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.
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.
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.
- 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.
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
Los Angeles County Health Survey
- 7,200 adults aged $>$ 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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Estimate</th>
<th>Wald Chi-Sq.</th>
<th>Pr &gt; ChiSq</th>
<th>Standardized Estimate</th>
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<tbody>
<tr>
<td>Intercept</td>
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<td>-1.215</td>
<td>8.24</td>
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<td>AGE3049</td>
<td>Age 30-49</td>
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<td>AGE5064</td>
<td>Age 50-64</td>
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<td>37.82</td>
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<td>AGE6599</td>
<td>Age 65 or older</td>
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<td>Hispanic</td>
<td>Hispanic</td>
<td>0.192</td>
<td>4.52</td>
<td>0.034</td>
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<td>AfrAm</td>
<td>Non-Hispanic African American</td>
<td>0.453</td>
<td>13.95</td>
<td>0.000</td>
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<td>Asian</td>
<td>Non-Hispanic Asian</td>
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<td>HighEdu</td>
<td>4-yr college graduate or higher degree</td>
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<td>-0.16</td>
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<tr>
<td>INC10K</td>
<td>Neighborhood average household income</td>
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<tr>
<td>Safety</td>
<td>Feel neighborhood is safe from crime</td>
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<td>12.76</td>
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<td>Fastfood</td>
<td>Eat fast food at least once per week</td>
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<td>VigPA</td>
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<td>HHden</td>
<td>Neighborhood household density</td>
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<td>LogFbusD</td>
<td>Log of stop density for frequent bus services</td>
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<td>LbusAcc</td>
<td>Local bus accessibility</td>
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<td>Rail</td>
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<td>RailxDen</td>
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</table>

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.
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.
- 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 a land-use transportation plan.

Future analysis
- Children obesity
- Change in demographic pattern:
  - Aging,
  - Millennium,
  - Assimilation
Thank you

Question?

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