Health Impact Analysis for Integrated Regional Land Use and Transportation Plan

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Health and Obesity

- Major health concern in the U.S.
  - Heart disease, Type 2 diabetes, hypertension, stroke, and certain cancers .
- 36% U.S. adults were obese in 2009-10.
- In LA County, obese adults has increased from 13.6% to 23.6% between 97-11.

Past Research

- Obesity declines with higher income & education.

- In LA, Hispanics and African Americans have higher obesity rates than others.

- Mixed land use, higher transit stop density, population density, longer walking distance are significantly associated with lower obesity level.

Regional Planning & Public Health

Integrated transportation and land use planning policies

- Solve the issue of public health.

- Reduce obesity

- Becoming important for both regional planning and public health agencies.

Transportation Approach

- Two transportation policies on reducing obesity.
  - Promote Active Transportation
  - Expand Public Transportation
- Both acknowledged by U.S. CDC.
- Encourage walk & bike more.

Land Use Approach

- Healthy Community Design (by CDC)
- Residential neighborhoods:
  - Higher densities, mixed land use, better street connectivity, or closeness to transit services
  - Encourage more walking or biking
  - Living in this type of community can reduce weight.

Integrated Regional Land Use / Transportation Plan

- MPOs in California are required to alleviate public health issues in the long-range plan.

- Active transportation and land use planning are two main elements in regional planning to reduce obesity.

Objective of This Research

- Analyze how neighborhood land use and built environment are associated with adults being obese.

Model Formulation

- The model estimates the probability of an individual being obese as a function of four groups of factors:

  - Individual socioeconomic characteristics,
  - Individual health behaviors,
  - Neighborhood quality and safety, and
  - Neighborhood land use and built environment.

Methodology

- Model: Binary logit model

- Assumption: land use and built environment characteristics of residential neighborhoods are significantly associated with one's probability of being obese.

- 2007 Los Angeles County Health Survey

- SCAG socio-economic and land use data

Data & Dependent Variables

Los Angeles County Health Survey

- 7,200 adults aged $\geq$ 18 are sampled
- Residential location by Census tract and zip code

Dependent Variables:

- An adult is obese
- BMI (Body Mass Index > 30)

Explanatory Variables - Individual

- Individual socio-economic characteristics
  - Age
  - Race/Ethnicity
  - Education

- Individual health behaviors
  - Eat fast food at least once per week
  - Engage in vigorous physical activity

Explanatory Variables - Neighborhood

- Neighborhood quality and safety
  - Neighborhood median income
  - Feel neighborhood is safe from crime
- Land Use & Built Environment
  - Household density
  - Bus stop density
  - Local bus accessibility
  - Neighborhood has a rail station

Model Result

Variable	Description	Estimate	Wald Chi-Sq.	Pr > ChiSq	Standardized Estimate
Intercept		-1.215	8.24	0.004	
AGE3049	Age 30-49	0.482	16.86	<.0001	0.13
AGE5064	Age 50-64	0.768	37.82	<.0001	0.19
AGE6599	Age 65 or older	0.152	1.17	0.279	0.04
Hispanic	Hispanic	0.192	4.52	0.034	0.05
AfrAm	Non-Hispanic African American	0.453	13.95	0.000	0.07
Asian	Non-Hispanic Asian	-1.052	36.51	<.0001	-0.17
HighEdu	4-yr college graduate or higher degree	-0.408	23.77	<.0001	-0.11
INC10K	Neighborhood average household income	-0.135	28.77	<.0001	-0.16
Safety	Feel neighborhood is safe from crime	-0.315	12.76	0.000	-0.06
Fastfood	Eat fast food at least once per week	0.368	26.73	<.0001	0.10
VigPA	Engage vigorous physical activity	-0.391	25.61	<.0001	-0.10
HHden	Neighborhood household density	-0.020	13.24	0.000	-0.19
LogFbusD	Log of stop density for frequent bus services	-0.068	5.24	0.022	-0.06
LbusAcc	Local bus accessibility	5.685	2.84	0.092	0.05
Rail	Neighborhood has at least one rail station	-0.453	14.09	0.000	-0.10
RailxDen	Interaction term = Rail x HHden	0.019	12.01	0.001	0.17

Likelihood Ratio: Chi-Sq.=407.68; Pr > ChiSq <.0001

Estimation based on N = 5245

c statistic = 0.686

An individual is less likely to be obese if he/she is...

- Younger, elderly, NH White, high education,

- living in a wealthier/safer neighborhood, eating less fast food, engaging in vigorous physical activity,

- living in higher density, with frequent bus services, near a rail station.

Model Result – Residential Density

Residents are less likely to be obese:

- Lower-density residents:
  if rail stations near neighborhoods.

- Higher-density neighborhoods:
  if better access to both rail and bus

Analysis & Discussion

- Significant association between neighborhood land use and obesity.

- Higher residential density, job density, near rail and good bus services are less likely to be obese.

Analysis & Discussion (2)

- TOD type of neighborhoods encourage more use of active transportation modes.

- Active transportation gives people an opportunity to engage in a moderate-level of exercise, thus reduce their weight.

Conclusion

- Contributes an approach to analyze health impact of an land use-transportation plan.
- Future analysis
  - Children obesity
  - Change in demographic pattern:
    - Aging, Millennium, Assimilation

Thank you
Question?

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