20-Minute Neighborhood Walkability Analysis for the Eugene-Springfield Metropolitan Area

Regional Transportation Options

Presentation Outline

• How did we get here? & Why this analysis?
• What has been done?
• What could be improved?
• How can it be used? & What more might be gained?

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Prepared by Lane Council of Governments
David Richey, GIS Analyst
Portland Plan

20-Minute Neighborhood Walkability Analysis

Previous studies
20-Minute Neighborhood Walkability Analysis

Eugene Climate & Energy Action Plan
Envision Eugene

Previous studies
20-Minute Neighborhood Walkability Analysis

Previous studies

Why this analysis?

Increasing active transportation is a promising approach to counteract issues at the forefront of both public health and transportation:

- the obesity and inactivity epidemics,
- growing [automotive] congestion,
- and air and noise pollution.

National Trends in Childhood Obesity and Ride Share 1960 and 2000

- National % Drive to School
- National % Walk/Bike to School
- National % Obesity (6-11 years)
- Figures for Bethel School District in 2008-2009

- 74% Drive to Bethel Schools
- 21% Walk/Bike to Bethel Schools
- 19% Obese in Bethel Schools

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Mean Adult Body Mass Index 2009

Body mass index per block is calculated from Department of Motor Vehicles card holder renewal information for Lane County for the years 1999-2009. Data was not screened or verified save to match to current address file, and represents former as well as current residents of the area.
Walkability is the extent to which the built environment is friendly to the presence of people living, shopping, visiting, enjoying or spending time in an area.

This study is modeled on the Portland 20-Minute Neighborhood analysis; walkability is defined by indices that can be measured quantitatively. The measures include the following factors:

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<th>People</th>
<th>Density</th>
<th>Destinations</th>
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<tr>
<td>Observed Variable</td>
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<td>Goods and Services</td>
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A grid of polygonal square tiles (40,000) is laid over the urban landscape and used to collect a series of metrics regarding the qualities of that landscape in terms of the presence of people and the presence of urban services in a walking and bike context. Collection of some of these attributes uses finer-scale, 33', geometries that are aggregated to the 330' tile. The lattice structure is tilted 45° to better capture network distances.
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**Measurement Methods**

People are aggregated to the 330’ tile.

Density measures are calculated for a \( \frac{1}{4} \)-mile Euclidean area.

Destinations are calculated based on \( \frac{1}{4} \), \( \frac{1}{2} \), and 1-mile service areas. Service areas are calculated on a “flat” road network, with slopes over 20% excluded, and travel allowed in either direction along all roadways except limited access highways.

All measures are indexed to a 0-100 scale: distances are assigned a value of 99 for \( \frac{1}{4} \) mile, 66 for \( \frac{1}{2} \) mile, and 33 for 1 mile, all other measures are divided by their maximum value to produce an indexed scale.
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Estimated number of residents per 330' tile.

Population Density

Unitless Index

- 0 - 1
- 2
- 3 - 4
- 5 - 16
- 17 - 100
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Employee Density

Estimated number of employees per 330' tile. The University of Oregon is shown separately with 9310 employees to increase the relief in viewing the rest of the employment data.

9310 Employees @ UO

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Elementary School Distance

Average distance within 330' tile to elementary based on 1/4, 1/2, & 1-mile service areas weighted on an equal interval (99, 66, 33).
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Bus Stop Distance

Average distance within 330' tile to bus stop based on 1/4, 1/2, & 1 mile service areas weighted on an equal interval (99, 66, 33).
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Convenience Store Distance

Average distance within 330' tile to convenience store based on 1/4, 1/2, & 1-mile service areas weighted on an equal interval (99, 66, 33).
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Full Service Grocery Distance
Average distance within 330’ tile to full service grocery based on 1/4, 1/2, & 1-mile service areas weighted on an equal interval (99, 66, 33).
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Parks Distance

Unitless Index
- 0 - 35
- 36 - 59
- 60 - 79
- 80 - 94
- 95 - 99

Average distance within 330' tile to park based on 1/4, 1/2, & 1-mile service areas weighted on an equal interval (99, 66, 33).
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Retail Goods and Services Density

Number of retail goods or service businesses within 1/4 mile radius of each 33' cell averaged to a 330' tile.
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Intersection Density

Number of intersections within 1/4 mile radius of each 33' cell averaged to a 330' tile.

Intersection Density

Unitless Index
- 0 - 2
- 3 - 6
- 7 - 17
- 18 - 42
- 43 - 100
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Bike Facility Density

Length of bike facility (including lanes, routes, and off street paths) to length of road within 1/4 mile radius of each 33' cell averaged to a 330' tile.
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Sidewalk Density

Length of sidewalk divided by two (representing full, two-side coverage) to length of road within 1/4 mile radius of each 33' cell averaged to a 330' tile.
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Infrastructure Composite

Nine distance and infrastructure factors.
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Full Composite
Population and employment plus all nine infrastructure and distance factors.
“By overlaying and weighing the three factors, we were able to identify where areas had more or less 20-minute neighborhood characteristics.”

“The premise of this Plan is that areas lacking land use patterns that would support walking should be addressed through policy actions that would create walking demand. The City’s scarce resources for improving Pedestrian environments should be targeted to areas with supportive land uses (that is, there are potential walkers) but lacking sidewalks and crosswalks.”
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Infrastructure Opportunity

Estimated number of residents and employees (population) per 330' block. Blocks selected are the top 20% of population density and, within that, the bottom 20% of composite infrastructure score. These represent the nuclei of opportunity areas for improving the composite of active transport factors.
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Opportunity Hot Spots

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Average Opportunity Area Infrastructure Scores

Awbrey Park  Bertha Holt  Camas Ridge  Centennial  Cesar Chavez

Coburg  Douglas Gardens  Edgewood  Edison  Fairfield

Gilham  Goodpasture  Guy Lee  Howard  Irving

Malabon  McCormack  Mt. Vernon  Ridgeview  River Road

Riverbend  Willagillespie  Yolanda

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Inverted Average Opportunity area Infrastructure Scores

Awbrey Park  Bertha Holt  Camas Ridge  Centennial  Cesar Chavez
Coburg  Douglas Gardens  Edgewood  Edison  Fairfield
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September 6, 2012
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Improvements to the Model: Towards a Density, Diversity, & Design (3-D) Framework

- Contextualize parameters by performing a predictive factor analysis to identify those attributes of populations and environments that are locally relevant. This would be done using travel survey data.
- Apply Multi-Modal Level of Service (MM-LOS) ratings to street segments as a cost when calculating service areas for destinations.
- Calculating a continuous service area on the network as opposed to the ¼, ½, & 1-mile breaks.
- Applying an attractiveness (diversity, entropy) factor to business based on the business diversity context in which they occur.
- Specifying the effect on particular areas or demographic populations through area analysis and a small area population model.
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Improvements to the Model: Predictors

Predictors of walking & biking in order of significance:
1. Large block size in context to origins discourage walking/biking
2. Areas with more higher valence intersections (4-5 segment junctions) are positively bike-walk associated
3. Land-use diversity in housing and employment, and areas with high employment and largely employed populations are positively walk-bike associated.

“To a significant extent, density attributes of neighborhoods are captured in what we are calling the design and diversity factors, that is, neighborhoods with small blocks, grid street patterns, and mixed uses also tend to be fairly dense.”

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447996/
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447996/table/t2/
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447996/table/t3/
Improvements to the Model: Predictors

Exogenous factors > Built Environment Factors
(topography, darkness, and rainfall > well-connected streets, small city blocks, mixed land uses, and close proximity to retail activities)

Demographic characteristics of trip makers > Built Environment factors

Urban design exerts a greater influence on biking than walking.
Walking increases with increased land use diversity of origin.
Biking is equally influenced by density, diversity, and design.

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Improvements to the Model: Predictors (biking)

“This study found that the built environment had a significant influence on the decision to use the active mode of transport, bicycling, instead of driving. For utilitarian travel, features of the physical environment—the road network, bicycle-specific facilities, and land use—were all associated with the likelihood of cycling, even after accounting for personal characteristics and trip distance.

The following features promoted cycling:

• less topographical variation,
• traffic calming and cyclist-activated traffic lights along bicycle routes,
• higher route connectivity (intersection density),
• local roads instead of highways and arterials,
• higher population density, and
• neighborhood commercial, educational, and industrial land uses.”

Route characteristics > Origin or Destination Characteristics
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3005092/figure/Fig2/

Street Results

Streets that lacked a sidewalk were 6.8 times more likely to feel unsafe.

Streets that had turn lanes were 6 times more likely to feel unsafe.

Streets that lacked street trees were 1.8 times more likely to feel unsafe.
Walking Path Results

Streets where the walking path wasn't wheel-chair accessible were 6 times more likely to feel unsafe.

Streets where the walking path was narrow were 3 times more likely to feel unsafe.

Streets where the walking path had a bad walking surface were 2.7 times more likely to feel unsafe.

Streets where the walking path was blocked by obstacles were 1.9 times more likely to feel unsafe.
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Improvements to the Model: Route characteristics

The LOS models are ideal for evaluating the benefits of “complete streets” and “context sensitive” design options because the models quantify the interactions of the modes sharing the same street right-of-way. The models enable the analyst to test the tradeoffs of various allocations of the urban street cross section among autos, buses, bicycles, and pedestrians.
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What more might be gained?

- Investigate health-related questions and outcomes and form new connections between Planners and those in the Public Health field.
- Evaluate how public policies could be revised to support 20-minute neighborhood and similar livability goals.
- Target specific areas for intervention based on identified opportunities.
- Use as a communication tool to engage neighbors in conversations about topics such as key community assets, individual choices and behavior changes, and mobility.
- Evaluate social equity considerations and identify key avenues to improve access to AT opportunities.