.47	0.82
Car	Frequency of personal vehicle use for travel 1: daily/ 2: a few times a week/ 3: a few times a month/ 4: a few times a year/ 5: never	1.18	0.54	1.15	0.54	1.51	0.94	1.26	0.71
Health	Opinion of health 1: if the general health is very good or excellent/ 2: Otherwise	1.98	0.92	2.12	0.99	1.97	0.95	2.13	1.02

Perceived Health Analysis

- ❖ Matrices of Variance-Covariance and Variance Inflation Factor calculations for Multicollinearity prior to modelling
- ❖ Discrete Choice Modeling (Binary Logit)
- ❖ Backward Elimination to ascertain about variables in the final models
- ❖ McFadden measure (likelihood ratio index), and Akaike Information Criterion (AIC) for best model selection

Perceived Health Analysis

Variable	Austin			DFW			San Francisco			LA		
	Coefficient	OR	95% CI	Coefficient	OR	95% CI	Coefficient	OR	95% CI	Coefficient	OR	95% CI
Gender	-0.32*	0.73	(0.53, 1.01)	-0.28***	0.75	(0.66, 0.86)	-0.28*	0.76	(0.56, 1.02)	0.05	1.05	(0.85, 1.32)
Age	0.02***	1.02	(1.01, 1.03)	0.02***	1.02	(1.01, 1.03)	0.02***	1.02	(1.01, 1.03)	0.03***	1.03	(1.02, 1.04)
Household size	0.11	1.11	(0.63, 1.96)	0.38**	1.46	(1.15, 1.86)	0.06	1.06	(0.63, 1.79)	0.38*	1.5	(0.98, 2.17)
Education level	-1.22**	0.51	(0.26, 1.01)	-0.74***	0.48	(0.36, 0.64)	-0.5	0.08	(0.02, 0.20)	-0.580*	0.57	(0.35, 0.88)
Household income level	-1.84***	0.16	(0.06, 0.44)	-1.50***	0.22	(0.14, 0.35)	-2.44***	0.09	(0.04, 0.20)	-0.73**	0.26	(0.11, 0.38)
Household vehicle	-1.6	0.26	(0.06, 1.06)	-0.26	0.77	(0.44, 1.35)	0.22	1.24	(0.41, 3.73)	-0.43	0.65	(0.28, 1.52)
Hispanic	-0.56	0.57	(0.37, 0.89)	-0.11	0.89	(0.72, 1.10)	-0.11	0.90	(0.51, 1.56)	-0.29*	0.76	(0.56, 1.00)
Physical activity level (low or moderate)	-0.16***	0.85	(0.81, 0.90)	-0.13***	0.88	(0.85, 0.9)	-0.20***	0.82	(0.77, 0.87)	-0.12***	0.88	(0.85, 0.92)
Physical activity level (vigorous)	-0.50***	0.61	(0.52, 0.71)	-0.29***	0.75	(0.71, 0.78)	-0.32***	0.73	(0.67, 0.80)	-0.35***	0.71	(0.65, 0.77)
Medical Condition	-2.27***	0.10	(0.07, 0.15)	-2.30***	0.10	(0.09, 0.12)	-2.42***	0.09	(0.06, 0.13)	-2.25***	0.11	(0.08, 0.14)
No.of days worked from home	-0.25	0.17	(0.02, 0.35)	-0.05*	0.95	(0.90, 0.99)	-0.04	0.96	(0.87, 1.05)	-0.01	0.99	(0.93, 1.05)
Bike	0.58*	1	(0.52, 1.42)	0.07	1.07	(0.33, 3.44)	0.38**	1.46	(0.77, 2.76)	-0.76	0.46	(0.14, 1.46)
Walk	0.36*	1.06	(0.57, 1.94)	-0.05	0.95	(0.73, 1.25)	0.09	1.09	(0.70, 1.70)	0.31	1.37	(0.97, 1.92)
Bus	-1.78	0.17	(0.02, 1.34)	0.02	1.02	(0.42, 2.46)	-0.58**	0.56	(0.36, 0.87)	0.15	1.17	(0.52, 2.60)
Train	-1.48	0.15	(0.04, 0.29)	-0.66	0.52	(0.19, 1.39)	-0.04**	0.96	(0.61, 1.51)	0.22	1.02	(0.43, 2.41)
Car	-1.83*	0.54	(0.15, 1.93)	1.80***	6.05	(2.11, 17.35)	-0.02	0.73	(0.22, 2.41)	0.44**	0.85	(0.74, 0.98)
McFadden R square	0.328			0.290			0.315			0.325		
AIC	1264.2			7081.5			1438.3			2489.3		
Log-likelihood	-283.02			-1431.00			-30.8.01			-572.31		

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05

Discussion and Conclusion

- ❖ No association between HH no. of vehicles and individuals' perceived health
- ❖ In DFW and LA: perception of health not affected by bike, walk, and transit trips, but driving more is related to better perceived health
- ❖ In Austin, walk/bike and in San Francisco, biking results in better perceived health, while public transit negatively affects health perception

Discussion and Conclusion

- ❖ Not surprisingly, the more exercise (light, moderate, vigorous), the better perceived health
- ❖ Medical conditions' negative influence on perception of health
- ❖ Women have better perceived health than men
- ❖ Older people consider themselves healthier than the younger
- ❖ In LA, Hispanics have lower perceived health than non-Hispanics
- ❖ The more teleworking, the better perceived health

Future Studies

- ❖ Information of weight and body mass index (BMI)
- ❖ Examining the joint effect of BMI and transport choice on perceived health in a longitudinal studies
- ❖ Consideration of built environment and natural environment factors to understand the walkability and bikeability of neighborhoods

