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Commuting in Portland, Oregon: the advantages of living within a transit oriented development community compared to traditional suburban development by comparing environmental, economic and health factors

Kyle Simpson
University of Central Florida

COMMUTING IN PORTLAND OREGON: THE ADVANTAGES OF LIVING WITHIN A TRANSIT ORIENTED DEVELOPMENT COMMUNITY COMPARED TO TRADITIONAL SUBURBAN DEVELOPMENT BY COMPARING ENVIRONMENTAL, ECONOMIC AND HEALTH FACTORS

by

KYLE M. SIMPSON

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ABSTRACT

Transportation is a function that affects nearly all life decisions, but is often not given much thought by the average individual throughout their daily routines. Most of this complacency streams from the mainstream development patterns in the United States that have changed little from the end of World War II. During the immediate post-war years a perfect mix for suburban living came together: the mass production of automobiles, guaranteed mortgages from the federal government through the G.I. Bill, and in 1956 the passage of the National Interstate and Defense Highways Act. These factors, along with the dominate social paradigm that the “American Dream” was to have a personal front and back yard, helped profoundly transform development in the country.

Over half a century later, the United States is now experiencing the consequences of this sprawled, auto-dependent development pattern. Energy prices have increased substantially over the past decade, which were only contained momentarily by a worldwide recession that was arguably caused by the same development patterns. Environmental consequences are becoming increasingly evident, ranging from contaminated storm-water runoff, to global climate change. Similarly, mental and physical health has degraded rapidly, with a soaring depression and obesity rates. The United States can, and should do better than this. Transit Oriented Development (TOD) offers a solution to help alleviate many of the complex issues that

many communities must address. While there is no perfect template, TOD is an important step forward for the overall quality of life for individuals throughout the nation.

This report will look at the steps that have been taken in the Portland Oregon Metropolitan Area to discourage sprawl development, measuring the effects of their actions on environmental, economic and health factors.

DEDICATION

For my parents, whom I thank for their support and guidance throughout my academic career.

For Dean Cleavenger, who has offered me great guidance and assistance. Without Dean, I would probably not be writing this report.

For Christopher Hawkins, who has helped me throughout the research and writing process, with great patience and direction.

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INTRODUCTION

Since the 1960's, the mainstream housing choice has been single-family detached houses. These homes are normally on quarter acre lots, and separated from other land uses such as commercial and industrial. This type of housing is now commonly referred to as sprawl, which gets its name from building further and further away from central cities. This type of development would not have been possible without the mass-use of private automobiles, coupled with cheap oil that has long been the norm in the United States. However, sprawled development has its drawl backs, which have become more pronounced as urban populations grow. The book *Urban Sprawl and Public Health* (Frumkin, Frank, & Jackson, 2004) speaks to one of the most pressing issues, auto dependence. (Frumkin et al., 2004) states that sprawl is designed and built to center around people in automobiles, rather than people themselves. The main goal is to move vehicles from one point to another with minimal difficulty and maximum speed (p. 20). Furthermore, in 1933, the Presidents Research Committee on Social Trends noted that automobile ownership had created an "automobile psychology", having become a dominate influence in the life of individuals, who in turn had become dependent on it (p. 36).

Researchers in 1933 were on point stating that individuals had become attached to automobiles, as decades later if they were not emotionally attached, they were dependent on them to move around the sprawling metro areas. Interestingly enough, many of the environmental issues that faced central cities in the early 20th century,

which automobiles promised relief from, are now pressing issues in many suburban developments across the country. Over the past 15 years, the United States has developed over 25 percent of all developed landmass in the country's history. This is coupled with a dramatic increase in average vehicle miles traveled per year, which have increased from 4,000 in 1960 to 10,000 in 2000 (Frumkin, Frank, & Jackson, 2004, p. xii).

These are just a few of the consequences of the many that have come from suburban style development patterns of the past half century. This report will first highlight some of the environmental, economic and health effects of sprawl through literature reviews. Second, two areas in the Portland Oregon Metropolitan area will be analyzed. Orenco Station is a Transit Oriented Development site, which will be compared to Aloha, a community situated along a major arterial roadway with suburban development. Census tract data will be used to compare the two sites, which will allow for a comparison of commute characteristics, housing costs, along with other parameters. Finally, these findings will be applied to current literature to see if Transit Oriented Development offers residents greater benefits than sprawling development.

WHY CONTROLLING SPRAWL MATTERS

Suburban sprawl is a relatively new issue that metropolitan areas face. As defined by (Barnett, 2003), sprawl is “low-density urban development rapidly spreading across rural areas. It may seem unplanned but is actually the result of complex interactions among government regulations and private initiatives” (p. 288). (Freeman, 2001) Defines sprawl as “low-density development, a separation of land uses, and infrastructure that favors the automobile” (p. 69). Furthermore, the National Research Council has begun to measure the multiplier effect sprawl has:

> Sprawl is spread-out development that consumes significant amounts of natural and man-made resources, including land and public works infrastructure of various types. Sprawl also adds to overall travel costs due to increasing use of the automobile to access work and residence locations more widely spaced due to the sprawl phenomenon. Furthermore, sprawl appears to deconcentrate centers and takes away from the multiplicity of purpose that neighborhoods once delivered (Burchell, et al., 2002, pp. Preface, para. 1)

While this type of single-use, spread out development was first seen as a solution to the issues that plagued city-centers in the early 20th century, sprawl has created numerous consequences that are have only intensified as urban populations continue to grow. Figure 1 is a classic example of sprawl, disconnected street networks with cul-de-sacs, uniform housing structures, and large distances in-between different destinations. There is also a lack of natural features, which was once one of the cornerstones of suburban

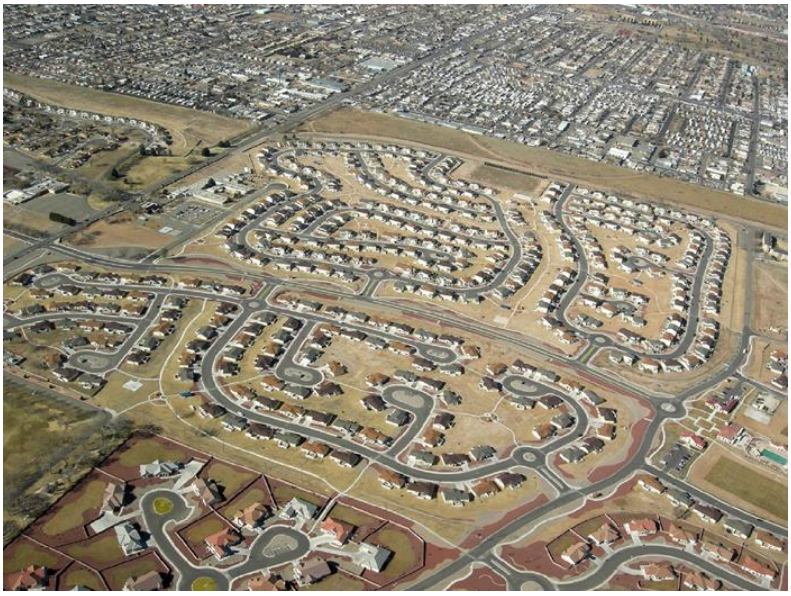

Figure 1. Suburban sprawl with single-family, detached housing.

Source: www.travel-studies.com

life, but it is now common for developers to clear-cut and uniformly grade whole developments. These development characteristics have many overlapping effects on a community, including environmental, economic and health factors. These impacts will be further analyzed in the following sections.

Although sprawl-characteristic development is still the most common in the US, alternatives have begun to be offered in mainstream development. The development pattern that will be covered in greatest depth in this report is Transit Oriented Development (TOD). TOD is generally defined as containing "moderate to high-density development that also includes

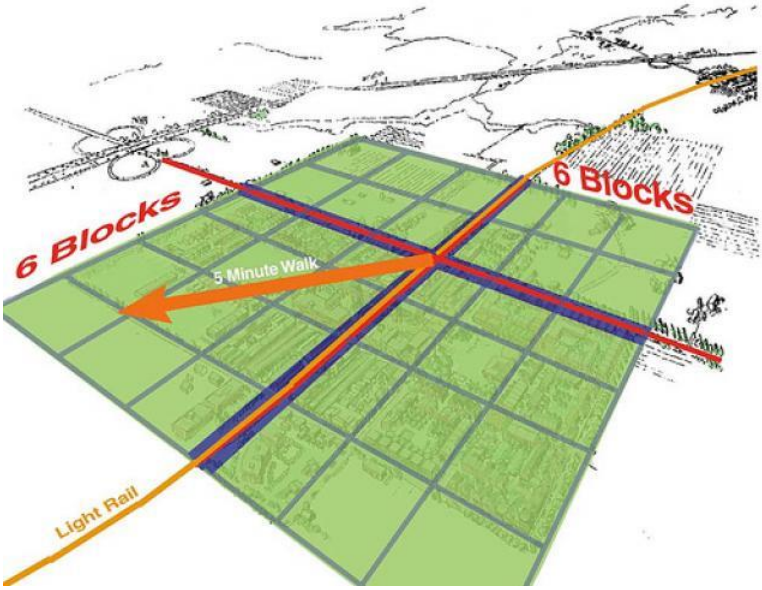

Figure 2. Transit-Oriented Development.

Source: www.travel-studies.com

Figure 3. Transit-Oriented Development in Charlotte, North Carolina.

Source: Charlotte Area Transit System

employment and shopping opportunities and is located within easy walking distance of a major transit stop" (Lund, 2006, p. 357). TOD is also seen as a way to boost transit ridership, increase walking activity, mitigate sprawl, accommodate growth and create interesting places (Parker, 2007). Smart Growth is also used regularly when talking about TOD sites. (Barnett, 2003) Defines Smart Growth with three essential elements. First, policies to discourage conversion of rural land at the edges of urban regions. Second, finding ways to make infill development more attractive to investors and consumers. Third, knitting the metropolitan region together with transportation systems that reduce dependency on automobiles. Furthermore, Table 1 shows the Smart Growth Principles as defined by the Smart Growth Network.

Table 1. Smart-Growth Principles

1.	Mixed land uses.
2.	Take advantage of compact building design.
3.	Create a range of housing opportunities and choices.
4.	Create walkable neighborhoods
5.	Foster distinctive, attractive communities with a strong sense of place.
6.	Preserve open space, farmland, natural beauty, and critical environmental areas.
7.	Strengthen and direct development toward existing communities.
8.	Provide a range of transportation choices.
9.	Make development decisions predictable, fair and cost effective.
10.	Encourage community and stakeholder collaboration in development decisions.

Source: Anonymous *Getting to Smart Growth: 100 Policies for Implementation.* Washington: Smart Growth Network and International city/County Management Association, 2002.

Environmental Issues

It is no secret that there are many pressing environmental issues that face the United States. It is often argued that development practices that have been commonplace for decades are no longer acceptable. Automobiles, which are at the center of most suburban residential developments, have become one of the largest contributors of many air pollutants. By some estimates they account for over three quarters of carbon monoxide emissions, over half of nitrogen oxide and volatile organic compounds, and nearly a third of carbon dioxide emissions (Frumkin, Frank, & Jackson, 2004, p. 73). Even though automobiles have become more fuel efficient and have better

environmental safeguards than those of the past, the increase in total vehicle miles traveled have outpaced increased efficiencies. In 2010, the average light duty vehicle in the US traveled 11,493 miles, while consuming 537 gallons of fuel (Highway Statistics Series, 2013).

It is also important to note the human health risks that arise from living near or spending an increased amount of time by major roadways. Multiple studies have concluded that people living within 200 meters of these roadways have an elevated risk for developing asthma along with reduced lung function, especially in children (Brugge, Durant, & Rioux, 2007, p. 1). Furthermore, a study in Amsterdam found that people living near streets with more than 10,000 vehicles per day were exposed to two-three times higher levels of black smoke, nitrogen oxide and carbon monoxide, compared to residents who lived on less busy streets (Frumkin, Frank, & Jackson, 2004, p. 76).

Diesel emissions have long been notorious for their environmental impact on air quality, specifically from the high level of fine particulate matter (PM) it contains. PM varies in size, generally ranging from 0.1-10 microns in diameter. While no PM exposure is healthy, the smallest particles are the most dangerous to human health, because they can penetrate the lining of lungs, attaching to blood cells (Frumkin, Frank, & Jackson, 2004, p. 69). The California Office of Environmental Health Hazard Assessment has found that people exposed to diesel emissions are more likely to develop lung cancer and other more immediate health problems than workers who were not exposed to diesel emissions (Fitzgerald, 2010, p. 152). Furthermore, the American

Cancer Society has found links between PM exposure and lung cancer rates (Brugge, Durant, & Rioux, 2007, p. 8).

It is also important to note that different atmospheric conditions, trip characteristics, vehicle characteristics and pollutant characteristics affect the total environmental impact. Newer cars have increased pollution controls, in the form of catalytic converters. While these instruments are successful in reducing air pollutants released, they do not perform at peak efficiency until they have reached ordinary operating temperatures. This is why winter mornings see some of the worst air quality as a direct result of automobiles, since catalytic converters are not operating at peak performance (Howard, 2011).

Economic Impacts

There are many economic impacts that sprawl has had on local and national economic situations. Many people move to suburban areas because they perceive them as more affordable. With nearly every metropolitan area, the further you are from the downtown core, generally housing costs decrease. However, there is an increase in transportation costs which are often not taken into account when factoring the entire value of a specific property.

There have also been long-standing funding inequalities between public transportation and roadway construction at the federal government level. The federal government devotes 82 percent of transportation funding to roads and highways, with

only 18 percent going to public transportation projects. Furthermore, local jurisdictions must match public transportation funds at 100 percent, but they only have to match road funds at 25 percent (Stranded at the Station: The Impact of the Financial Crisis in Public Transportation , 2009). However, these current funding levels are better than when the National Interstate and Defense Highway act was passed in 1956, where interstate funding required only a 10 percent match from local and state governments (Interstate FAQ, 2013).

While highway funding has long outweighed funding for all other modes of transportation at the federal government level, the development patterns highways and interstates have created are beginning to come under scrutiny. As housing developments have moved further and further away from employment centers, commute times for individuals have increased at astounding rates over the past decade. This increase in commute time comes from increased physical distance from employment centers, along with an increased number of drivers commuting from outlying areas. With a national average of 76.1 percent of commuters driving alone to work, traffic congestion is a growing burden on the economic potential of the United States (Transportation Statistics Annual Report 2010 , 2011).

For example in 2011, the average work commuter in the United States was delayed for an annual total of 38 hours, wasting an average of 19 gallons of fuel (Schrank, Eisele, & Lomax, 2012). The combined cost of wasted fuel, along with lost time and productivity cost the average American over $800 in 2011, while in 1982 the cost was only $324 in 2011 dollars. While these figures themselves are staggering, the

national cost of automobile congestion is alarming. In 2011, urban commuters in the United States spent 5.5 billion more hours traveling due to auto congestion. The increased time spent in traffic caused 2.9 billion gallons more to be purchased, for a total congestion cost of $121 billion dollars. These figures would actually be much worse without the limited role that public transportation plays in the U.S., saving an estimated 20.8 billion dollars in yearly congestion costs (p. 1).

Congestion is not the only major economic cost that the U.S. faces from automobile use on an annual basis. Each year, automobile crashes cost over $150 billion in medical costs and lost wages (Kapoor, Dlabay, & Hughes, 2012, p. 332). Furthermore, the average person spends over $200,000 on automobile-related expenses throughout their lifetime including depreciation, insurance, taxes and fees, gasoline, and maintenance, along with other expenditures (Kapoor, et el., 2012, p. 266). This is a significant amount of an individual's overall lifetime expenditures, and it only accounts for vehicle related costs, not the cost of automobiles themselves. Most often, individuals only consider the most direct cost of driving, gas prices, as the major economic indicator. However, there are always less apparent costs to driving, such as wear and tear on the vehicle and road, parking, tolls, along with societal costs including air and noise pollution.

Finally, the economic cost of the physical development of sprawl is a great burden to individuals and families, along with the municipalities that provide services to these areas, such as water, sewer, electric, and local road upkeep. The Transit Cooperative Research Program has published a comprehensive report on these costs,

in *TCRP Report 74: Costs of Sprawl-2000* (Burchell, et al., 2002). Their price figures are based on The Rutgers Development Cost Model, which takes into account current housing prices, along with the land-cost share. Using this model, land costs have been approximated to be 25 percent of total costs for single-family detached dwellings, 20 percent for single-family attached dwellings, 60 percent for mobile homes, and 10 percent for multifamily dwellings. For nonresidential developments, land costs average approximately 20 percent for office buildings, 30 percent for retail buildings, 25 percent for industrial buildings, and 15 percent for warehouse structures (p. 284).

To calculate the economic effects of sprawl compared to controlled growth development, the prices of new housing types were broken down to the previous percentages. For example, if a new single-family dwelling costs $200,000, $150,000 is assumed to be structure costs, while $50,000 would be land costs. If the density of the development is increased by 10 percent under controlled development, the land portion of the overall cost would decrease by an amount similar to the increased density. Now the $200,000 house would cost $195,000; $150,000 for the structure and $45,000 for land (Burchell, et al., 2002, p. 285).

Using this model, conclusions on future development costs can be determined. Based on common characteristics of residential sprawl, single-family detached housing will cost the American's $2.1 trillion, with overall development costs totaling $4.4 trillion from 2000 to 2025. However, if smart-growth principals are used, the overall development costs are reduced by $420 billion, a seven percent savings rate. This would also equate into an average residential house decreasing from $167,038 to

$154,035, a 7.8 percent reduction. It is important to keep in mind that these savings reflect only the savings from decreased housing costs. There are also residual savings on transportation costs from decreased automobile use, decreased healthcare costs from increased physical activity, along with non-quantifiable quality of life improvements.

Additionally, there are vast differences in average household total amounts spent on transportation in the United States. Table 1 shows average household transportation expenditures in the US from 2004-2009.

Table 2. Average household transportation expenditures 2004-2009, in dollars

	Vehicle purchases	Gasoline and motor oil	Other vehicle expenses	Public transportation	Total
2004	3,397	1,598	2,365	441	7,801
2005	3,544	2,013	2,339	448	8,344
2006	3,421	2,227	2,355	505	8,508
2007	3,244	2,384	2,592	538	8,758
2008	2,755	2,715	2,621	513	8,604
2009	2,657	1,986	2,536	479	7,658
Average (Sprung, 2012)	**3,170**	**2,154**	**2,468**	**487**	**8,279**

As shown in Table 2, public transit expenditures only accounted for 6% of households' total transportation expenditures during 2004-2009. While the percentage spent by households on public transportation in major metropolitan areas such as New York or Boston is likely to be higher, it is still substantially less than the cost of an automobile. Moreover, public transportation costs are more static than gasoline prices, which are extremely elastic. In 2008 before the economic collapse, the weekly U.S. regular conventional retail gasoline price went from an average $2.947 per gallon during

the week of February 11th to an average of $4.054 during the week of July 14th (Gasoline and Diesel Fuel Update, 2013). This represented a 38% price increase in only 22 weeks. In 2007, there were 3,032,399 million vehicle miles traveled on US highways (Transportation Statistics Annual Report 2010 , 2011). With the national average fuel economy at 20.6 mpg in 2007 (Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2012, 2013), the increase the difference between gas price of $2.947 and $4.054 per gallon is $162,954,645,293. This is a dramatic drain on the national economy, as individuals and families saw their disposable income slashed, leading into the greatest economic recession since the great depression.

Health Factors

When talking about the health factors of sprawl, it is important to differentiate between physical health problems and mental health issues. Most of the physical health factors that are present in sprawling, uncontrolled growth areas arise as a direct result of the physical design of residential and commercial development. Single use zoning generally creates long distances between destinations, such as place of employment, retail outlets, restaurants, grocery stores, entertainment destinations, parks and recreational activity centers. With large distances between these locations, the majority of people will drive. Even if a person's destination is within walking distance in an auto-dominate area, people are more likely to drive since the physical environment is built for automobiles and not for walking. This makes people feel "out of place" walking, which

contributes to people not even consider walking or biking as an alternative to driving (Lund, Reasons for Living in a Transit-Oriented Development, and Associated Transit Use, 2006). There have been multiple studies showing that residents that live in traditional, more compact neighborhoods get more exercise than their suburban counterparts. In one such study, people living in these compact neighborhoods got 30 minutes more of walking for commuting purposes than people living in suburbs (Frank, et al., 2006). Also, the overall air quality for an area is likely to improve as the rate of commuters' not driving private automobiles decreases.

Many lifestyle habits that individuals exhibit are developed based on experiences during their childhood. Knowing this, it is very important to examine children's commute characteristics, too and from school. As development patterns have shifted, so has children's travel mode to school. Approximately 35 years ago, 49% of students walked or biked to school. The rate now is 14%. Furthermore, in 1969 90% of children living within a mile walked or biked, while currently only 31% walk or bike (Schlossberg, Greene, Phillips, Johnson, & Parker, 2006). During the same time period as this decline in walking and biking to school, obesity rates in the United States have continued to grow at alarming rates. In a 1971-1974 CDC National Health and Nutrition Examination Survey (NHANES), 5.1% of U.S. children ages 2-19 were obese. In the 2009-2010 NHANES, that rate had increased to 16.9% (Fryar, Carroll, & Ogden, Prevalence of Obesity Among Children and Adolescents: United States, Trends 1963–1965 Through 2009–2010, 2012). The rate of increase in obesity among US adults has increased at an even higher rate. In the 1971-1974 NHANES, the obesity rate for adults aged 20-74

was 14.5%. In the 2009-2010 NHANES, the rate jumped to 36.1% (Fryar, Carroll, & Ogden, 2012).

The decline in walking and biking for commuting purposes in children and adults does not only affect physical health. The impact of places on residents' mental health and happiness has been often overlooked in relation to sprawl. In *Public Spaces Urban Places* (Carmona, Tiesdel, Heath, & Oc, 2010), this connection is examined:

> Pedestrian movement is compatible with the notion of streets as social space, and there is a symbiotic relationship between pedestrian movement and economic, social and cultural exchange and transactions. By contrast, car-based movement is pure circulation, with private cars also facilitating an essentially private control over public space. Opportunities for most forms of social interaction and exchange only occur once the car has been parked. Over time, vehicular movement space has overwhelmed social space. (p. 83)

There have been multiple studies that have found sense of community to be higher in neighborhoods that facilitated personal interaction, in places where automobiles were not necessary for transportation (Freeman, 2001). In suburban communities, most residents have their own land that can be used for gardening or outdoor recreation, so there are generally fewer parks and preserved community green-fields. However, personalizing open-space reduces the potential for making friends and social ties that come from strolling or having a picnic in a neighborhood park (Freeman, 2001, p. 70). These unplanned social interactions have been dubbed chance

interactions, as they are unplanned, and generally occur as a result of normal life tasks. These interactions almost always occur outside of an automobile, such as walking or biking. These types of interactions help to build social capital, which is a person having a personal sense of belonging to a particular area. McMillan & Chavis, 1986, define sense of community as “a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members’ needs will be met through their commitment to be together” (p. 637). Furthermore, Jane Jacobs in her famous book *The Death and Life of Great American Cities* focused on sidewalk life in New York City,

> People stopping by at the bar for a beer, getting advice from the grocer and giving advice to the newsstand man, comparing opinions with other customers at the bakery and nodding hello to the two boys drinking pop on the stoop, eyeing the girls while waiting to be called for dinner, admonishing the children, hearing about a job from the hardware man and borrowing a dollar from the druggist, admiring the new babies and sympathizing about the way a coat faded (1993, p. 73)

Humans are social creatures, but post WWII suburban development has created environments that are very isolating to individuals. The United States has one of the highest rates of depression in the developed world, and many studies have linked this dramatic rise in depression to development trends. From 1994 to 2008, the rate of antidepressant use in the United States increased 400%. This represents a rate of one in 10 Americans over the age of 12 taking antidepressants (Pratt, Brody, & Gu, 2011).

Frumkin et el., (2004) describes three ways that sprawl can contribute to depression. First, by limiting opportunities for physical activity, sprawl may deprive people of one of the most effective treatments of depression. Second, by limiting opportunities for interpersonal contact, sprawl may aggravate social isolation. Third, if beautiful, natural environments can raise spirits, could ugly suburban roads and parking lots do the opposite? (p. 159)

Another serious physical health risk streaming from automobiles includes the vehicles themselves. According to U.S. Census Bureau data in 2009, 33,808 motor vehicle occupants were killed in crashes, along with 4,872 nonoccupants, whom include pedestrians and bicyclists. The number of nonoccupants killed annually is a disheartening number, representing 13% of automobile related fatalities nationwide. Moreover, 2,217,000 motor vehicle occupants were injured in vehicle crashes in 2009, along with 116,000 nonoccupants (Statistical Abstract of the United States: 2012, 2011). It is important to remember that the 13% of people killed in motor vehicle crashes, nonoccupants, represent a very small total number of commuters. In 2009, 3.5% of commuters walked or biked to work, representing 4,732,000 commuters, compared to 119,393,000 commuters who drove themselves or carpooled (Transportation Statistics Annual Report 2010 , 2011).

Research Design

Within the United States, medium to large sized cities, with the exception of New York and Chicago, have very low public transit ridership, along with extremely low bicycle-commuting. It is often argued that this is the case because of the way most cities were developed from the 1950's onward, with freeways moving people from the suburbs to the city-center for employment, with little regard to the urban fabric or the long-term consequences of the development. (Brown, Morris, & Taylor, 2009) Describe the First National Conference on City Planning that took place in 1909, stating that "unable to foresee a future of sprawl, oil dependence, congestion, and smog, many contemporary observers, undoubtedly including many conference participants, considered the private auto the savior of urban transportation" (p. 161). A century later, most jurisdictions within the US have yet to implement substantial measures to help combat the issues that mass-automobile use and sprawled-development have caused. Portland Oregon is one of the few exceptions in the country of a newer city that offers a comprehensive mix of transportation options, along with strong growth-management controls.

In 1973, Oregon was the first state to pass the nation's first set of land-use planning laws. These measures were intended to preserve the state's natural beauty from suburban development. The law requires jurisdictions to create urban growth boundaries, use urban land wisely, and protect natural resources.

In 1978, voters in the Portland metro area of Clackamas, Multnomah and Washington counties approved a ballot measure that made Metro the nation's first elected regional government. Metro coordinates the land-use plans of the regions 27 jurisdictions, along with maintaining an urban growth boundary. Metro also has the power to make binding decisions regarding development within the urban growth boundary. Furthermore in 1992, the regions voters approved a home-rule charter that directed Metro to make regional growth management its top priority. The charter required the creation of the Future Vision, a long range statement of the region's outlook and values. It also required a regional policies on land-use, transportation, water quality, natural areas and other areas of regional significance, called the Regional Framework Plan.

In 1994, Metro sent out a questionnaire to all residential units within their jurisdiction. They found that for 83 percent of responders, increasing development along transit corridors was their preferred development pattern for the region. Moreover, 77 percent of responders supported encouraging growth in established centers, along with 58 percent supporting reduced average new lot sizes. Finally, 55 percent supported reduced parking requirements for retail and commercial developments. With these findings, along with many community meetings and outreach events, Metro created the 2040 Growth Concept, a long-range growth-management plan. The plan is intended to:

• Encourage more efficient use of the land in cities, business centers on “main streets” and on major transit routes

• Protect natural areas, parks, streams and farmland both inside and outside the urban growth boundary

• Promote a transportation system that includes all types of travel, such as bicycling, walking and using mass transit, as well as cars and freight

• Work with neighboring cities just outside the region – such as Sandy, Canby and Newberg – to keep the separation between communities

• Promote diverse housing options for all residents of the region.

(Anonymous, n.d.)

Figure 4. SW Tualatin Valley Highway in Aloha.

Source: Google Maps

While there are many more land-use controls in place than most areas across the country, it is important to see if the controls have actually helped control growth and discourage sprawl. Although growth is contained by an urban growth boundary, the Portland Metro area still contains areas of more traditional style suburban development. One such area is Aloha, an unincorporated area

in Washington County. It is situated along a major arterial roadway, SW Tualatin Valley Highway, which contains traditional suburban strip development, as show in Figure 4.

Figure 5. Orenco Station development plan.

Source: www.terrain.org

While there are still suburban style developments in the Portland Metro area, there are also examples of Transit Oriented Development, even far outside of the city center. Orenco Station is a TOD

Figure 6. Orenco Station town center.

Source: www.theatlanticcities.com

site in Washington County, containing mixed use development, attached and detached single-family housing, and apartments. Orenco Station is located at the Orenco/231st Ave. MAX station, on the Blue Line of the regions light rail network. Construction of Orenco Station began in 1997 on the 209 acre green-space development which now has nearly 1,900 residential units along with 220,000 square feet of retail space. Metro, Portland's metropolitan land-use planning agency, zoned multiple sites along Max's Blue Line for future TOD, which is one of the reasons Orenco Station came to be. Consequently, Orenco Station has its own zoning ordinance, which allows for streets as narrow as 20 feet, a maximum building setback of 19 feet off the street, and alley loaded garages (Mehaffy, n.d.).

Method

One of the largest arguments against areas implementing Transit Oriented Development (TOD) or similar type of mixed-use, pedestrian scale neighborhoods is that there is a preconceived notion that housing prices will be too expensive within the development. While TOD areas sometimes do have higher initial housing costs than traditional suburbs, often other economic factors are neglected to be considered. There is the fixed cost of rent or mortgage payments, but also many variable costs, the biggest normally being transportation. Moreover, many factors that cannot be easily assigned a monetary value, such as quality of life, social capital, access to communal open space ++and gathering places, such as churches and coffee shops. These factors have a major influence on the overall quality of the living environment. These are the qualities that are often missing from unplanned, suburban development. Although housing costs may be lower, increased transportation costs for driving long distances, greater healthcare costs due to lack

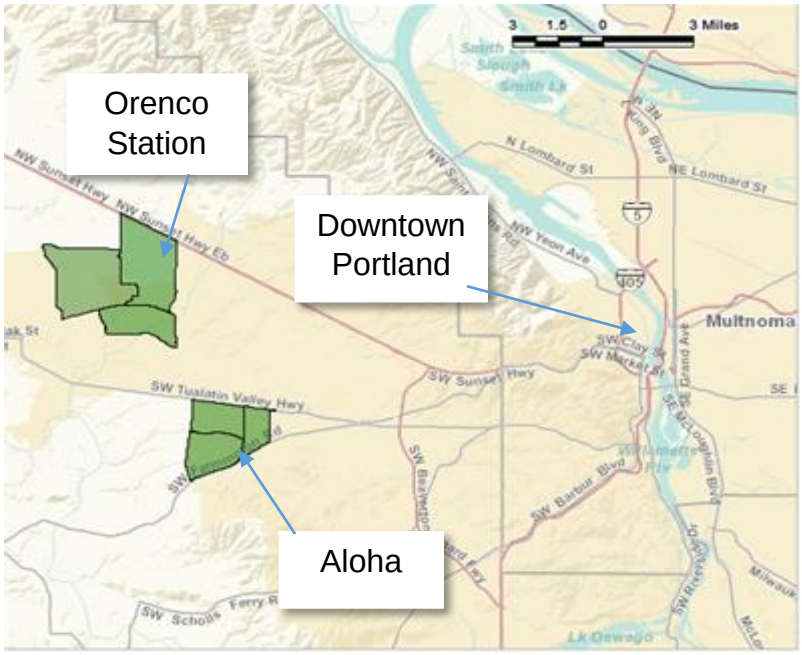

Figure 7. Sites that will be analyzed and vicinity to Downtown Portland.

Source: US Census Bureau

of recreational and walking opportunities are opportunity costs that need to be considered.

For the purpose of this study, United States Census Bureau data will be used. The data for Aloha consists of Census Tracts 317.03, 317.04 and 317.05. The data for Orenco Station consists of Census Tracts 348.08, 326.07 and 326.08. Both of these areas are within Washington County, one of the three counties that has land in the City of Portland. The averages from these Census Tracts will be averaged together to show one average for their respective area, and will be measured against averages from Clackamas, Multnomah and Washington Counties, the three that share jurisdiction with the city of Portland. Data from the Portland-Vancouver-Beaverton Metropolitan Statistical Area will also be compared. All datasets will come from American Community Survey 2011 5-year estimates.

Analysis

After analysis, most of the findings are consistent with the literature reviewed. One of the biggest differences between Orenco Station and Aloha are the housing unit size, which are detailed in Table 2. In Aloha, 76 percent of housing units are single-family detached houses, while in Orenco they account for only 39 percent of the housing stock. There is also a large difference in the number of multi-unit housing developments. In Orenco, developments with 10-19 units account for 13 percent of housing, with 20+ unit developments accounting for 15 percent. In Aloha, the percentage is 4.8 and 3.7 respectively.

Table 3. Number of housing units per building design.

	1 Unit Detached	**1 Unit Attached**	**2 Units**	**3-4 Units**	**5-9 Units**	**10-19 Units**	**20+ Units**	**Total**
Aloha	4,957	403	134	300	188	315	245	6,552
Orenco	2,047	1,118	63	197	335	681	818	5,278

These differences directly correlate with the common development characteristics between suburban, single use development, compared to Transit Oriented Developments, with higher intensity development, along with mixed-use buildings and row-houses.

One of the most common measures for individuals and families choosing housing locations is the cost of either rent or mortgage. One of the most predominant arguments in popular literature against TOD is the perception that it will drive up housing costs. In Orenco, the median monthly rent was actually lower than Aloha. In Orenco, the median

rent was $1,018 compared to $1,048 in Aloha. It is also important to note that the average rental household size was larger in Aloha with 3.11 persons per unit, compared to 1.98 in Orenco. However, the average monthly mortgage cost was more in Orenco, $1,831 compared to $1,577 in Aloha. Figure 8 shows the averages for the two areas.

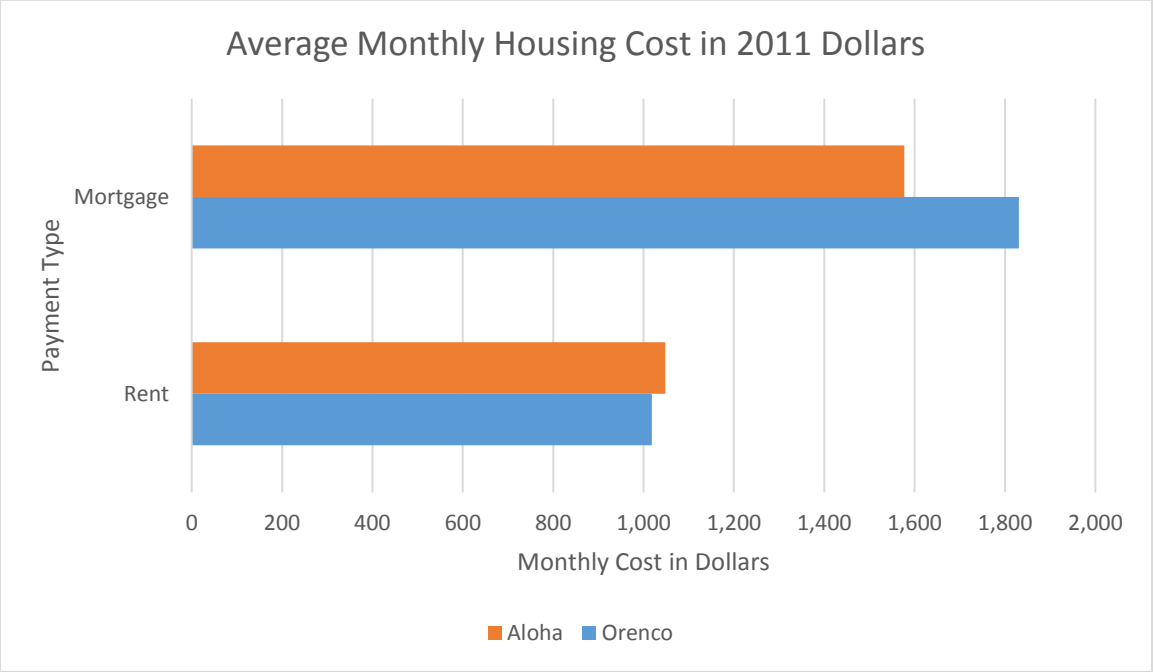

Figure 8. Average monthly housing cost for Aloha and Orenco.

Another important economic measure is the percentage of monthly income spent on housing costs. In Orenco, rental costs were spread out fairly evenly, ranging from less than 15 percent of monthly income to over 35 percent, as shown in Table 4. 36.8 percent of rental units in Orenco spend less than 20 percent of their monthly income on rent, compared to 0 percent in Aloha. Moreover, in Aloha 54.8 percent of renters pay more than 35 percent of their monthly income for rent, which greatly decreases their amount of disposable income.

Table 4. Percentage of household monthly income spent on housing costs.

	>15%	15-19.99%	20-24.99%	25-29.99%	30-34.99%	<35%
Aloha Mortgage	n/a	977	374	713	449	897
Aloha Rent	n/a	n/a	268	130	263	801
Orenco Mortgage	n/a	718	561	415	218	606
Orenco Rent	307	476	221	343	420	358

Housing values were slightly higher in Orenco than in Aloha, as show in Table 5. The two areas are separated by less than five miles, thus showing a utility of location increase in price. There are many qualities that Orenco provides that Aloha lacks, such as a walkable town center, mixed-use development, and close access to high quality transit service. In Aloha, the majority of houses, 70.3 percent fall between $200,000-$299,999, while in Orenco 44.2 percent fall between $200,000-$299,999, along with 48.4 percent between $300,000-$499,999.

Table 5. Number of housing units per selected value.

	>50,000	50,000-99,999	100,000-149,999	150,000-199,999	200,000-299,999	300,000-499,999	500,000-999,999
Aloha	54	0	101	452	2890	578	36
Orenco	8	0	32	122	1265	1383	50

For some time now, it has been understood in urban design that people generally react to their environment, with one of the most noticeable changes in behavior being choice of transportation. Orenco had five percent fewer commuters that drove alone compared to Aloha, although Orenco had a higher percentage than the overall metro

area, which result from the low percentage in Multnomah County, where Downtown Portland is located. It is also important to note that Intel Corporation's Ronler Acres campus is directly north of Orenco, which employs thousands of people. This could be a factor for transit ridership, since it is less than a mile drive from Central Orenco. Orenco also had a lower average travel time than Aloha at 21.83 minutes compared to 24.3 minutes.

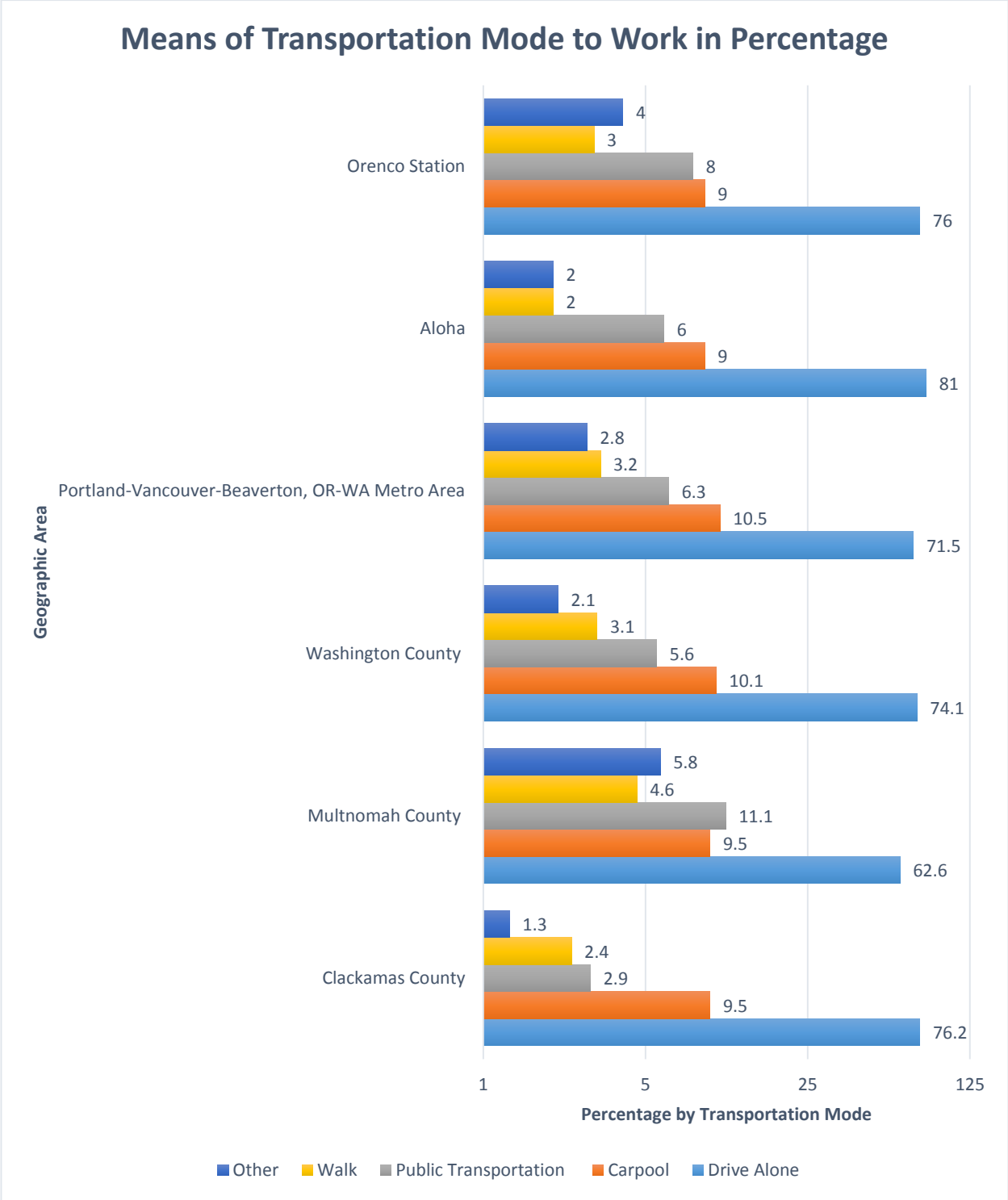

Figure 9. Means of transportation mode to work in percentage for selected area.

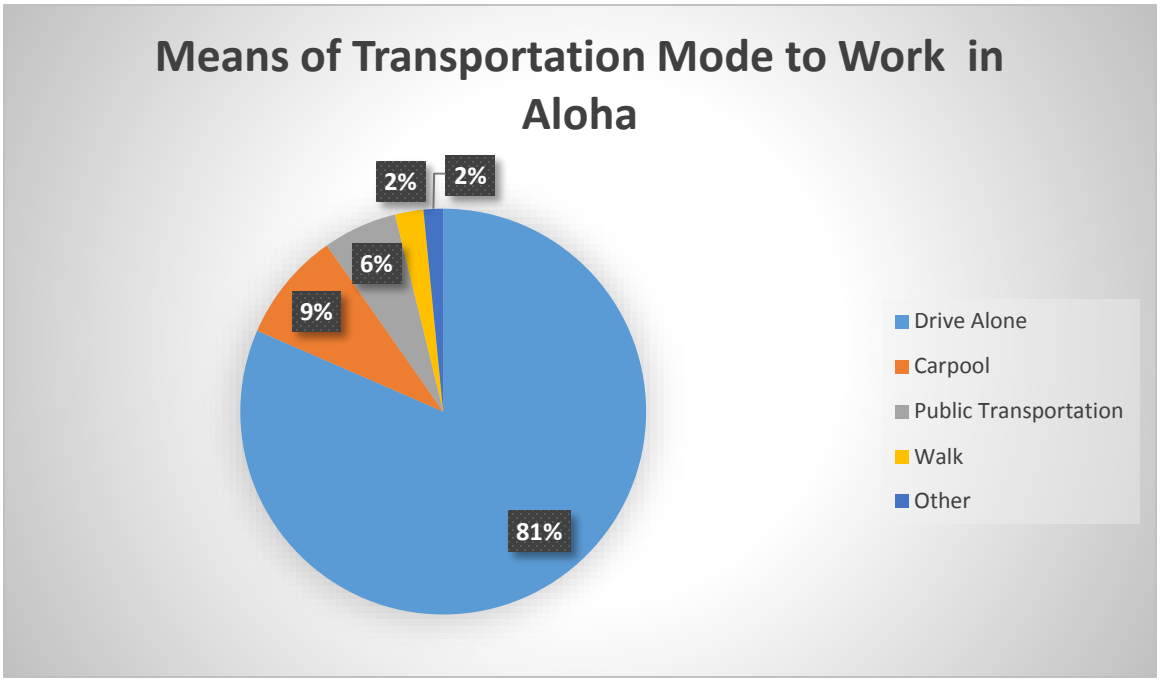

Figure 11. Means of transportation mode to work by selected characteristic in Aloha.

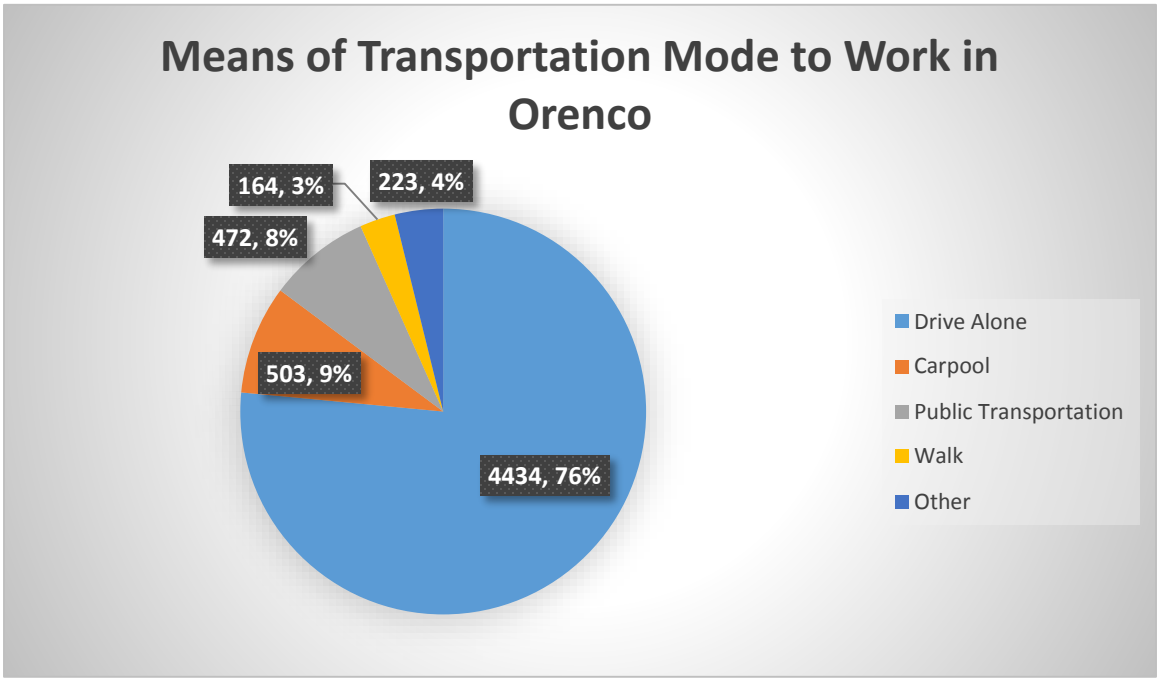

Figure 10. Means of transportation mode to work by selected characteristic in Orenco

The racial mix between Orenco and Aloha were overall similar, with the largest difference being people of Hispanic origin. Figure 12 shows the breakdown between the two sites.

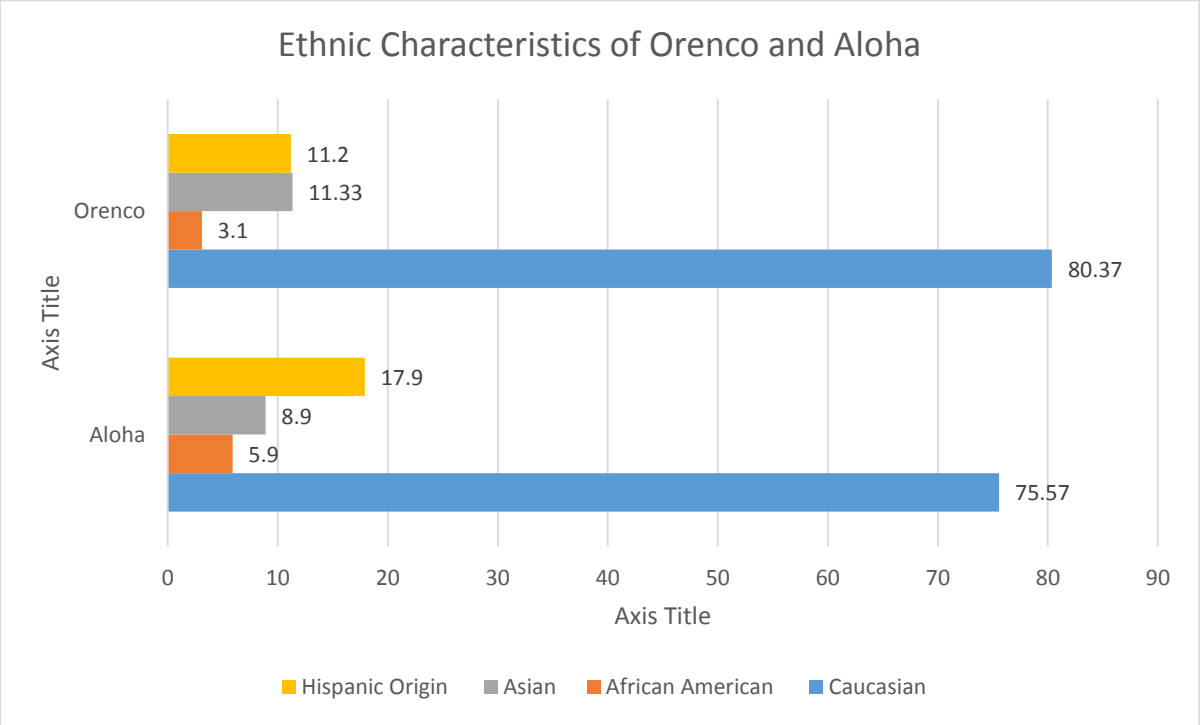

Figure 12. Ethnic characteristics of Orenco and Aloha.

Another important factor between the two areas for comparison is the average household income and benefits. The results were again similar, but Orenco had less households in lower income brackets than Aloha, and more in higher brackets after the $75,000-$99,999 value set. The results are shown in Figure 13.

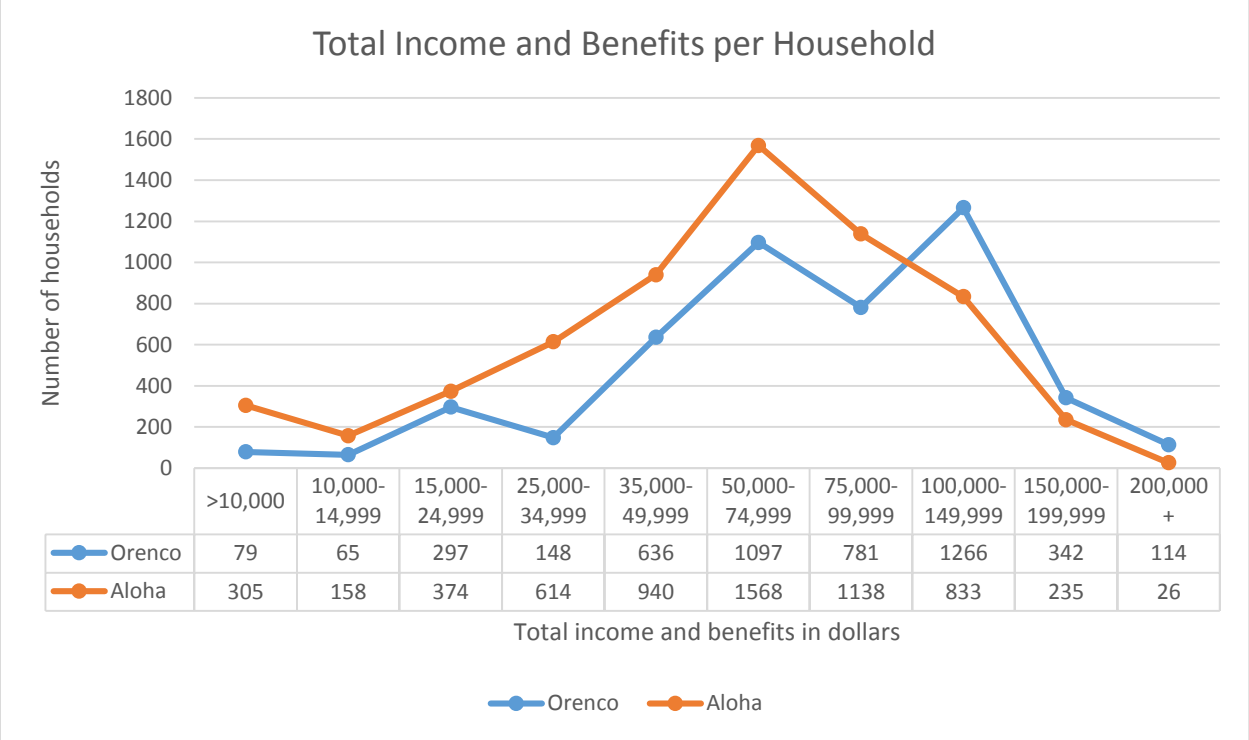

Figure 13. Total income and benefits per household in Orenco and Aloha.

CONCLUSION

This report has compared two areas in the Portland Oregon Metropolitan. Aloha is a typical suburban style development, while Orenco Station is a Transit-Oriented Development. Orenco contains many of the qualities outlined for Smart-Growth communities, including walkable streets, mixed-use development, proximity to transit service and compact building designs. Orenco is much more compact than Aloha, with more multi-unit developments than single-family detached houses, which are the most common in Aloha.

Transit ridership is higher within Orenco than it is in Aloha, eight percent to six percent respectively. It is important to note that statistics only represent commuting to and from work, and do not consider trips taken for leisure, shopping and other errands. It is possible that if data were collected for these trips, the total rate of transit ridership could be higher. Rates of commuters driving alone was five percent lower in Orenco than in Aloha, along with a total shorter commute time.

With the data collected, it is evident that the principles of TOD have been successful in reducing automobile dependence within the area. There are also many other quality of life factors that are less measureable, but have a great impact on individuals within the community. In Orenco, residents have the ability to comfortably walk to commercial areas and recreational spaces, giving residents a greater opportunity to experience chance-encounters which help build community relationships,

along with other positive factors. TOD has the ability to help reverse the negative development patterns that have overtaken development since the end of World War II.

There are also many steps that local governments can take to allow and encourage TOD sites to be built. Zoning codes that only allow single-use zoning should be updated, along with maximum density allocations in the TOD site. Since there is a greater number non-automobile commuters in these areas, decreased parking minimums should be considered to reduce the cost to developers, while potentially reducing the amount of impervious surface.

Local governments need to begin taking into account all factors a new development will have on an area in the future, beyond simple tax base increase. While initial revenue from new developments and subdivisions are attractive, the long-term maintenance cost of large road networks and utilities have become problematic for many municipalities. Local governments must account for projected future maintenance costs, along with quality of life factors such as resident's access to green-space, retail, grocery stores and access to the city center without use of a private automobile. Providing viable transportation alternatives for residents must become a focal point for future development.

There is opportunity for future research on the effect TOD has on resident's transportation choices and quality of life. Data from the American Community Survey only accounts for trips to and from work. It is likely that the percentage of biking and walking is higher for all trips taken in Orenco, but future research is needed to confirm

this. There are also quality of life factors that cannot be measured from census data, such as residents mental and physical health, community culture and pride, and how many people switched to alternative transportation modes after moving to Orenco. These are all factors that would be beneficial when comparing TOD to traditional development. While TOD is not the only solution for improving communities and giving residents different transportation options, it is an alternative that must be considered as the United States and the world continue to transition from rural to urban living.

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