Rapid Health Impact Assessment:

Clark County Bicycle and Pedestrian Master Plan

Prepared by Clark County Public Health
May, 2010

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Clark County Bicycle and Pedestrian Master Plan
Rapid HIA Summary

- Based on relationships established by research, Public Health finds that all proposed projects, programs, and policies will positively impact physical activity.

- Based on geographic concentrations of people, health outcomes, SES, and built environment characteristics, Public Health recommends that the bicycle and pedestrian master plan focus on the area south of the I-5/I-205 junction, north of Vancouver city limits, and west of 182nd Avenue/ NE Ward Road.

Recommendations

Projects
Include low-speed roadway designs as bicycle and pedestrian projects
Implement a variety of bikeway facility types
Programs
Include temporary street closures (ciclovias) in programs
Add programs that manage automobile parking
Policies
Declare measureable targets for project objectives. The plan should include: • Numeric objectives that define a desirable level of service • Which government agency is responsible for implementation and when • Benchmarks and performance measures for assessing progress
Prioritize projects and adopt policies that increase the following measures of walkability: connectivity, urban design, land use mix, and residential density. Specific proposals for consideration (not mentioned in the plan) include: • limit construction of new cul-de-sacs • connect existing cul-de-sacs • limit block size • design for imageability, enclosure, human scale, transparency, and complexity (See Ewing et al., 2006) • encourage a dense mix of land uses • encourage higher density housing
Create policies to increase bicycle and pedestrian access to nutritious food
Design for inexperienced cyclists
Include health and equity in project evaluation criteria
Recognize increased numbers of bicyclists and pedestrians as a safety strategy

Clark County Bicycle and Pedestrian Master Plan
Rapid Health Impact Assessment

Introduction

Public Health conducted this rapid Health Impact Assessment with the primary goal of offering meaningful input into the Bicycle and Pedestrian Master Plan process. This assessment estimates impacts in terms of health benefits derived from increased opportunity for physical activity. The magnitude of physical activity increase resulting from specific strategies will be explored in greater depth in a subsequent, comprehensive HIA.

This analysis has two areas of concentration. First, we describe existing conditions with particular emphasis on equity, identifying disparities in the social and built environments. Second, the proposals in the draft plan are examined and compared with research findings on the relationship between the built environment and physical activity. The proposals are divided into three categories as follows:

- Projects – Bicycle and pedestrian infrastructure improvements specifically proposed in the plan
- Programs – On-going activities such as encouragement, education, enforcement, and maintenance
- Policies – Guidance for decision making and consistent action

It should be noted that the draft plan being reviewed does not represent a comprehensive or formal draft version of the final document, but rather an exercise in project planning to determine information gaps. This is therefore an assessment of a snapshot of the planning process, and Public Health acknowledges that the plan will continue to improve. Nonetheless, based on analysis of current conditions and a review of the draft plan as it now stands, Public Health has created a set of recommendations that are presented in detail at the conclusion of this report.

Baseline Conditions

Existing conditions are described below based on Census 2000 data; all figures are based on 2000 census data unless otherwise stated. Updated data will be used for the in-depth HIA. To facilitate a rapid analysis, we used income, poverty, and percent racial/ethnic minorities to approximate neighborhood socioeconomic status (SES).

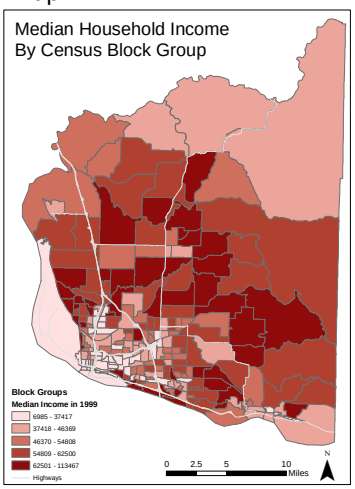
Baseline Social Determinants

Income

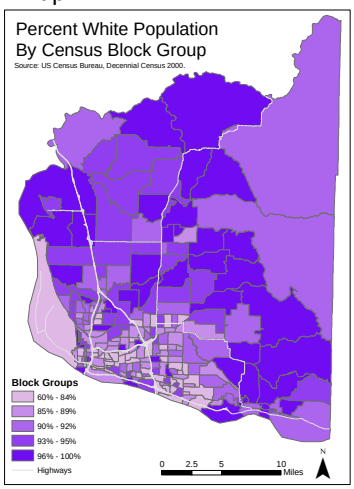
One of the strongest predicators of health outcomes is income. In Clark County, median income is highest in block groups located just outside of cities, as shown in Map 1. Not surprisingly, poverty prevalence is the opposite, with the highest rates in central block groups and outlying areas. In this respect, the county could be said to have bands of interconnected higher income block groups stretching from the northwest to southeast

and from west to east across the center of the county. As of 2000, median income among block groups varied dramatically, from $6,985 to $113,467.

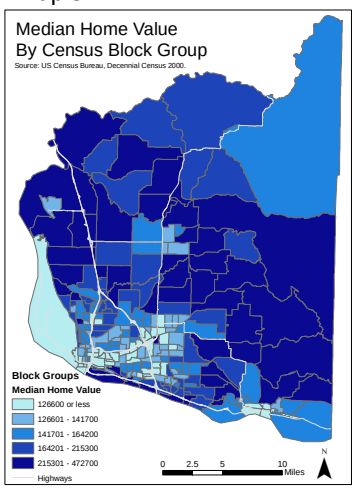
Map 1



Map 2



Map 3



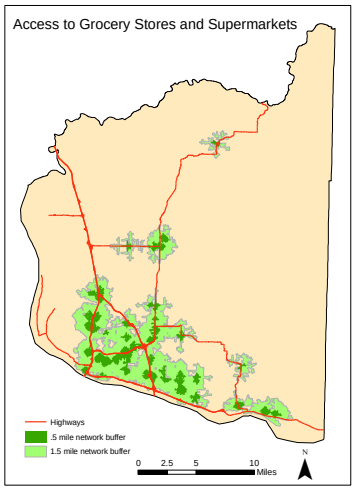
Race/Ethnicity

Map 2 shows the distribution of racial and ethnic minorities in Clark County. The county is homogenous relative to other regions, with only 11.4% of the population described as a racial or ethnic minority. Block groups with the most racially diverse populations are located just south of SR 500 between the interstates, and in the eastern area of Vancouver. Block groups range in percent nonwhite population from 0% to over 40%.

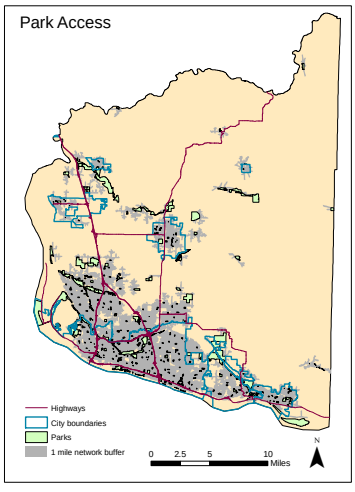
Housing Affordability

As displayed in Map 3, the least expensive housing is found along SR 500 in Vancouver, with pockets of less expensive housing in Battle Ground, Washougal, and Camas. The most expensive housing is found along the Columbia River, north of Washougal and Camas, and in outlying areas beyond city limits.

Map 4



Map 5



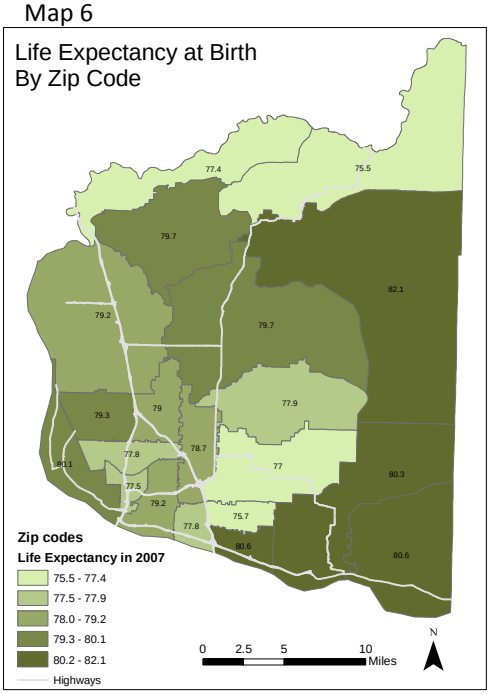
Access

Access to nutritious food requires an automobile in most of the county. The map at left shows 0.5 and 1.5-mile network buffers (walkable via the street network) around supermarkets and grocery stores. Residences within the light green areas could reasonably bicycle to purchase groceries. Similar buffers showing a half-mile walkable service area are shown in dark

green. Only about 4% of the county's land area is within walking distance of a grocery store or supermarket.

Map 5 displays 1-mile network buffers around parks, representing the walkable service area of parks. Access to parks is best within city boundaries and the area north of Vancouver. Outside of these areas, there is very little opportunity to access parks without driving.

Map 6



Baseline Health Outcomes

Data from one private insurance provider describes obesity levels by census tract in 2007. According to this data, the highest rates of obesity are concentrated around the intersection of SR 500 and I-205. Other pockets of higher rates exist in the northeastern and southeastern most census tracts in the county. Rates vary from 21% in downtown Vancouver to 39% east of Camas (Institute of Portland Metropolitan Studies, 2010). Note that these rates are for the insured population covered by a single provider and do not represent actual obesity rates.

As of 2007, life expectancy at birth ranged from 75.5 to 82.1 years within the county. Map 6 shows that life expectancy is lower in central and northern zip codes (Vital Registration System, 2007; Public Health: Seattle & King County, 2007; Washington State Department of Health, 2007). The 6.6 year disparity between zip codes reflects substantial geographic variation in health, a relationship shown to be consistent for various health outcomes.

Baseline Built Environment

Walkability

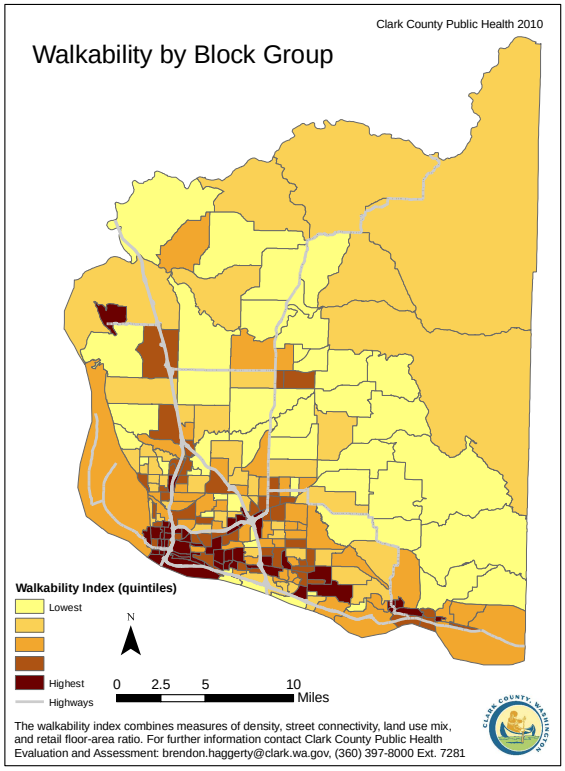
Walkability is measured as a composite of net residential density, road network connectivity, retail floor-area ratio, and land use mix. This index is well established in the literature as a predictor of physical activity (Sallis et al., 2009). Map 7 shows that the block groups with the highest walkability are in Vancouver, south of SR 500 and west of I-205.

Bikeability

For purposes of this analysis, bikeability has been measured in bikeway miles/square miles. It should be noted, however, that most of the measures of walkability are also relevant to bikeability, as walkability accounts for variables such as land use, connectivity, and density. Accordingly, this measure should be considered in the

context of the walkability. Map 8 shows differences in the bikeway miles per square mile between block groups. Table 1 provides a comparison for various geographies. The highest bikeability is found in central and north Vancouver, as well as the Camas area.

Map 7



Map 8

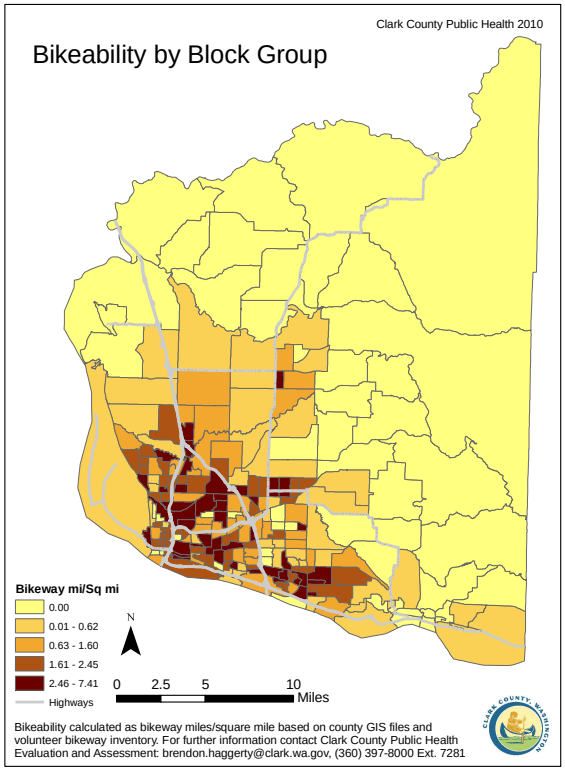


Table 1. Bikeway Network Density

	Clark County	Incorporated Areas (Clark)	Unincorporated Areas (Clark)**	Portland
Bikeway miles	196.3	106.2	90.1	318.0
Gross square miles	656.2	87.7	568.9	145.4
Bikeway miles per square mile	0.3	1.2	0.2	2.2
Average among block groups	1.4	1.6*	1.2*	4.5

* Approximate estimates due to non-coterminous geography
**Includes rural areas outside of Urban Growth Areas

As shown in table 1, Clark County has more bikeway miles in incorporated areas than in unincorporated areas. The block group average roughly adjusts for population density, since there are more block groups in areas that have denser settlement and more bikeway miles. Even in incorporated areas, the county still has less than half the network density of neighboring Portland, which has increased its bicycle mode share through increasing the extent of the bikeway network (Geller, 2010).

These measures of the built environment correlate with measures of socioeconomic status. Table 2 displays correlations between the built environment and socioeconomic

status when measured at the block group level. The data indicate that there is a significant negative correlation between walkability and socioeconomic status; as median income increases, walkability decreases. This reflects the tendency of low-income residents to locate in denser downtown areas where housing stock is older and more affordable. In contrast to walkability, the relationship between bikeability and socioeconomic status is significant, but fairly weak. As evident in the maps above, these relationships are a reflection of higher walkability within central areas and of the tendency of people with higher SES to locate in outlying areas.

Table 2. Correlations between the built environment and SES (2000 Census)

	Bikeway mi/Sq mi	Pct Non-white	Pct below poverty	Pct Unemployed	Med. Home Value	Med. HH Income
Walkability index '09	.263(**)	.254(**)	.584(**)	.295(**)	-.541(**)	-.656(**)
Bikeway mi/Sq mi '09	1	.318(**)	.154(*)	-.019	-.265(**)	-.196(**)

** Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).
N=233

Impact of Proposed Actions

Summarizing Impacts & Evidence
Strong evidence,
Likely to increase physical activity: ●

Emerging evidence,
Supportive of physical activity: ◉

For each project, program, and policy, proposed in the draft plan, Public Health reviewed relevant research. Proposals included in the draft plan are summarized in table 3. Note that these are general proposals in draft form, and that the final plan will build upon these ideas to produce a more detailed set of proposals. Proposals that are strongly supported by evidence are identified in the table with a filled circle symbol. Research shows that these proposals are likely to increase physical activity. Proposals that represent a best practice based on case studies or emerging evidence are identified with a partially filled circle. These strategies are supported by prior experience or indirectly support an increase in physical activity.[1]

Detailed project lists have not yet been developed and are pending results of inventory efforts. In light of the lack of specific projects, Public Health assessed objectives included in the plan goals, which articulate policies to accomplish the construction of infrastructure projects. These policies were assessed for their potential to increase physical activity and are referenced in the table below.

Based on relationships established by research, Public Health finds that all proposed projects, programs, and policies will positively impact physical activity. The degree of impact varies, and there are additional actions that could be taken to maximize increases in physical activity. Such actions are discussed in the recommendations section.

[1] Symbol system based on New York City Active Design Guidelines (City of New York, 2009). Impact and evidence categorization may be changed or refined in the forthcoming in-depth HIA.

Table 3. Draft Project, Program, and Policy Proposal Impacts

	Proposal	Page (Draft Plan)	Evidence of Phys. Activity Increase
	Projects		
1	Installation of wayfinding signage	4	⦿
2	Complete "recommended bikeway and walkway network"	5	●
3	Provision of secure bike parking at activity centers, business centers, schools, and major transit stops	5	●
	Programs		
4	"Publicize the availability of bicycle and pedestrian opportunities"	4	●
5	Development of a maintenance program for bicycle and pedestrian facilities	4	●
6	Mitigation during construction and maintenance activities	4	⦿
7	Bicycle and pedestrian counting program in order to measure progress	5	⦿
8	Enforcement programs	5	●
9	Safety education programs	5	●
10	Coordinate with schools on SRTS	5	●
11	Monitoring of bicycle and pedestrian crash data	5	⦿
12	Implementation of regular communication between Clark County and other jurisdictions in order to address bicycle and pedestrian issues	5	⦿
13	County-wide training program to educate engineers, planners, and public decision makers about the needs of bicyclists and pedestrians	6	⦿
	Policies		
14	Integrate bicycle and pedestrian facilities into new construction	5	●
15	Provide facilities that link to regional destinations	5	●
16	10% reduction in minimum parking requirement for adding "proportionate bicycle parking"	54	●
17	Bicycle facilities will be designed for "Type B" cyclists	54	●
18	*Bicycle facility selection criteria: Speed-volume chart	56	●
19	*Pedestrian facility selection criteria: Multiple benefit, Safety, Accessibility, Connectivity, Walkability	57	●
20	Design guidelines for bicycle parking	45	⦿
21	Design guidelines for bicycle facilities	62	⦿
22	Design guidelines for safety	67	⦿
23	Design guidelines for maintenance and street closures	75	⦿

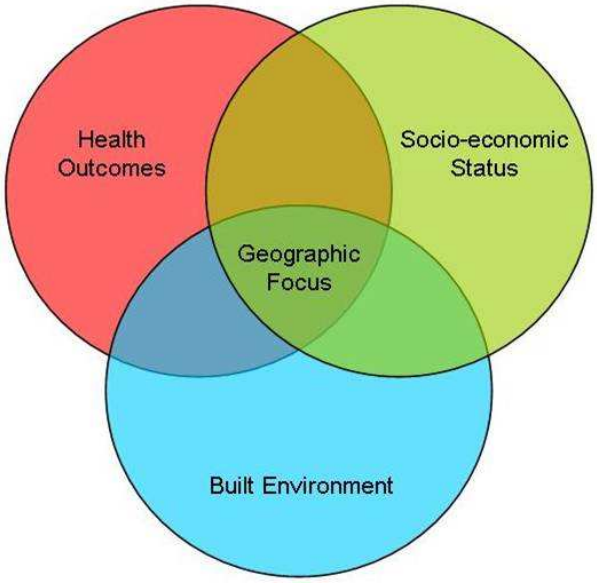
*Revisions to bicycle and pedestrian project evaluation criteria are currently underway. Public Health has submitted separate recommendations on these criteria (see appendix).

Recommendations

Recommended Geographic Focus

Public Health recommends focusing the plan impact on moderate-to-high density geographic areas that:

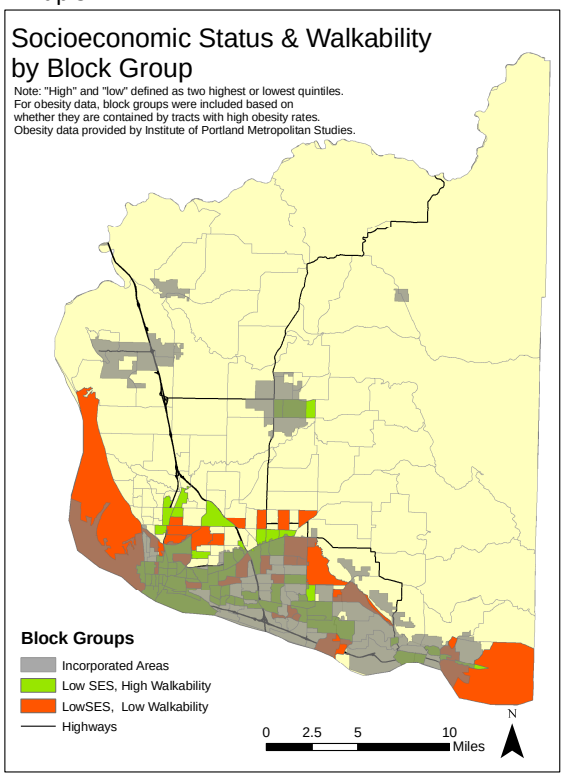
- Are disadvantaged in terms of social determinants of health
- Have unfavorably distributed health outcomes
- Have measures of the built environment that constitute a high need or a high potential for enabling physical activity



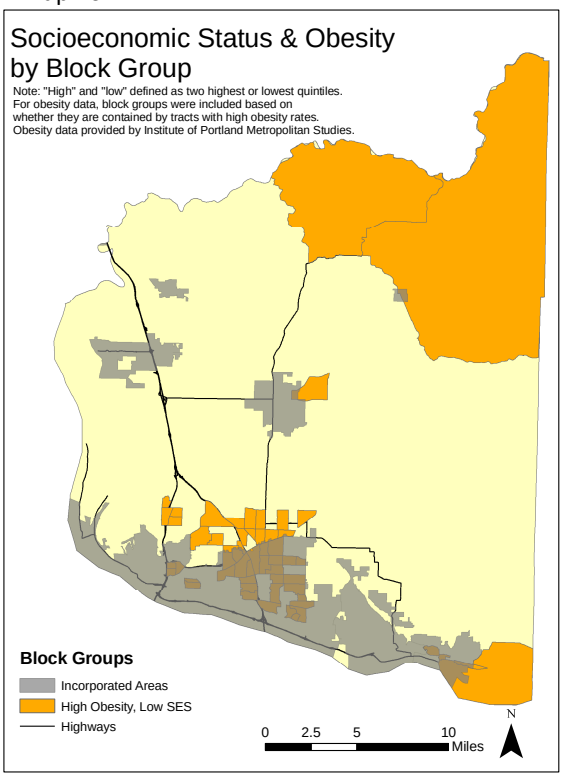
The graphic at left illustrates the conceptual basis for determining a geographic focus. Geographic areas of concern in terms of these three domains have the potential to yield the greatest health benefits from increased physical activity.

For the purposes of this rapid HIA, quintiles are used to determine areas of high need (highest two or lowest two, depending on the variable measured). Additionally, as the scope of the plan includes only unincorporated areas, the recommended geographic focus is limited to areas outside incorporated cities. Despite the limitations of scope, consistent and coordinated bicycle and pedestrian improvements should be implemented throughout the county, as many areas within incorporated areas offer opportunities to increase physical activity through biking and walking.

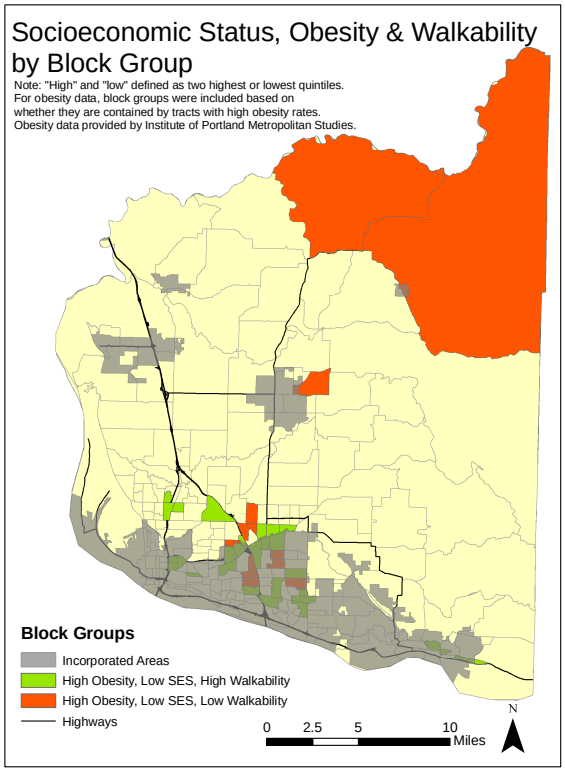
Map 9



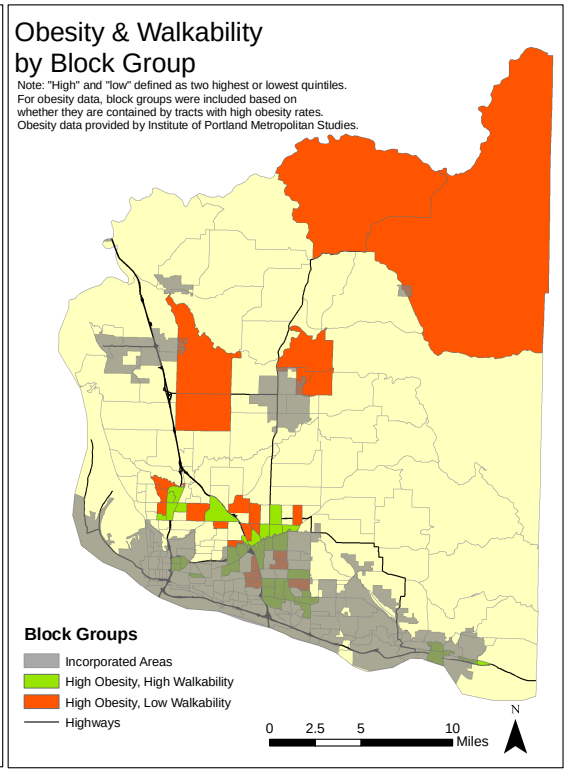
Map 10



Map 11



Map 12



The map set above (maps 9-12) identifies block groups that have low SES, high obesity, and high walkability potential or needs. Red and green areas represent the lowest and highest two quartiles in walkability, respectively.

Green areas have high walkability potential and are ideal candidates for:

- infrastructure improvements (sidewalks & bikeways)
- streetscape improvements (traffic calming, road diets, corridor improvements)
- encouragement programs and individualized marketing

Red areas have high walkability needs and are ideal candidates for:

- infrastructure improvements (sidewalks & bikeways)
- land use changes (more mixed-use, denser development)
- connectivity improvements (fewer cul-de-sacs, more connections)
- improved urban design for walkability (designing at human scale)

Additionally, orange-shaded areas on map 10 identify areas that have low SES and high obesity rates. Based on these measures, the areas surrounding I-205, especially where it meets SR 500, are areas that could benefit from higher priority for bicycle and pedestrian improvements. These areas offer the greatest opportunity to maximize health benefits from physical activity. Areas with higher density are more likely to achieve greater health benefits not only because of greater numbers of people affected, but also because of the higher likelihood of physical activity being facilitated by supporting transit service, mixed use development, and walkable neighborhoods.

Based on geographic concentrations of people, health outcomes, SES, and built environment characteristics, Public Health recommends focusing on the area south of the I-5/I-205 junction, north of Vancouver city limits, and west of 182nd Avenue.

Recommended Additional Actions

The recommendations listed below are based on research and literature on best practices. A summary of evidence can be found in the appendix.

Table 4. Recommended Additional Actions

	Recommendation	Evidence of Phys. Activity Increase
	Projects	
1	Include low-speed roadway designs as bicycle and pedestrian projects	●
2	Implement a variety of bikeway facility types	●
	Programs	
3	Include temporary street closures (ciclovias) in programs	◉
4	Add programs that manage automobile parking	●
	Policies	
5	Declare measureable targets for project objectives. The plan should include: • Numeric objectives that define a desirable level of service • Which government agency is responsible for implementation and when • Benchmarks and performance measures for assessing progress	◉
6	Prioritize projects and adopt policies that increase the following measures of walkability: connectivity, urban design, land use mix, and residential density. Specific proposals for consideration (not mentioned in the plan) include: • limit construction of new cul-de-sacs • connect existing cul-de-sacs • limit block size • design for imageability, enclosure, human scale, transparency, and complexity (See Ewing et al., 2006) • encourage a dense mix of land uses • encourage higher density housing	●
7	Create policies to increase bicycle and pedestrian access to nutritious food	◉
8	Design for inexperienced cyclists	●
9	Include health and equity in project evaluation criteria	●
10	Recognize increased numbers of bicyclists and pedestrians as a safety strategy	●

Acknowledgements

This Rapid HIA is part of Planning Active Walkable Neighborhoods (PAWN), a project of Clark County Public Health. Funding for PAWN is provided by Active Living Research, a program of the Robert Wood Johnson Foundation. The project team includes Alan Melnick, Jonnie Hyde, Laurie Lebowsky, and Brendon Haggerty.

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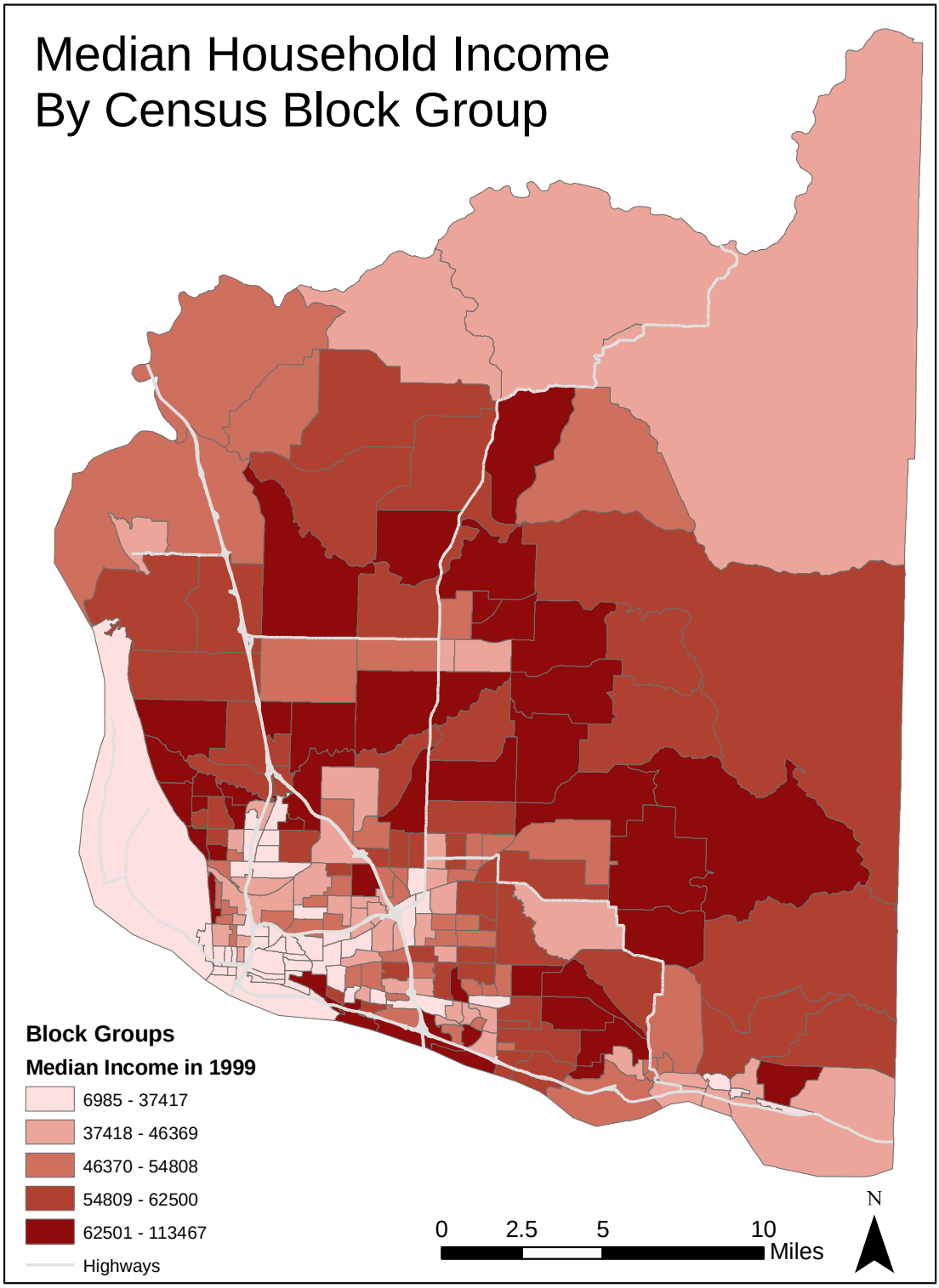
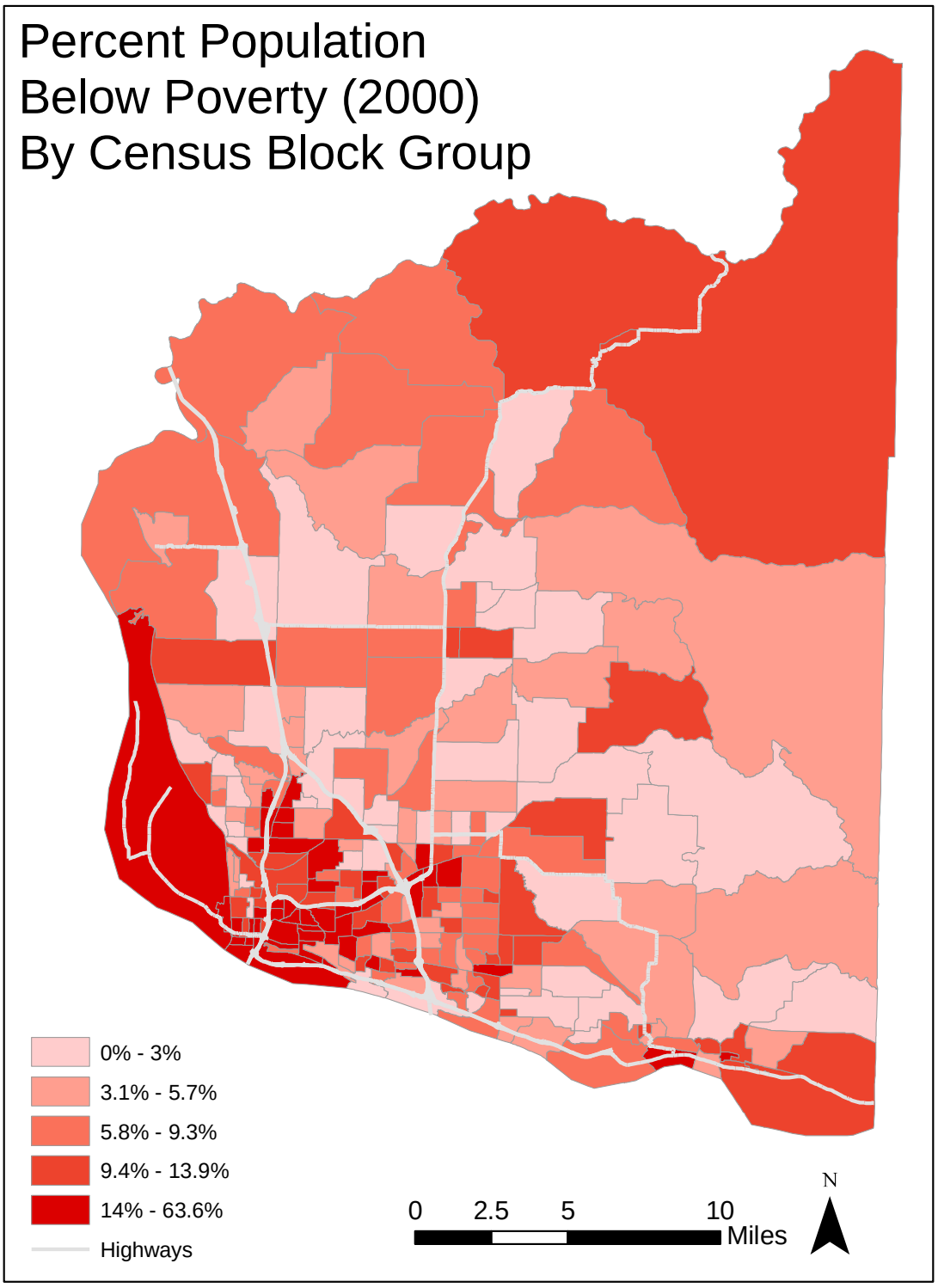
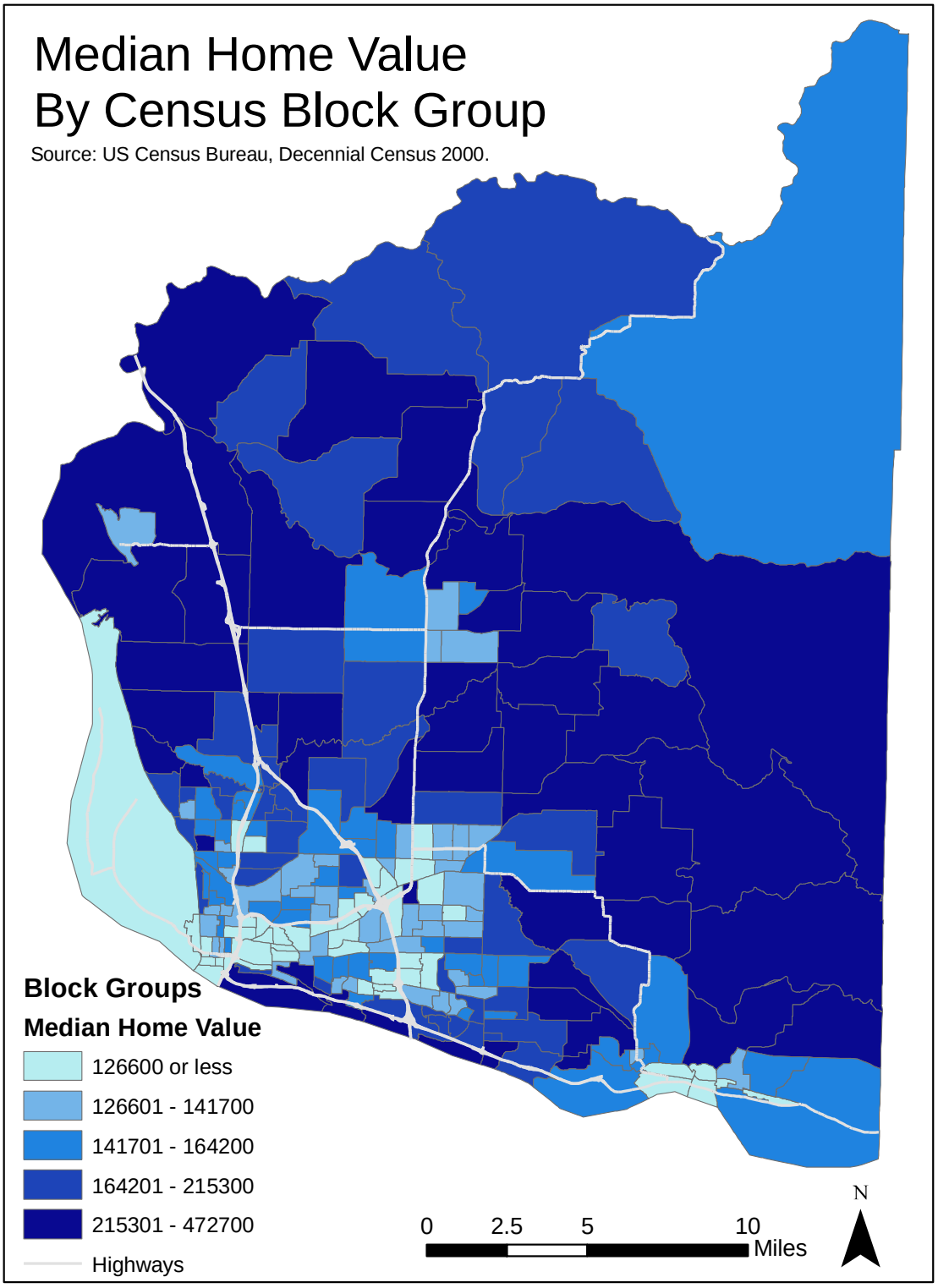
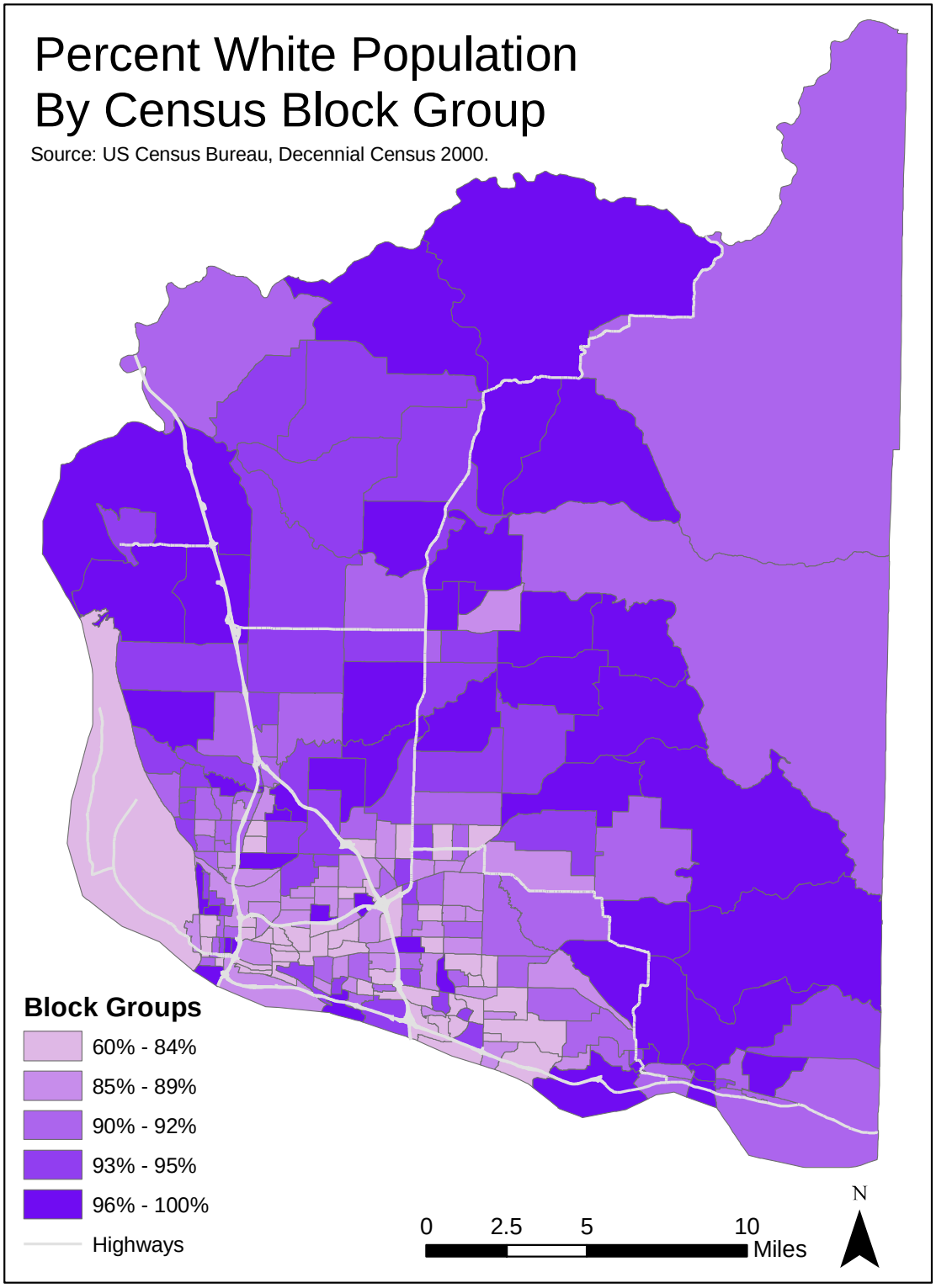
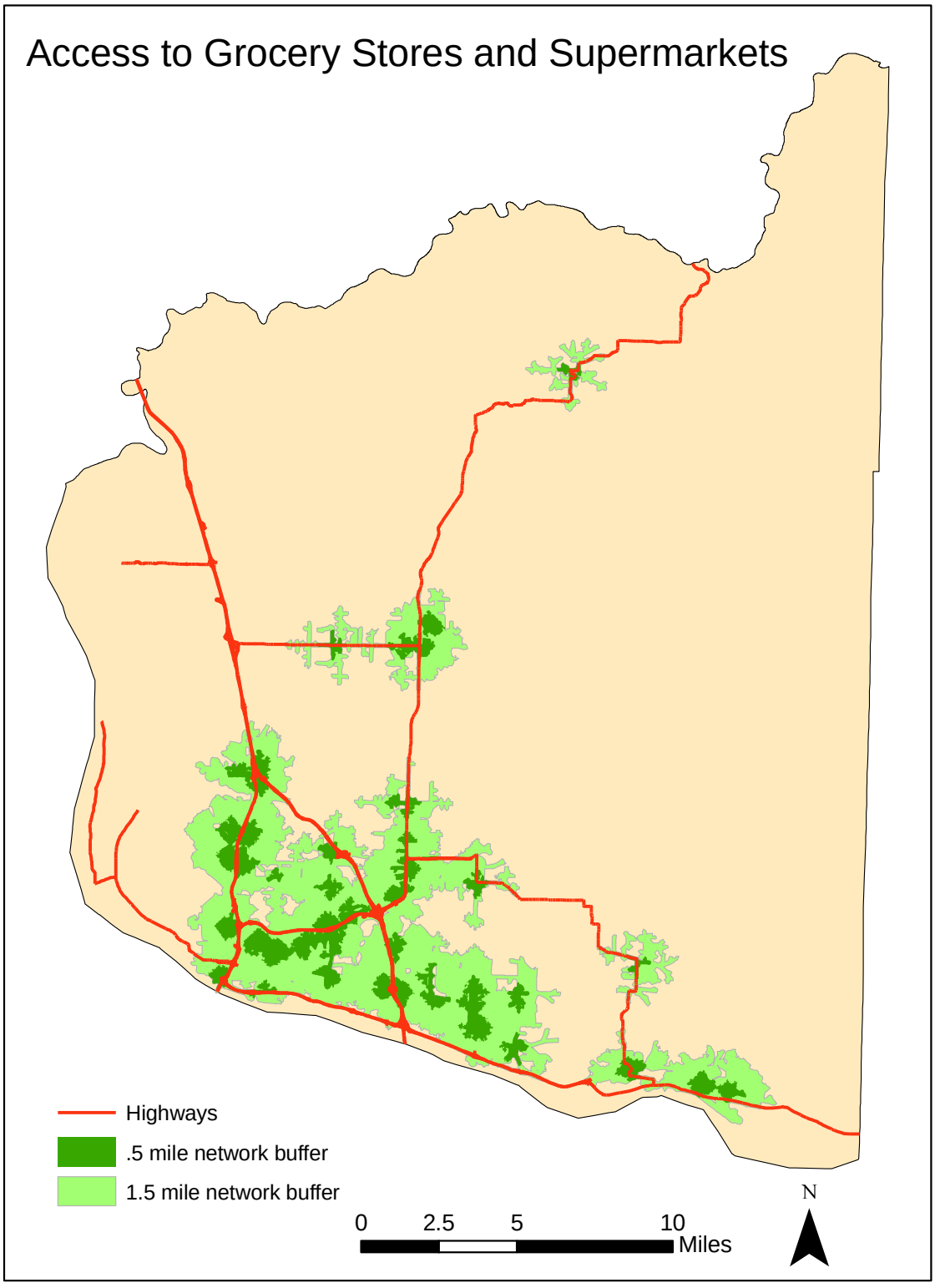
Appendix A: Maps of Existing Conditions

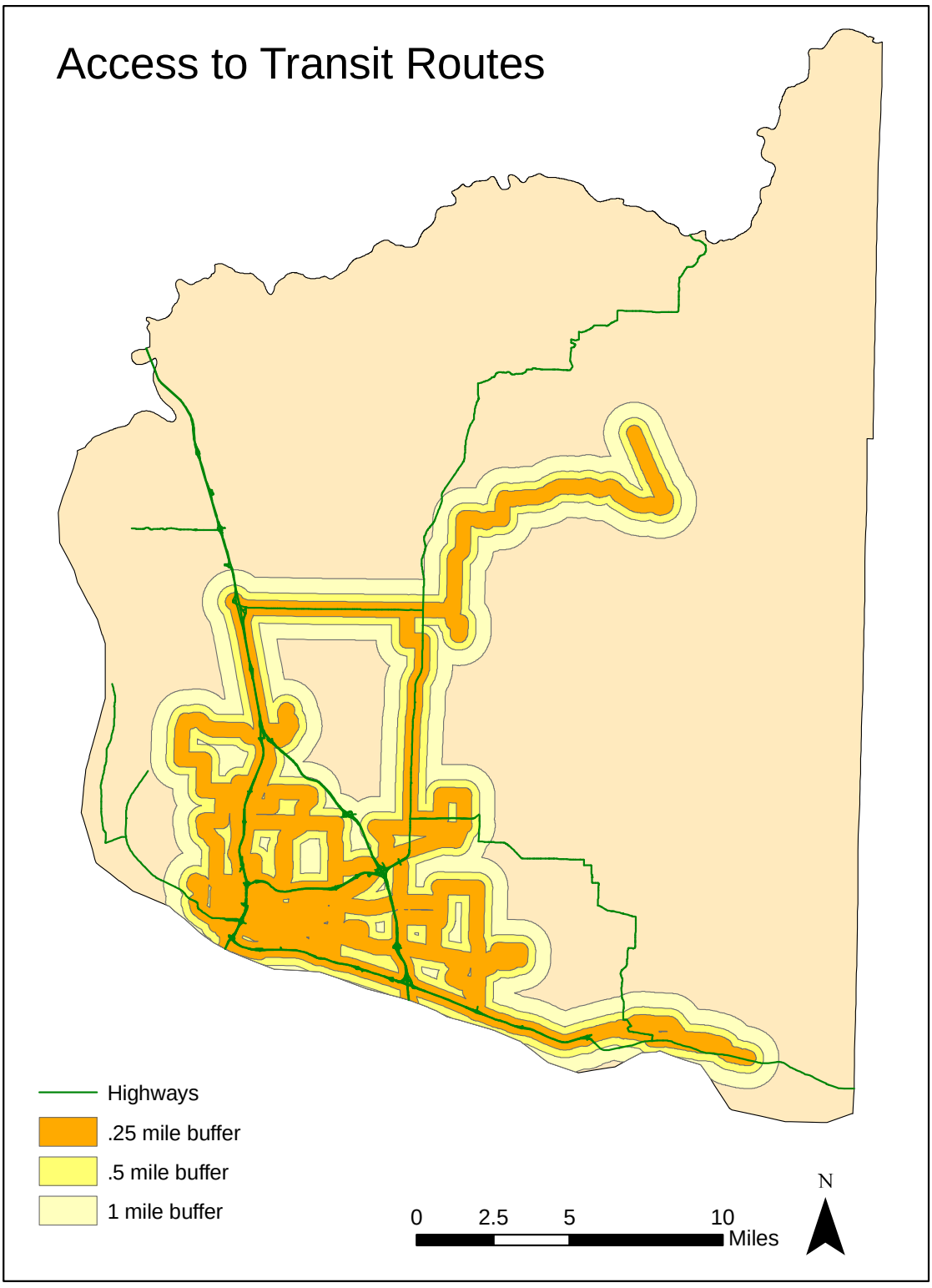


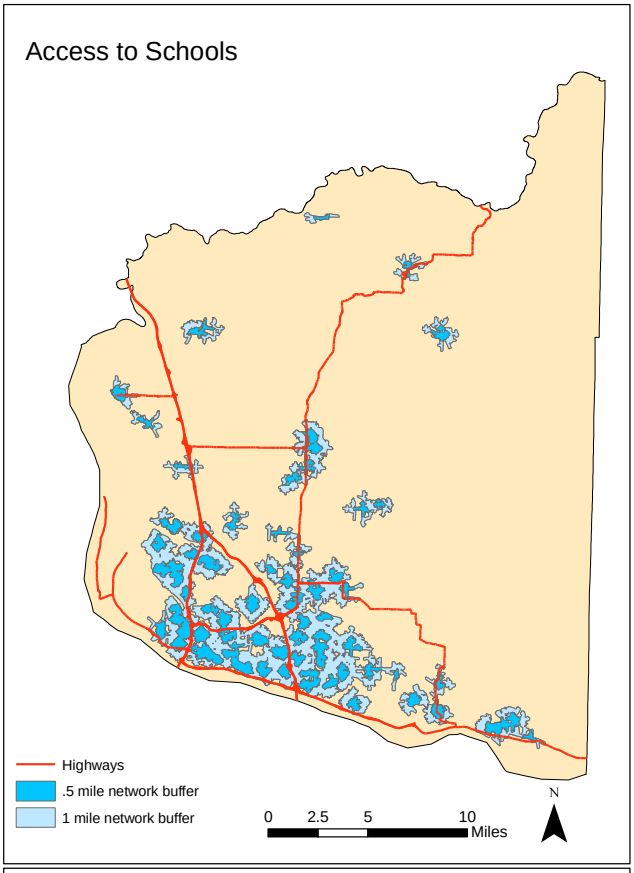

Percent Population
Below Poverty (2000)
By Census Block Group
0% - 3%
3.1% - 5.7%
5.8% - 9.3%
9.4% - 13.9%
14% - 63.6%
Highways
0
2.5
5
10
Miles
N

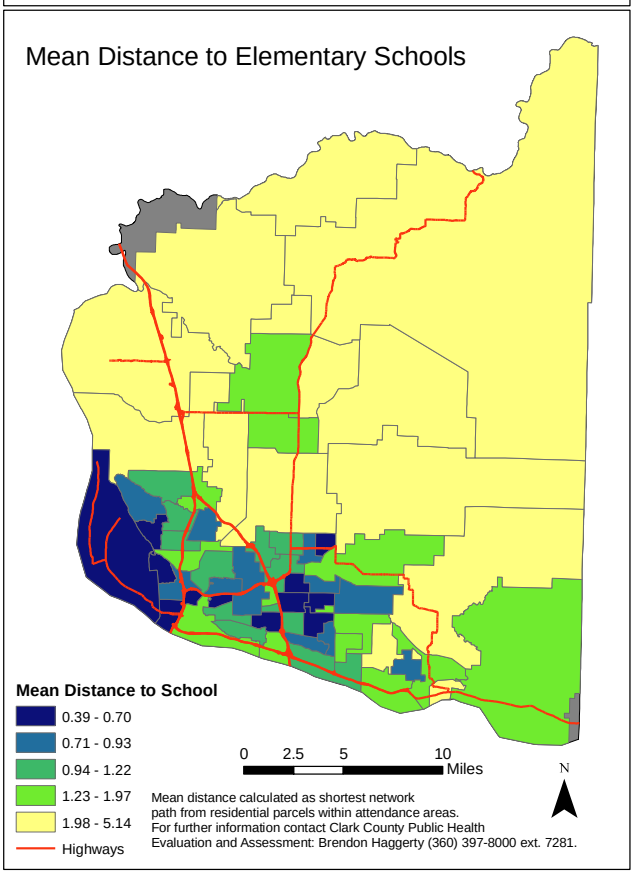

Median Home Value
By Census Block Group
Source: US Census Bureau, Decennial Census 2000.
Block Groups
Median Home Value
126600 or less
126601 - 141700
141701 - 164200
164201 - 215300
215301 - 472700
Highways
0
2.5
5
10
Miles
N

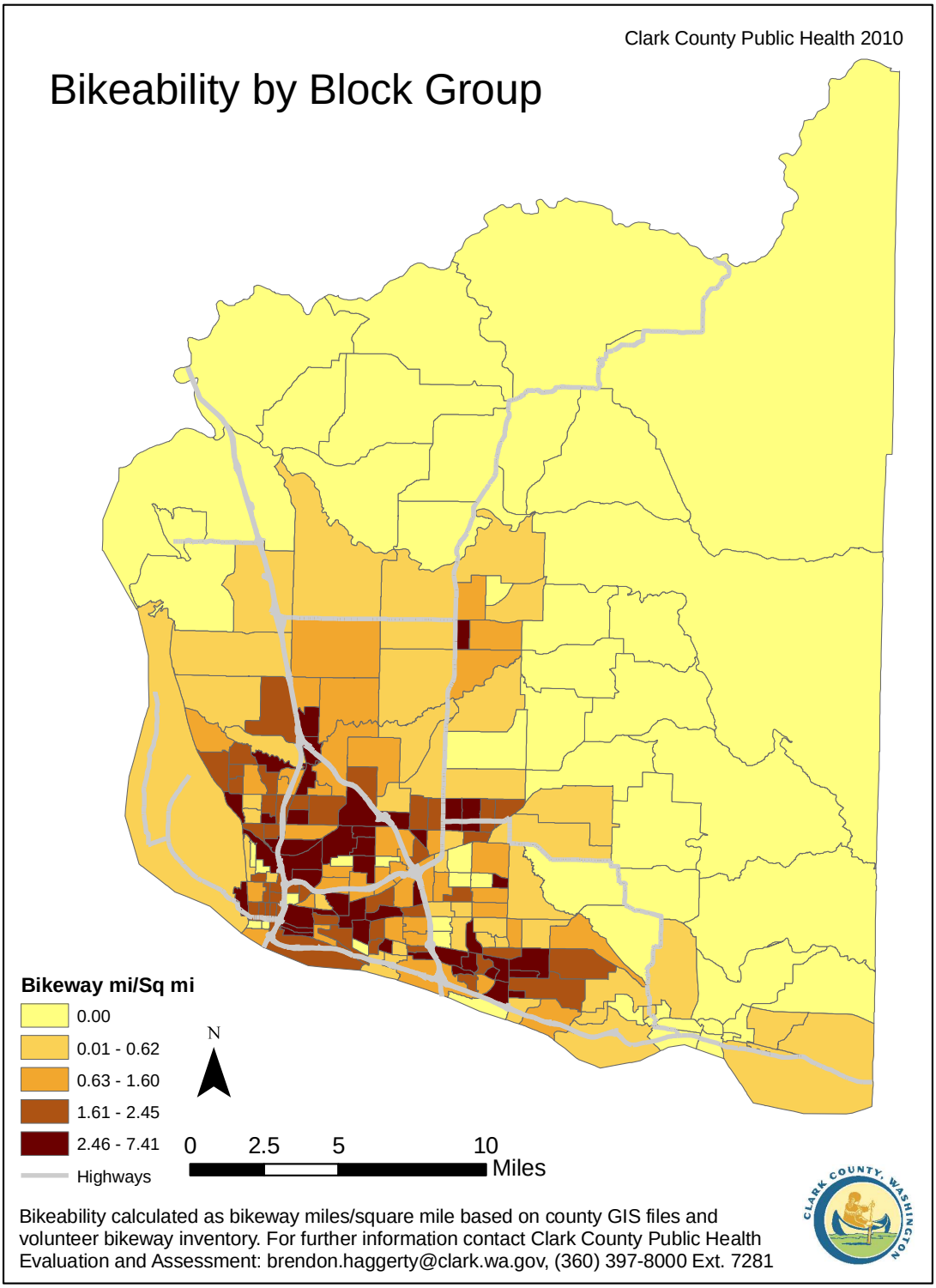

Percent White Population
By Census Block Group
Source: US Census Bureau, Decennial Census 2000.
Block Groups
60% - 84%
85% - 89%
90% - 92%
93% - 95%
96% - 100%
Highways
0
2.5
5
10
Miles
N

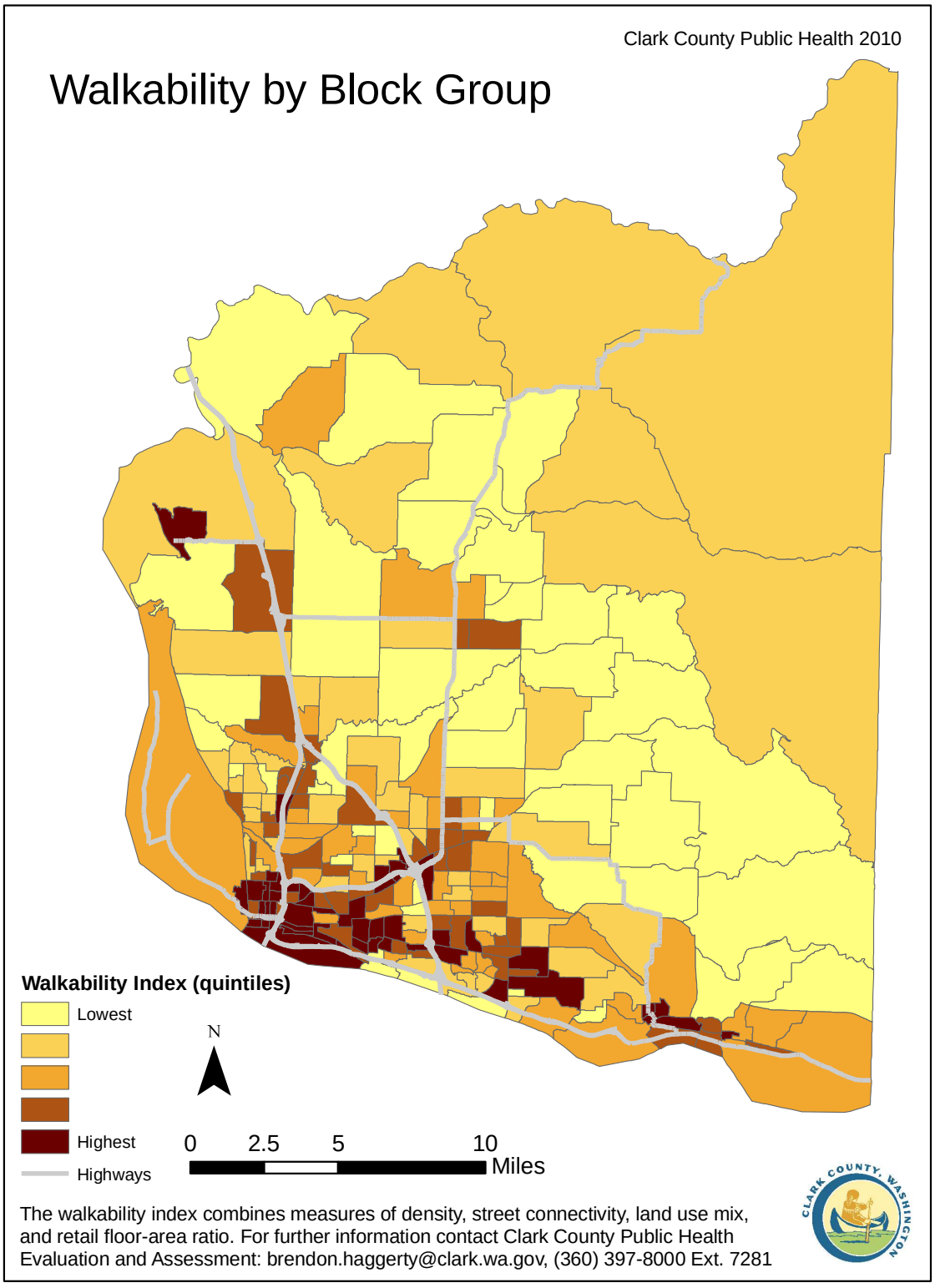

Access to Grocery Stores and Supermarkets
Highways
.5 mile network buffer
1.5 mile network buffer
0
2.5
5
10
Miles
N

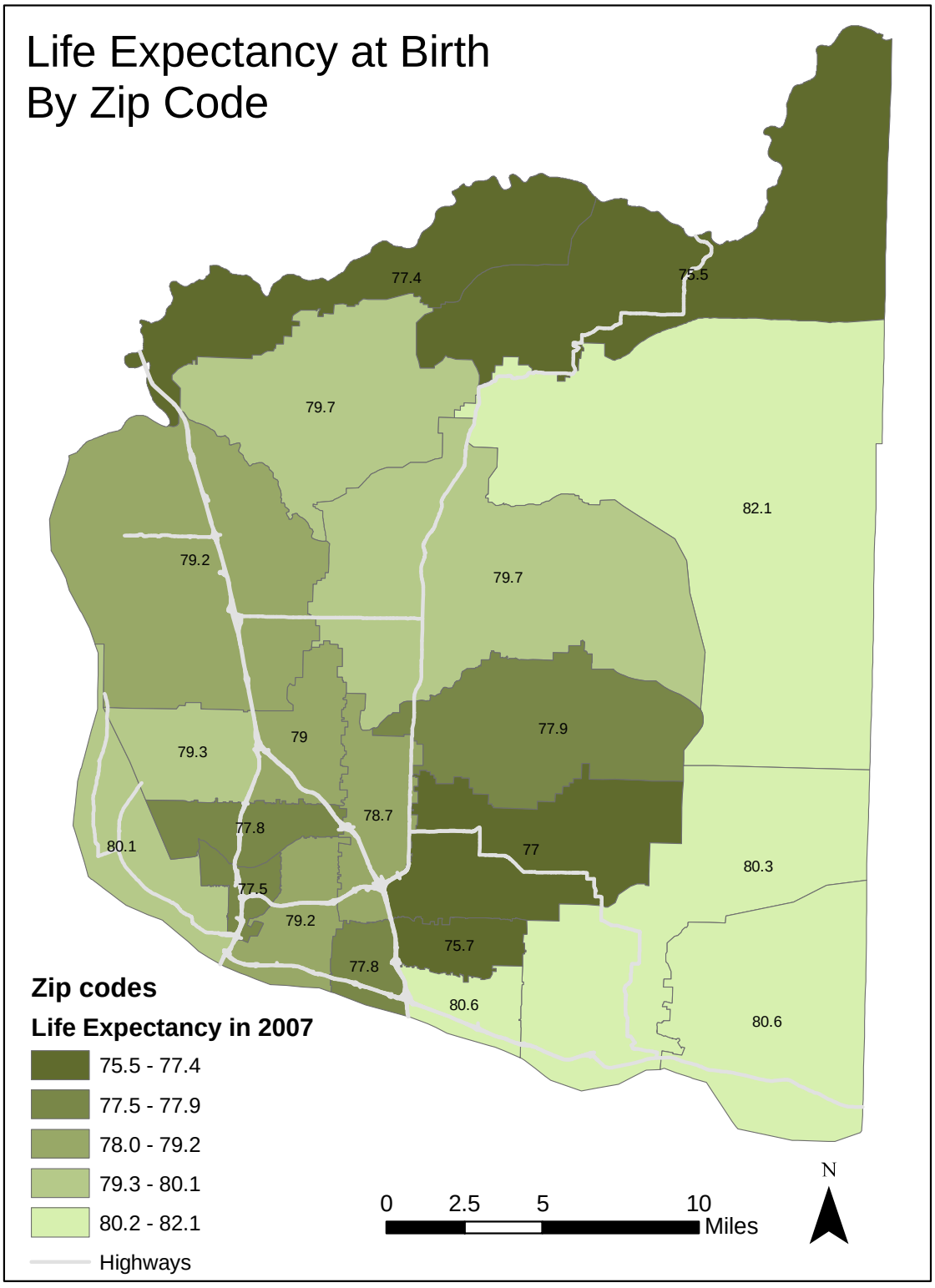

Access to Transit Routes
Highways
.25 mile buffer
.5 mile buffer
1 mile buffer
0
2.5
5
10
Miles
N


Access to Schools
Highways
.5 mile network buffer
1 mile network buffer
0 2.5 5 10
Miles
N


Mean Distance to Elementary Schools
Mean Distance to School
0.39 - 0.70
0.71 - 0.93
0.94 - 1.22
1.23 - 1.97
1.98 - 5.14
Highways
0 2.5 5 10
Miles
N
Mean distance calculated as shortest network
path from residential parcels within attendance areas.
For further information contact Clark County Public Health
Evaluation and Assessment: Brendon Haggerty (360) 397-8000 ext. 7281.


Clark County Public Health 2010
Bikeability by Block Group
Bikeway mi/Sq mi
0.00
0.01 - 0.62
0.63 - 1.60
1.61 - 2.45
2.46 - 7.41
Highways
N
0
2.5
5
10
Miles
Bikeability calculated as bikeway miles/square mile based on county GIS files and volunteer bikeway inventory. For further information contact Clark County Public Health Evaluation and Assessment: brendon.haggerty@clark.wa.gov, (360) 397-8000 Ext. 7281
CLARK COUNTY, WASHINGTON


Clark County Public Health 2010
Walkability by Block Group
Walkability Index (quintiles)
Lowest
Highest
Highways
N
0
2.5
5
10
Miles
The walkability index combines measures of density, street connectivity, land use mix, and retail floor-area ratio. For further information contact Clark County Public Health Evaluation and Assessment: brendon.haggerty@clark.wa.gov, (360) 397-8000 Ext. 7281


Life Expectancy at Birth
By Zip Code
77.4
75.5
79.7
82.1
79.2
79.7
77.9
79
79.3
78.7
77.8
80.1
77
80.3
77.5
79.2
75.7
77.8
80.6
80.6
Zip codes
Life Expectancy in 2007
75.5 - 77.4
77.5 - 77.9
78.0 - 79.2
79.3 - 80.1
80.2 - 82.1
Highways
0
2.5
5
10
Miles
N

Appendix B: Evidence of Impacts

Projects

1. Wayfinding

Impact: Supportive of increase in physical activity

Evidence: Depending on the quality and availability, there is a hypothesized increase in use of alternative modes associated with wayfinding signage. Importantly, best practices include accompanying wayfinding with encouragement and marketing efforts (VPTI, 2010). Whereas there are no studies measuring cycling increases as a result of wayfinding, the practice is growing (Pucher, Dill, and Handy, 2010).

2. Completed network

Impact: Likely to increase physical activity

Evidence: Many studies have shown the importance of infrastructure in increasing walking and cycling mode shares. Cross-sectional studies consistently show a positive correlation between bike facilities and cycling (Pucher, Dill, and Handy, 2010). Among these, Dill and Carr (2003) found each additional bikeway mile per square mile is associated with a roughly one percent increase in bicycle mode share. Recent studies have found that walkability is a highly significant predictor of physical activity independent of self-selection and socioeconomic status (Sallis et al, 2009). A review of studies on the built environment correlates of walking found that sidewalks and connectivity are commonly found to be significant correlates (Saelens & Handy, 2008).

3. Bike parking

Impact: Likely to increase physical activity

Evidence: Research supports the provision of end-of-trip facilities in general. In a 2008 review of best practices, Pucher and Buehler found that cities with high mode shares provide state-of-the-art bike parking. In a review of literature on bicycle parking effects, Pucher, Dill, and Handy (2010) point out that research shows a strong impact of bike parking. They cite Hunt and Abraham (2007), who estimated the availability of bicycle parking to be valued at the equivalent of 27 minutes of travel time. Pucher, Dill, and Handy also note that "it is not clear to what extent providing parking facilities follows increased bicycling levels instead of preceding and encouraging more bicycling. The causation is almost certainly in both directions."

Programs

4. Publicity

Impact: Likely to increase physical activity

Evidence: Marketing programs have been successful in promoting behavior change. Such programs can increase the use of alternative (active) modes by 10-25% (Victoria Transportation Policy Institute [VTPI], 2010). Impacts from marketing can be expected to decline over time, and must be implemented *after* infrastructure improvements to achieve maximum benefit (VTPI, 2010). Evaluations of trip reduction efforts in Portland show increases in bicycle mode share (City of Portland Office of Transportation, 2005).

5. Maintenance program

Impact: Likely to increase physical activity

Evidence: Recent research shows that maintenance levels are lower in low-income minority neighborhoods (Zhu and Lee, 2008). Sallis, et al. found that physical activity was lower in low-income walkable neighborhoods than in high-income walkable neighborhoods (2009). The authors suggest that other needs, such as maintenance and safety from crime, are prerequisites for physical activity.

6. Construction mitigation

Impact: Supportive of increased physical activity

Evidence: Best practices in work zone mitigation measures are recommended in various existing guidelines, including the MUTCD, Seattle DOT Traffic Control Manual, and the FHWA module on Bicycle and Pedestrian Accommodation in Work Zones (FHWA, 2006).

7. Traffic Counts

Impact: Supportive of increased physical activity

Evidence: As articulated by the National Bicycle and Pedestrian Documentation Project, bicycle and pedestrian counts are critical to determining current growth rates and future demand. Early results show that there are significant regional differences that will require specifying local demand models (Jones, 2009).

8. Enforcement

Impact: Likely to increase physical activity

Evidence: In a study of European successes in increasing the safety cycling and walking, Pucher (2003) found that a contributing factor was the heightened enforcement of traffic laws by police. In addition to traffic codes that favor and prioritize vulnerable road users, police are stricter in citing users of all modes for violations. Lower speeds are safer for cyclists and pedestrians: at 20 mph, there is a five percent chance of dying if hit by a motor vehicle. This chance increases to 45% at 30mph, and 85% at 40mph (United Kingdom Department of Environment and Transportation, 1997). However, research comparing enforcement to engineering (traffic calming), report that enforcement effects tend to be temporary, whereas effects of traffic calming are greater and more permanent (Transportation for America, 2009).

9. Safety Education

Impact: Likely to increase physical activity, strong evidence
Evidence: Safety education is most effective among children. Evidence suggests that promoting helmet use is effective, and that lowering the cost of helmets increases use. Training programs improve pedestrian skills such as timing and choosing safe crossings (Killoran et al., 2006).

10. Safe Routes to Schools

Impact: Likely to increase physical activity
Evidence: There is strong evidence that SRTS programs and infrastructure improvements near schools increase physical activity among students. At schools with SRTS programs, parents report higher rates of active transportation to school in a wide variety of social and built environments (Boarnet, 2005). Additionally, research suggests that there are also benefits to adults in the larger community (Watson and Dannenberg, 2008).

11. Monitor crash data

Impact: Supportive of increased physical activity
Evidence: Similar to monitoring bicycle and pedestrian traffic counts, this basic data input enables better planning for future bicycle and pedestrian improvements.

12. Inter-jurisdictional communication

Impact: Supportive of increased physical activity
Evidence: Best practice

13. County-wide training program

Impact: Supportive of increased physical activity
Evidence: Best practice

Policies

14. Integrate Bike/Ped facilities into all new construction

Impact: Likely to increase physical activity
Evidence: See proposal #2.

15. Link regional destinations

Impact: Likely to increase physical activity
Evidence: See proposal #2.

16. Reduced parking requirements

Impact: Likely to increase physical activity

Evidence: Managing automobile parking reduces SOV mode share and increases use of alternative modes (Litman, 2008). Litman recognizes the findings of several studies that support managing parking to achieve an 85% occupancy rate, stating that an excessive supply of parking reinforces automobile dependency. Shoup (1997) documented the success of one parking cash-out program that let to a 39% increase in the number of employees bicycling and walking to work.

17. Design for type "B" cyclists

Impact: Likely to increase physical activity

Evidence: Type "B" cyclists are described in the 1999 AASHTO guide as cyclists who are, "comfortable riding on neighborhood streets and shared-use paths and prefer designated facilities such as bike lanes or wide shoulder lanes on busier streets." The same set of standards identifies type "C" cyclists as children requiring multi-use paths or low-traffic neighborhood streets. The importance of accomodating facilities has been supported by a recent study in Portland. Dill (2009) found that 24% of utilitarian bicycle trips occurred on bicycle boulevards or off-street paths, despite the fact that these facilities constitute less than 3% of the network. The same study found that cycling on streets with low traffic volumes was the second most important of 7 route choice factors, surpassed only by minimizing total distance. Of the cyclists studied, 59% achieved the recommended 150 minutes of physical activity through utilitarian travel.

18., 19. Selection criteria

Impact: Likely to increase physical activity

Evidence: **Whereas the criteria proposed in the draft plan are mostly aligned with literature findings, current revisions are underway to tailor criteria to Clark County needs and priorities. In light of these developments, Public Health has made recommendations on evaluation criteria (see appendix).*

20. Design guidelines for bicycle parking

Impact: Supportive of increased physical activity

Evidence: See proposal #3.

21. Design guidelines for bicycle facilities

Impact: Supportive of increased physical activity

Evidence: The quality and perceived safety of bikeways is of critical importance to helping adults achieve weekly recommended levels of physical activity through transportation. One research study concluded that "a network of different types of infrastructure appears necessary to attract new people to bicycling. Simply adding bike lanes to all new major roads is unlikely to achieve high rates of bicycling." (Dill, 2009). Dill also found that cyclists go out of their way to use certain facility types and features more than others (Dill, 2010).

22. Design guidelines for safety

Impact: Supportive of increased physical activity

Evidence: Research and experience suggest that by designing for perceived safety concerns and cyclist preference, real threats to safety can be mitigated while making cycling more appealing (Dill, 2009). The experience of Portland and many European cities has shown that crash rates decrease as the number of pedestrians and cyclists increase (Jacobsen, 2003). This is known as the "safety in numbers" concept.

23. Design guidelines for maintenance and street closures

Impact: Supportive of increased physical activity

Evidence: See proposal # 6.

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Appendix C: Evidence on Recommended Actions

Projects

1. Include low-speed roadway designs as bicycle and pedestrian projects
Impact: Likely to increase physical activity
Evidence: Research shows that low-speed traffic designs are especially attractive to utilitarian cyclists. In a survey of Portland cyclists, Dill & Voros (2007) found that people who agreed that their neighborhood had destinations connected by quiet streets were more likely to use bicycles for transportation. Pucher & Dijkstra (2003) identify perceived safety and traffic speeds as the foremost barriers to bicycling and walking, a finding supported by Dill's survey. Pucher and Dijkstra also point to European examples of successful traffic calming and the associated reduction in crash injuries. The 2009 report *Dangerous by Design* points out that slower traffic speeds decrease crashes for all users, and that engineering measures create more permanent effects than enforcement (Transportation for America, 2009).

2. Implement a variety of bikeway facility types
Impact: Likely to increase physical activity
Evidence: Based on empirical observations of cyclist behavior, Dill (2009) found that bike lanes are important and favored by cyclists, but mainly as connections when routes on low-traffic streets are not available. Dill concludes that, "A network of different types of infrastructure appears necessary to attract new people to bicycling. Simply adding bike lanes to all new major roads is unlikely to achieve high rates of bicycling."

Programs

3. Include temporary street closures (ciclovias) in programs
Impact: Supportive of increased physical activity
Evidence: Communities around the world have embraced the trend of day-long street closures to encourage physical activity (Pucher, Dill, and Handy, 2010). There is widespread popularity of these programs, which are often targeted to low-income areas. Anecdotally, such programs have increased a sense social cohesion (Holt, 2008). As access to physical activity and social cohesion are important social determinants of health, implementing temporary street closures would improve health outcomes.

4. Add programs that manage automobile parking
Impact: Likely to increase physical activity
Evidence: (See evidence for proposal 4). Managing automobile parking reduces SOV mode share and increases use of alternative modes (Litman, 2008). Litman recognizes the findings of several studies that support managing parking to achieve an 85% occupancy rate, stating that an excessive supply of parking reinforces automobile dependency.

Policies

5. Declare measureable targets for project objectives. The plan should include:

- **Numeric objectives that define a desirable level of service**
- **Which government agency is responsible for implementation and when**
- **Benchmarks and performance measures for assessing progress**

Impact: Supportive of increased physical activity
Evidence: Various publications identify adoption of performance measures as a best practice in ensuring the effectiveness of plans (Public Health Law & Policy, 2009).

6. Prioritize projects and adopt policies that increase the following measures of walkability: connectivity, urban design, land use mix, and residential density. Possible actions not mentioned in the plan include:

- **limit construction of new cul-de-sacs**
- **connect existing cul-de-sacs**
- **limit block size**
- **design for imageability, enclosure, human scale, transparency, and complexity (See Ewing et al., 2006)**
- **encourage a dense mix of land uses**
- **encourage higher density housing**

Impact: Likely to increase physical activity
Evidence: In studies of the built environment, both with self-reported data and with empirically observed physical activity, research finds significant built environment predictors of physical activity. Among these, Sallis et al. (2009) identified four independent influences on physical activity: connectivity, urban design, land use mix, and residential density. Connectivity is essentially a measure of the prevalence of cul-de-sacs and dead ends. Dill & Voros (2007) found that higher connectivity is positively associated with physical activity. The walking environment is important in increasing walkability. Ewing et al. (2006) identified five important urban design concepts that influence walkability, listed above. These measures can be said to encapsulate person-oriented design as opposed to auto-oriented design. Density and land use-mix are significant predictors of physical activity (Sallis, et al., 2009, Krizek & Johnson, 2006), and have been found in case studies to positively influence bikeability and walkability (Pucher & Dijkstra, 2003).

7. Create policies to increase bicycle and pedestrian access to nutritious food
Impact: Supportive of increased physical activity
Evidence: In a review of literature on food access, PolicyLink and The Food Trust found that access to grocery stores is associated with healthier food consumption and with lower risk of obesity (2010). Of particular concern are inequalities in access based on socioeconomic status, as documented by Larson (2009).

8. Design for inexperienced cyclists
Impact: Likely to increase physical activity
Evidence: In her study already described above, Dill (2009) found that even experienced cyclists are willing to travel far out of their way to access low-stress bikeways such as

off-street paths and bicycle boulevards. When compared to shortest-path routes, utilitarian cyclists deviated 57% to use an off-street path for the entire trip (Dill, 2010). This suggests that designing for the least experienced users will attract more cyclists and better serve experienced cyclists.

9. Include health and equity in project evaluation criteria
Impact: Likely to increase physical activity
Evidence: According to the World Health Organization, improving the social determinants of health is an issue of social justice, and addressing inequalities is "an ethical imperative" (Commission on Social Determinants of Health, 2008). Including health and equity in project evaluation criteria is one way Clark County can help ensure equal access to physical activity, healthy food, and transportation.

10. Recognize increased numbers of bicyclists and pedestrians as a safety strategy
Impact: Likely to increase physical activity
Evidence: There is consistent evidence that injury rates from crashes decrease as the number of cyclists and pedestrians increases (Jacobsen, 2003). As Jacobsen succinctly puts it, "Policies that increase the numbers of people walking and bicycling appear to be an effective route to improving the safety of people walking and bicycling."

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Appendix D: Recommendation on Health Outcomes Criterion

Following the adoption of "Health Outcomes" as a project selection criterion, Public Health recommends the following system for assigning the 20 points currently allocated. The recommendations below reflect point values based on ability to improve health outcomes, particularly through physical activity. The strength of evidence supporting the criteria was also considered, with more weight given to strategies that are supported by extensive evidence.

Summary of health outcomes points break-down

Socioeconomic status	10 points
Walkability potential	4 points
Connectivity	5 points
Low-stress facilities	1 point

Socioeconomic Status: 10 points

Description: Project is located in a block group with unfavorable social determinants of health

Measure: % of block group population living in poverty based on census data (See Map 1).

Points:

Quintile	Points
1 (Lowest poverty BGs)	0
2	2
3	5
4	7
5 (Highest poverty BGs)	10

Evidence: Health outcomes improve as socioeconomic status increases (Commission on Social Determinants of Health, 2008). Availability of physical activity increases with socioeconomic status, while risk of obesity decreases (Powell, Frank, & Chaloupka, 2004).

Walkability Potential: 4 points

Description: Project adds infrastructure in areas with high walkability potential

Measure: If possible, measure walkability within the project impact area. Eligible projects are at or above the 60th percentile in walkability county-wide. If walkability cannot be measured in the project area, use block groups with walkability index values in the highest 2 quintiles county-wide (See Map 2). The walkability index is based on connectivity, land use mix (destinations), retail FAR, and density.

Points: All 4 points awarded if conditions are met.

Evidence: Walkability is linked with physical activity, independently of income or self-selection (Sallis et al., 2009). Neighborhoods with higher walkability facilitate physical activity (Transportation Research Board and Institute of Medicine, 2005).

Connectivity: 5 points

Description: Project improves connectivity for active transportation modes
Measure: Eligible projects provide a new connection, improving the effective connected node ratio for active transportation modes. If possible, measure walkability within the project impact area. Additional points are available for projects in areas at or below the 40th percentile in walkability county-wide (see Map 2). If walkability cannot be measured in the project area, use block groups with walkability index values in the lowest 2 quintiles county-wide.
Points: 2 points if a new connection is provided, 5 points if in an area with poor connectivity or within a 1 mile network buffer of a school.
Evidence: Connectivity is a strong predictor of physical activity (Sallis et al. 2009; Dill, 2004).

Low-stress facilities: 1 point

Description: Project involves low-speed/low-traffic designs
Measure: Eligible projects include bike boulevards, off-street paths, traffic calming, or other projects that reduce the speed of vehicle in close proximity to cyclists & pedestrians.
Points: Awarded if conditions are met.
Evidence: Cyclists go out of their way to use these facilities, indicating that they have potential to attract new users (Dill, 2009). Low speed designs are safer for users (Pucher and Dijkstra, 2003).

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