Transit-Oriented Development in Portland:

Multiyear Summary Report of Portland State University Surveys

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1 Introduction

The term transit-oriented development (TOD) has been part of urban planning research and practice for over 25 years, though the concept has existed for longer. Though precise definitions vary, TOD generally refers to developments that are compact or dense, have a mix of land uses, are walkable, and are within a short distance (one-quarter to one-half mile) of a major transit station or hub (Jamme et al., 2019; Renne and Appleyard, 2019). TOD has become a common policy lever for local, regional, and state governments aiming to reduce reliance on private vehicles and increase use of transit systems, particularly rail systems, representing major capital investments. More recently, practitioners and scholars have looked at TOD as a potential tool for more equitable development, particularly in response to concerns that new rail transit investments could cause gentrification and displacement (Lung-Amam, Pendall, and Knaap, 2019).

As the number of TODs built grew in the 1990s and 2000s, so too did our understanding of how they influence travel behavior. A major study of California TODs in 2003 found that TOD residents were nearly five times as likely to take transit (and considerably less likely to drive) as residents living in the nearby community, with around a quarter of residents commuting by transit (Lund et al., 2004). These findings are consistent with other research that has shown that access to transit increases transit use (e.g., Ewing and Cervero, 2010; Park et al., 2018). The same study found that transit was much less common for non-work trips. For both work and non-work trips, the numbers varied considerably by specific TOD/location, with other factors such as workplace parking, employer policies around flex time and transit passes, along with land-use variables accounting for many of the differences. One recent review of this research also found that many studies demonstrate higher levels of transit use by TOD residents. However, findings are often inconsistent with respect to magnitude and influenced by many other factors, including regional context or accessibility, neighborhood characteristics, distance to the central business district, and demographics. In addition, results also varied depending on the outcome measure (e.g., transit use, motor vehicle use, vehicle miles travelled, commute vs. non-commute trips, and walking/bicycling behavior) (Ibraeva et al., 2020).

Since 2005, we have been conducting surveys of TOD residents in the Portland, OR, metropolitan region. The region has embraced TOD as an integral part of its growth strategy to reduce reliance on private motor vehicles and increase density within its urban growth boundary. The results from most of those surveys were published in a series of reports (Dill, 2006; Dill, 2007; Dill, 2011; Dill and McNeil, 2015). This report presents the cumulative results from those surveys, which aimed to understand residents' travel behavior and the factors that may influence mode choice, including demographics, attitudes, and housing preferences. The surveys were conducted in 2005, 2007, 2010, 2014, and 2018, often within one to three years of when the TOD was completed.

Most, though not all, of the TODs in our research were supported financially by the Portland Metro regional government's Transit-Oriented Development (TOD) Program. Metro's TOD Program has a stated goal of funding projects that "stimulate private development of higher-density and mixed-use projects near transit" (Metro, 2018). Section 2 of this report describes the 44 TODs included in this cumulative analysis. We also define two ways of grouping the TODs that we use to present our findings, one based on geography and the other based on TOD characteristics. Section 2.6 describes the survey process, including the instruments used, distribution processes, and response rates. While some aspects of our instrument and process changed with each successive round of surveys, most items remained consistent over the years. For this report, we focus on results from the survey questions that are consistent.

Our cumulative findings are presented in the subsequent sections and aim to answer the following questions:

- **Who lives in TODs?** The demographics of TOD residents will influence travel outcomes. In addition, knowing who lives in TODs can help us understand whether and how they may meet other policy objectives, such as providing housing opportunities for people with fewer travel options (e.g., lower-income households, older adults).
- **How do TOD residents travel?** If TOD is meeting its objectives, residents will be using transit, as well as walking and perhaps bicycling, to a greater degree than people not living in TODs. There should also be differences in vehicle ownership. Our surveys provide data on how the TOD residents travel and their vehicle ownership patterns. For some indicators, we can compare this to data for the city as a whole.
- **Did moving to a TOD change their travel behavior?**
- **What other factors influence travel behavior of TOD residents?** This section examines two issues. First, some residents may choose to live in a TOD because they want to use transit – they are self-selecting into a TOD environment. There is some debate over whether self-selection diminishes the value of TOD. Our analysis examines the interaction between respondents' housing and travel preferences and travel behavior. Second, we look at how the price of parking at worksites influences commute mode choice of TOD residents.
- **How do characteristics of a TOD correlate with differences in travel behavior?** Not all TODs are equal. Research shows that density, the mix of uses, proximity to downtown Portland, and transit accessibility may all influence the relative "success" of a TOD with respect to reducing private motor vehicle use.

2 TOD sites

Our surveys occurred in 2005, 2007, 2010, 2014, and 2018. In all years, Metro provided the funding to survey residents in TODs that received financial support through its TOD Program. Our 2005 surveys also included TODs that were not part of the Metro program. As shown in Figure 2-1, the TODs are located throughout the region. Most are near a MAX light rail station, though some are served instead by the Portland Streetcar, Westside Express Service (WES) commuter rail, and/or high-frequency TriMet bus service. General descriptions of the TODs appear below, with additional details in an appendix (Section 12.1).

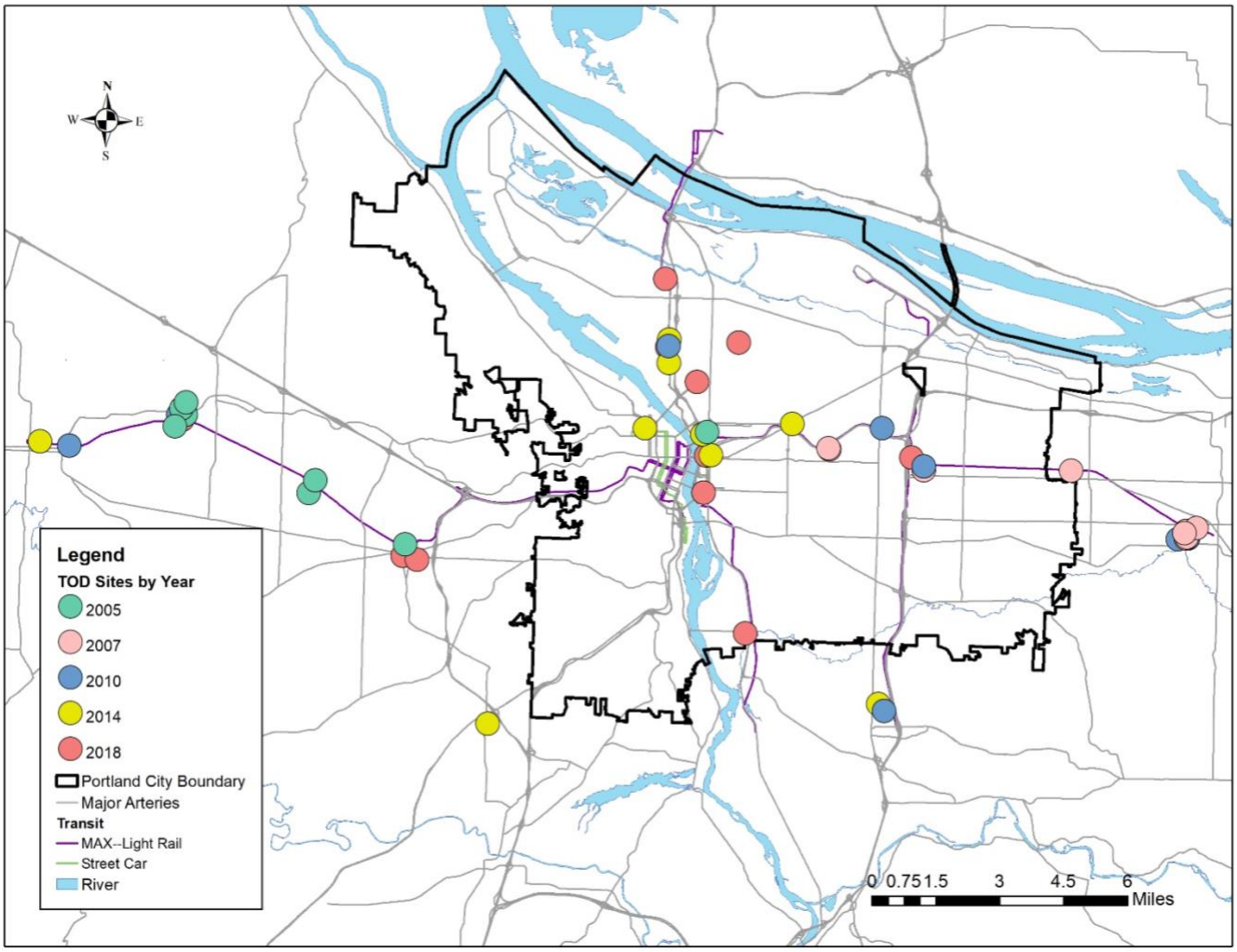


Figure 2-1 Map of all TOD locations

2.1 2005 sites

The first in our series of TOD surveys sought to control for regional accessibility by selecting primarily developments along the Westside MAX line in Washington County, including sites at or near Orenco Station and The Round at Beaverton (Table 2-1). These developments had received attention regionally and nationally as examples of TODs, making them appealing candidates to study. In addition, the 2005 survey included one site in the city of Portland toward which Metro had recently contributed TOD funding, The Merrick. The 2005 TODs include a mix of relatively dense, single-family homes (e.g., in the Orenco Station neighborhood and Arbor Gardens), townhouse style (some Orenco Station MFH, Club 1201, Arbor Station, Elmonica Station Condominiums), and multistory buildings (The Merrick, Beaverton Round, and some Orenco Station MFH) (Figure 2-2).

Table 2-1: 2005 TOD survey sites

Building Name	Year Built	# units	Building Type	City	Transit Station
Merrick	2004	150	Rental apartments with ground-floor retail	Portland	Convention Center MAX Station
Arbor Gardens	2002-2004	434	Townhomes	Hillsboro	Orenco–NW 231st MAX Station
Club 1201	2000	210	Townhomes	Hillsboro	
Orenco Station-MFH	1997-2003	114	Condominiums, some with ground-floor retail	Hillsboro	
Orenco Station-SFH	1997-2003	332	Single-family houses, triplexes, and duplexes	Hillsboro	
Arbor Station	2004	65	Townhomes	Beaverton	Elmonica MAX Station
Beaverton Round	2003	63	Condominiums with ground-floor retail	Beaverton	Beaverton Central MAX Station
Elmonica Station Condominiums	2004-2005	120	Condominiums	Beaverton	Elmonica MAX Station

Merrick

Beaverton Round

Club 1201

Orenco Station-MFH

Orenco Station-SFH

Arbor Station

Arbor Gardens

Elmonica Station Condominiums

Figure 2-2 2005 TOD survey sites

2.2 2007 sites

The 2007 TOD sites (Table 2-2) were on the east side of the Portland region, along the MAX Blue Line between downtown Portland and Gresham. Each of the TODs were within a quarter-mile straight-line distance to a MAX station and were higher density than surrounding buildings. Most were two to four stories and included parking, though at a lower number per dwelling unit than many suburban multifamily developments (Figure 2-3 and Figure 2-4). All of these developments were supported through Metro's TOD Program.

Table 2-2 2007 TOD survey sites

Building Name	Year Built	# unit	Building Type	City	Transit Station
Russellville Park (Senior)	2009	283	Apartments for seniors	Portland	NE 102nd Ave. MAX
Burnside Station	1999	22	Apartments	Portland	NE 172nd Ave. MAX
Center Commons	2001	39	Apartments	Portland	NE 60th Ave. MAX
Center Commons Townhomes	2001	26	Townhomes	Portland	NE 60th Ave. MAX
Russellville Commons	1998	222	Apartments	Portland	NE 102nd Ave. MAX
Bridal Veil	2000	8	Condominiums	Gresham	Gresham Center MAX
Central Point	2000	22	Condominiums with ground-floor retail		
Gresham Central	1996	90	Apartments		
Landmark	2007	29	Townhomes		
Oneonta	1995	20	Townhomes		
Three Cedars	2000	16	Apartments		

Russellville Commons and Russellville Park

Burnside Station

Center Commons Townhomes

Center Commons

Figure 2-3 2007 TOD sites in Portland

Gresham Central

Landmark

Central Point

Oneonta

Bridal Veil

Three Cedars

Figure 2-4 2007 TOD sites in Gresham

2.3 2010 sites

The 2010 sites were all supported by Metro and included more recently constructed TODs and a few that had not been included in previous surveys (Table 2-3). The sites include three buildings in Portland (one in North Portland and two in the outer east Portland area), three in Gresham, one in Happy Valley, and two in Hillsboro (one in downtown Hillsboro and one in the Orenco Station area). All of the buildings were between three and five stories in height (Figure 2-5). One of the sites, Broadway Vantage, was developed as affordable housing with some units set aside for formerly homeless families.[1]

Table 2-3 2010 TOD survey sites

Building Name	Year Built	# unit	Building Type	City	Transit Station
Broadway Vantage	2009	58	Apartments for income-eligible tenants	Portland	NE 82nd Ave. MAX
Patton Park	2009	54	Apartments with ground-floor retail	Portland	N Killingsworth St. MAX
Russellville Park (Senior)	2009	283	Apartments for seniors	Portland	NE 102nd Ave. MAX
Nexus	2007	422	Apartments with ground-floor retail	Hillsboro	Orenco/NW 231st Ave. MAX
Villa Capri West	2002	20	Apartments	Hillsboro	Washington/SE 12th Ave. MAX
Town Center Station	2010	52	Apartments	Happy Valley	Clackamas Town Center MAX
3rd Central	2009	34	Apartments with ground-floor retail	Gresham	Gresham Central MAX
The Beranger	2006	24	Condominiums with ground-floor retail	Gresham	

[1] http://www.innovativehousinginc.com/housing/broadway_vantage.html

3rd Central

Broadway Vantage

Nexus

Patton Park

The Beranger

Town Center Station

Villa Capri West

Figure 2-5 2010 TOD sites

2.4 2014 sites

The 2014 sites consisted entirely of buildings constructed between 2010 and 2014 (Table 2-4). The locations were more centrally located in the Portland region than past cohorts, with all but three being located within 2.5 miles of the Portland city center. The others were located one each in Tigard, downtown Hillsboro, and Happy Valley/Clackamas Town Center. All buildings in this round were at least four stories in height, and all but one were rental apartments. All but one also had ground-floor retail space.

The 2014 surveys also included University Pointe, adjacent to the Portland State University (PSU) campus in downtown Portland. While that development is privately owned and operated, it is marketed as housing for PSU students. Tenants can rent bedrooms in shared apartments. Given the distinct nature of the rentals and the tenants being overwhelmingly PSU students, we did not include the development in this analysis.

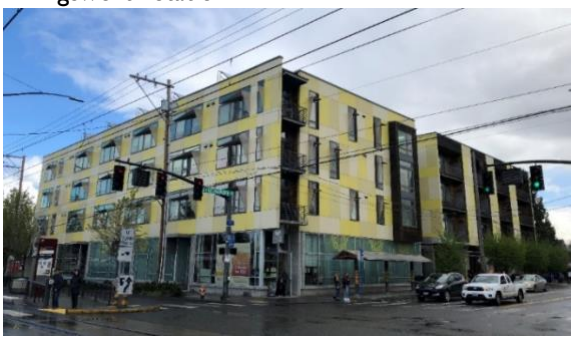
Table 2-4 2014 TOD survey sites

Building Name	Year Built	# unit	Building Type	City	Transit Station
Central Eastside Loft	2012	70	Apartments with ground-floor retail	Portland	SE Grand & E Burnside Portland Streetcar
Hollywood Apartments	2013	47	Apartments with ground-floor retail	Portland	Hollywood/NE 42nd Ave. Transit Center MAX
Killingsworth Station	2011	54	Condominiums with ground-floor retail	Portland	N Killingsworth St. MAX
Milano	2012	60	Apartments	Portland	Rose Quarter Transit Center MAX
Pettygrove	2012	95	Apartments with ground-floor retail	Portland	NW 21st & Northrup Portland Streetcar
The Prescott	2013	155	Apartments with ground-floor retail	Portland	N Prescott St. MAX
4th Main	2014	71	Apartments with ground-floor retail	Hillsboro	Hillsboro Central/SE 3rd MAX
Acadia Gardens	2012	41	Apartments with ground-floor retail	Happy Valley	Clackamas Town Center MAX
The Knoll	2010	48	Apartments with ground-floor retail	Tigard	Tigard Transit Center Westside Express Service (WES) commuter rail and bus

Central Eastside Lofts

Hollywood Apartments

Killingsworth Station



Milano

Pettygrove

The Prescott

Figure 2-6 2014 TOD sites in Portland

Acadia Gardens

The Knoll

4th Main

Figure 2-7 2014 TOD sites outside Portland

2.5 2018 sites

The 2018 sites were all part of the Metro TOD Program and were constructed between 2015 and 2017 (Table 2-5). Six of the buildings were in Portland (Figure 2-8), with four being within 2.5 miles of the city center. The ones further from downtown Portland were in the southeast Sellwood neighborhood (Moreland Crossing) and outer east Portland (Rose). Two sites were in the downtown Beaverton area, while one other was in the Orenco Station area of Hillsboro (Figure 2-9). Most of the buildings were four to five stories, with one being six (Hub9) and one being 10 (Slate). All were rentals.

The 2018 survey effort also included two developments that are all commercial space – Clay Creative and The Radiator. Our survey effort for those developments included surveys of employees and customers, which are not included in this report.

Table 2-5 2018 TOD survey sites

Building Name	Year Built	# unit	Building Type	City	Transit Station
5135 N. Interstate (Slogan)	2017	25	Apartments with ground-floor retail	Portland	N Killingsworth St. MAX
K-Street Apts.	2017	34	Apartments with ground-floor retail	Portland	NE 15th & Killingsworth MAX
Moreland Crossing Apts.	2015	68	Apartments	Portland	SE Tacoma/Johnson Creek MAX
Northwood	2016	57	Apartments with ground-floor retail	Portland	Kenton/N Denver Ave. MAX
Rose	2015	90	Apartments with ground-floor retail	Portland	E 102nd Ave. MAX
Slate	2017	75	Apartments with ground-floor retail	Portland	NE MLK & E Burnside Portland Streetcar
Hub9	2015	124	Apartments with ground-floor retail	Hillsboro	Orenco MAX
La Scala	2017	44	Apartments with ground-floor retail	Beaverton	Beaverton Transit Center WES commuter rail
The Rise at Old Town	2017	87	Apartments with ground-floor retail	Beaverton	Beaverton Central MAX

Slogan

K-Street Apartments

Rose

Northwood

Slate

Moreland Crossing Apartments

Figure 2-8 2018 TOD sites in Portland

The Rise

Hub9

La Scala

Figure 2-9 2018 TOD sites outside Portland

2.6 Analysis grouping

To present overall survey findings from 44 TODs in a manageable and cohesive manner, we explored a number of approaches to grouping respondents. We sought a grouping methodology which would account for differences in types of buildings and neighborhoods and allow for identifying significant differences between sets of respondents, while making intuitive sense as a grouping approach. We developed two groupings, one based on geographic location within the city and a second based on type of TOD. We use the geographic grouping to present most of our findings, and use the TOD type grouping mainly to explore differences in travel behavior by TOD characteristics.

2.6.1 Geographic grouping

We defined our geographic groups in part by examining some accessibility characteristics of the sites:

First, we considered the walk shed around the building location (or central point in the case of multiple building developments), using Network Analyst in ArcMap to bound a quarter-mile walk distance (using a streets layer derived from Metro's Regional Land Information System – RLIS). Across all TODs in the study, the average quarter-mile walk shed yielded an area of 68 acres, ranging from 35 acres on the low end to 88 on the high end.

Next, we looked to several existing methodologies for examining access to destinations and transit, namely Walk Score for walk accessibility (https://www.walkscore.com/) and the AllTransit Performance Score (https://alltransit.cnt.org/) developed by the Center for Neighborhood Technology . Walk Score considers the set of destinations that can be reached on foot and provides a score between one and 100. The Walk Score website suggested that scores between 90 and 100 constitute a Walker's Paradise, 70-89 is Very Walkable, 50 to 69 is Somewhat Walkable, and 0-49 is Car Dependent. Our sites ranged from 48 to 96. The AllTransit Performance Score considers the number of routes and transit trips departing from within one-half mile of the building, along with the number of jobs accessible via a 30-minute trip and the percentage of transit commutes in the census block group. The scores range from 1 to 10, with 10 being the best score. However, our sites all fell within a narrow range of 8.2 to 9.8.

A composite score was created that sought to roughly equally weigh the walk shed area (in acres), the Walk Score, and the AllTransit Performance Score. Because the walk shed area and Walk Score were already in a generally comparable range, we adjusted the AllTransit Performance Score (by cubing the score and dividing by 10) to yield a range of 55 to 94. The sum of these three numbers became the access score for the site.

In addition to the access score, we considered the distance to Portland's city center (city hall) in miles (network distance). Finally, we considered basic geographic location factors, including

being located in a city center area (including Portland, Gresham, Beaverton and Hillsboro) or a suburban area.

Considering these factors, five distinct groups emerged, each with significant commonalities within the group and differences between the groups. They included TODs within 2.5 miles of the Portland city center ("Portland Center" group); TODs in east Portland and the adjacent areas of Clackamas Town Center ("East Portland" group); TODs in Gresham ("Gresham" group); those in the city center areas of Beaverton and Hillsboro in Washington County ("West Center" group); and those in the suburban areas of Washington County ("West Suburb" group). Table 2-6 shows the average, minimum and maximum of each the scores discussed above for each of the groups. The walk shed average is highest in Portland Center, followed closely by Gresham. This likely reflects the gridded streets in these areas which were originally laid out in the early 1900s. The smallest walk shed is in the East Portland group, where much of the area was developed after World War II and includes some areas that were not annexed into the city of Portland until much later. The West Suburbs have the lowest Walk Score average, generally reflecting the lower number of shopping-type destinations in those areas. The West Suburbs also had the lowest AllTransit score, reflecting both the presence of fewer frequent transit lines and the distance to job centers via transit.

Table 2-6 Factor average, minimum and maximum by group

		Portland Center	East Portland	Gresham	West Center	West Suburb	Grand Total
Distance to Portland Center (miles)	Average	1.4	5.5	11.8	10.4	11.0	7.3
	Min.	0.3	3.2	11.7	7.2	8.5	0.3
	Max.	2.3	9.4	12.0	15.4	12.2	15.4
Quarter-mile walk shed (acres)	Average	77	60	73	67	63	68
	Min.	68	35	60	57	46	35
	Max.	83	78	88	79	74	88
Walk Score	Average	87	76	89	91	65	81
	Min.	82	67	83	80	48	48
	Max.	94	84	91	96	75	96
AllTransit Performance Score, adjusted	Average	80	79	80	78	62	76
	Min.	55	70	78	73	57	55
	Max.	94	83	80	86	70	94
Composite Access Score	Average	244	215	243	237	191	225
	Min.	226	195	227	215	176	176
	Max.	258	232	259	248	205	259

The first group of TOD locations were those within 2.5 miles of the Portland city center (Table 2-7). These locations had the largest average walk shed at 77 acres, were tied for the highest average adjusted AllTransit Performance score, and had the highest average composite access

score at 244. However, the Portland Center group only had the third highest average Walk Score at 87.

Table 2-7 Portland group

TOD Name	Address (all in Portland)	Dist. to Portland Center (miles)	Walk Score[a]	1/4-mile walk shed (acres)	Transit Perf. Score[b]	Adj. Transit Perf. Score[c]	Access Score
Milano	105 NE Multnomah St.	0.26	84	77	9.8	94.1	255
Merrick	1239 NE MLK Blvd.	0.32	91	68	9.8	94.1	254
Slate (Block 75)	124 NE 3rd Ave.	0.73	82	74	9.7	91.3	247
Central Eastside Lofts	111 NE 6th Ave	0.78	88	78	9.7	91.3	257
5135 N. Interstate	5135 N Interstate Ave.	1.97	86	79	9.1	75.4	241
The Prescott	1450 N Prescott	1.61	82	78	8.9	70.5	230
Patton Park	5272 N Interstate Ave	1.99	85	76	8.8	68.1	229
Pettygrove Point	1976 NW Pettygrove St	1.16	94	78	9.5	85.7	258
Killingsworth Station	1455 N Killingsworth St	2.13	88	77	9.1	75.4	240
K-Street Apts.	1650 NE Killingsworth St.	2.23	88	83	8.2	55.1	226
Hollywood Apts.	4111 NE Broadway	2.31	85	81	9.4	83.1	249

a: via Walkscore.org b: via alltransit.cnt.org c: cubed and divided by 10

East Portland sites (Table 2-8) were all more than three miles from the Portland city center (on average they were 5.5 miles away). They had the smallest walk shed size on average (60 acres) and the second lowest Walk Score (76 on average). However, their adjusted AllTransit Performance score was consistently among the highest at 79. The average composite access score of 215 rated them fourth out of five groups.

Table 2-8 East Portland group

TOD Name	Address (Portland except where noted)	Dist. to Portland Center (miles)	Walk Score[a]	1/4-mile walk shed (acres)	Transit Perf. Score[b]	Adj. Transit Perf. Score	Access Score
Center Commons townhomes	5845 NE Hoyt St	3.22	77	35	9.4	83.1	195
Broadway Vantage	8340 NE Broadway	4.42	67	51	9.4	83.1	201
Acadia Gardens	8370 SE Causey Ave (Happy Valley)	7.82	71	58	9.3	80.4	209
Center Commons	5845 NE Hoyt St	3.20	77	51	9.4	83.1	212
Northwood	8338 N Interstate Ave.	3.54	84	77	8.9	70.5	232
Moreland Crossing Apts.	8150 SE 23rd Ave.	4.99	72	78	8.9	70.5	220
The Rose	9700 NE Everett Court	5.16	70	63	9.4	83.1	216
Russellville Park Senior	20 SE 103rd Ave	5.47	80	65	9.3	80.4	226
Russellville Commons	10320 SE Pine St	5.48	81	63	9.3	80.4	224
Town Center Station	8719 SE Monterey Ave (Happy Valley)	8.03	78	61	9.3	80.4	219
Burnside Station	18200 NE Couch St	9.39	81	60	9	72.9	214

a: via Walkscore.org b: via alltransit.cnt.org c: cubed and divided by 10

The Gresham group (Table 2-9) had the second highest walk shed area (at 73 acres), due to a well-gridded street network in the downtown Gresham area. The Walk Score was also among the highest (89 on average), and the adjusted AllTransit Performance score was tied with the Portland Center locations for highest overall.

Table 2-9 Gresham group

TOD Name	Address (all in Gresham)	Dist. to Portland Center (miles)	Walk Score[a]	1/4-mile walk shed (acres)	Transit Perf. Score[b]	Adj. Transit Perf. Score	Access Score
Three Cedars	551 NE Roberts Ave	11.78	90	69	9.3	80.4	239
Gresham Central	800 NE Roberts Ave	11.82	91	67	9.3	80.4	238
Central Point	302 NE Roberts	11.84	91	88	9.3	80.4	259
Bridal Veil	246 NE 4th St	11.86	90	79	9.3	80.4	249
Oneonta	446 NE Hood Ave	11.86	90	80	9.3	80.4	250
The Beranger	287 NE 3rd St	11.89	90	79	9.3	80.4	249
3rd Central Point	188 NW 3rd St	11.66	89	60	9.2	77.9	227
The Landmark	861 NE Linden Ave	12.04	83	65	9.3	80.4	229

a: via Walkscore.org b: via alltransit.cnt.org c: cubed and divided by 10

The West Center group (Table 2-10) was in the middle of the groups in terms of walk shed size (67 acres) and adjusted AllTransit Performance score (78); however, they had the highest average Walk Score at 91.

Table 2-10 West Center group

TOD Name	Address	Dist. to Portland Center (miles)	Walk Score[a]	1/4-mile walk shed (acres)	Transit Perf. Score[b]	Adj. Transit Perf. Score	Access Score
La Scala	4725 SW Lombard Ave. (Beaverton)	7.22	95	76	9.2	77.9	248
The Rise at Old Town	4545 SW Angel Ave. (Beaverton)	7.48	96	63	9.3	80.4	239
4th Main	390 East Main Street (Hillsboro)	15.37	91	79	9.1	75.4	245
Beaverton Round	12600 SW Crescent Ave (Beaverton)	7.33	94	57	9.5	85.7	237
Villa Capri West	1160 SE Washington St. (Hillsboro)	14.69	80	63	9	72.9	215

a: via Walkscore.org b: via alltransit.cnt.org c: cubed and divided by 10

The West Suburb group (Table 2-11) had the lowest overall composite access score at 191. The walk shed size was only larger than East Portland (at 63 acres), while the Walk Score and adjusted AllTransit Performance score were each the lowest, on average, of all the groups.

Table 2-11 West Suburb group

TOD Name	Address (Hillsboro except where noted)	Dist. to Portland Center (miles)	Walk Score[a]	1/4-mile walk shed (acres)	Transit Perf. Score[b]	Adj. Transit Perf. Score	Access Score
The Knoll	12291 SW Knoll Drive (Tigard)	8.49	67	63	8.3	57.2	188
Elmonica Station Condominiums	1120 SW 170th Ave (Beaverton)	8.99	48	58	8.9	70.5	176
Arbor Station	17123 SW Berkeley Ln (Beaverton)	9.19	55	60	8.8	68.1	183
Club 1201	1201 NE Horizon Loop	11.95	74	46	8.4	59.3	179
Orenco Station - SFH	1619 NE Orenco Station Pkwy	11.95	68	74	8.4	59.3	201
Hub9	980 NE Orenco Station Loop	12.03	71	70	8.4	59.3	201
Orenco Station - MFH	1340 NE Orenco Station Pkwy	12.05	75	71	8.4	59.3	205
Nexus	1299 NE Orenco Station Pkwy	12.12	71	66	8.4	59.3	197
Arbor Gardens	6305 NE Chestnut St	12.20	55	61	8.8	68.1	185

a: via Walkscore.org b: via alltransit.cnt.org c: cubed and divided by 10

2.6.2 TOD type grouping

In addition to grouping the TODs by geography, we sought to group TODS by how much they adhere to characteristics traditionally associated with transit-oriented development, including having densities of people and destinations, and multimodal transportation options and infrastructure that is conducive to supporting trips by modes other than single-occupant vehicles (SOV). As discussed in the introduction, there are multiple definitions of TODs with varying levels of specificity, and no widely agreed upon quantitative distinctions between a TOD and something less conducive to non-SOV travel. However, we sought to create groupings that would allow for the comparison and differentiation between developments that get closer to the dense and transit-rich environments and those that are further from meeting those objectives.

To classify our TODs, we used two dimensions and two levels within each dimension, resulting in four categories.

The first dimension differentiates TODs based on the density of populations and jobs. These measures speak to both the market for services and transit (population, as well as employees) and the likelihood of having destinations (jobs). A prior study that sought to identify TOD thresholds used this measure and proposed a cutoff of 30 people and/or jobs per acre (Renne and Ewing, 2013). Given the range of developments in our sample, we use a threshold of 23 people and/or jobs per acre as a break between what we termed high- and low-density groups.

The second dimension measures the transportation environment around the development, including walkability and transit access. For this, we used three measures, each with equal weighting:

1. Intersection density as a proxy for walkability;
2. Transit access using two metrics from the AllTransit tool (https://alltransit.cnt.org/): the number of weekly transit trips accessible within a quarter-mile of the site location and the number of jobs accessible by transit within 30 minutes; and
3. Distance to the TOD's primary transit station (usually a light rail station).

The result was a four-group matrix of density and transportation access: High Density and High Transportation (eight buildings); High Density and Low Transportation (three buildings); Low Density and High Transportation (10 buildings); and Low Density and Low Transportation (20 buildings). The breakdown by building is shown in Table 2-12. We included the TODs for seniors in a separate category, as the travel behavior of those residents differs significantly, and the developments sometimes provide other transportation services. The analysis in Section 8 does not include those developments. In addition, note that there are only three developments and 54 survey respondents in the High Density and Low Transportation category. This makes sense, given the Metro aim of supporting TODs near high-quality transit. Therefore, in the analysis, we suggest focusing more on the other three TOD types.

Table 2-12 Density and transportation matrix

	Transportation High	Transportation Low
Pop + Jobs Density High	n=267 Beaverton Round Central Eastside Lofts (Couch St. Apts.) Hollywood Apts. Merrick Milano Russellville Commons Slate (Block 75) The Rise at Old Town	n=54 La Scala (Lombard Plaza) Town Center Station Pettygrove
Pop + Jobs Density Low	n=222 5135 N. Interstate (Slogan) Bridal Veil Broadway Vantage Center Commons (rental & townhomes) Killingsworth Station (K Station) Hub9 (The Core) Northwood Oneonta Patton Park The Prescott	n=500 3rd Central 4th Main Acadia Gardens Arbor Gardens Arbor Station Burnside Station Central Point Club 1201 Concordia University K-Street Apts. Elmonica Station Condominiums Gresham Central Landmark Moreland Crossing Apts. (Moreland Station) Nexus Orenco Station - MFH Orenco Station - SFH Rose The Beranger Three Cedars Villa Capri West
Senior	n=200 Russellville Park (2007 and 2010) The Knoll	

3 Survey development and implementation

The 2005 survey was developed borrowing questions (with permission) from two other sets of researchers and previous work by the author (Dill). The first survey borrowed from was used by Professors Hollie Lund, Richard Willson, and Robert Cervero in their research on TODs in California, "Travel Characteristics of Transit-Oriented Development in California." That survey focused on collecting commute information and data about three recent trips. The other survey that we borrowed from was developed by Professors Susan Handy and Patricia Mokhtarian at the University of California, Davis. That survey was used in a study of several neighborhoods in California, focusing on people who had recently moved. It collected broader information about travel, particularly non-work travel, along with information about travel and housing preferences and decisions.

The 2005 survey asked respondents to recall for the past week (defined by dates on the form) the number of trips they made from their home by various modes (private vehicle, walk, bicycle, bus, and MAX) for 13 purposes. This was done to estimate a "trip generation" rate for the development. After the initial survey, this portion of the form was replaced with a separate one-day travel diary. Both eight-page survey forms included the following sections:

- Information on Your Household. This included questions on household size and number of vehicles.
- Information on Your Place of Work/School and Commuting.
- Information on Commuting from Your Prior Residence
- Your Daily Travel. This section focused on non-work travel during different times of the year.
- Information on Your Current Place of Residence. This section focused on the importance of various items in selecting their home. Most of the questions came from the Handy and Mokhtarian instrument. In the second phase, a series of questions on sense of community were included.
- Information on Your Travel Preferences. This section attempts to gauge people's preferences for various modes and was developed by Handy and Mokhtarian.
- Your Household Vehicles. This section includes a question from Handy and Mokhtarian about changes in vehicle ownership resulting from characteristics of their current neighborhood.
- Information About You. This section includes standard demographic questions and some questions about mobility impairments.

Surveys for subsequent years followed this format for the most part, with most of the questions remaining identical from year to year in order to allow for comparison. However, minor changes were made:

- 2007: The one-day travel diary was replaced with a "trip log" where respondents would note how many trips they made, for what purposes, and by what modes. The goal was to reduce the burden on the survey taker, but still allow for trip generation rates.
- 2010: The separate trip log was replaced with a set of guided questions within the main questionnaire about up to seven trips they took from home on the most recent Tuesday. The questions asked where they went, how they got there, and how they got home. To include the guided questions, but keep the survey the same overall length (eight pages), several questions were cut, including questions about the frequency of walk, bike or transit trips taken during wet and cold weather. One set of questions on their views about their neighborhood was removed. A few other minor edits were made, including updating car-share options to include Zipcar.
- 2014: Based on feedback from Metro staff, we made efforts to reduce the number of questions in certain sections in order to reduce the burden on survey respondents. This consisted primarily of reducing the number of options included in the list of factors that were (or were not) important to the respondent in selecting their home, and statements about their travel preferences. On the trip log, we asked about any trips made during the day, and not only trips made to and from home. This was done in order to understand if trip-chaining was occurring. Mobility options were again updated to including new car-sharing options. We included a question on how many bike trips they had made in the past 30 days. We updated questions about how their new residence differed from their prior residence in terms of size, cost and commute.
- The 2018 survey was very similar to the 2014 survey, except that some travel options were updated to include options such as Uber, Lyft, and bike share.

3.1 Survey packet and mailing

In most cases, survey packets were mailed to each unit in a TOD building, although in a few cases only a random subset of all units were selected (usually in larger developments in more than 200 units). For certain larger buildings, and with the permission of building management, surveys were placed at or under the doors of each unit. In cases where a building manager or operator were able to provide us with a list of unoccupied units, such units were omitted. Packets contained an introductory letter, survey forms, and pre-paid pre-addressed return envelopes. Generally, two surveys were included in the packet, with instructions indicating that all adults residing in the household were invited to take the survey. In cases where a building manager was able to provide the number of adults residing in each unit, the number of surveys corresponded to that number. In some cases, building managers agreed to collect (or place a collection box for) the surveys on-site. The first survey packet was followed up by a reminder postcard and second mailing to non-respondents. We have 1,243 usable surveys for this cumulative analysis.

Table 3-1 Incentives

	Survey per packet	Incentive
2005	2 (Merrick); 1 (West Side)	$3 Starbucks card included in all packets
2007	1	Respondents entered for $300 Fred Meyer gift card
2010	2, except where exact # of adults were known (Russellville Park)	$5 gift card included in packet (some buildings) or upon submission of completed survey to building manager.
2014	2, except where exact # of adults were known (The Knoll and The Prescott)	$5 gift card to local merchant (coffee shop, etc.) for completed survey, plus drawing for $100 Amazon gift card. K Station and The Hollywood each had drawings for five $50 Amazon gift cards
2018	2, except where exact # of adults were known (K St., Northwood, Slogan, Rise, Rose)	$5 Starbucks gift card mailed to all people completing survey. Entry for one of 10 $100 Amazon gift cards.

3.2 Response rates

Because we allowed for more than one response per unit in 2010, 2014, and 2018, we calculated response rates for those years based on the share of units with at least one response, as follows:

$$\text{Unit response rate} = \frac{\text{\# responding units}}{(\text{\# units sent}) - (\text{\# returned as vacant or undeliverable})}$$

Those response rates ranged from 13% to 59% at the building level, with overall response rates by year of 30-36% (Table 3-2). The table also shows both the total number of responses and the number of responding units. In most buildings, only a small share of the units returned more than one survey.

Table 3-2 2018, 2014, and 2010 unit response rates

	# of units	Undeliverable/ vacant	# of responding units	Total responses	Unit Response rate
2018					
Slogan	25	3	11	12	50%
Hub9	124	24	13	14	13%
K-Street Apts.	28	9	5	5	16%
La Scala (Lombard Plaza)	44	5	7	8	18%
Moreland Crossing	68	?	29	34	43%
Northwood	57	2	25	28	45%
Slate	75	5	19	27	27%
Rose	86	1	24	27	28%
The Rise at Old Town	75	3	26	29	36%
2018 total	*582*	*52*	*159*	*179*	*30%*
2014					
Killingsworth Station	54	0	32	39	59%
Hollywood Apartments	47	1	16	17	35%
Central Eastside Lofts	70	5	17	27	26%
Milano	60	6	21	26	39%
Pettygrove	95	3	20	26	22%
The Knoll	48	0	24	27	50%
The Prescott	155	5	49	60	33%
4th Main	71	22	11	11	22%
Acadia Gardens	41	1	12	18	30%
2014 total	*641*	*43*	*202*	*251*	*34%*
2010					
3rd Central	34	0	11	11	32%
Broadway Vantage	58	1	12	15	21%
Nexus	421	43	117	142	31%
Patton Park	53	1	24	30	46%
The Beranger	24	3	5	5	33%
Town Center Station	52	6	19	20	41%
Villa Capri West	20	2	4	4	22%
Russellville Park (senior)	283 (200 surveyed)	5	97	111	50%
2010 total	*862*	*61*	*289*	*338*	*36%*

In 2007, we only included one survey for each unit, except for Russellville Commons and Russellville Park, where we knew ahead of time how many units were vacant and how many included more than one person. We calculated response rates for 2007 based on the number of surveys sent:

$$\text{Response rate} = \frac{\text{\# responses}}{(\text{\# surveys sent}) - (\text{\# returned as vacant or undeliverable})}$$

Those response rates ranged from 0% to 42% at the building level, with an overall response rate of 26% (Table 3-3).

Table 3-3 2007 response rates

	# of units	# surveys sent	Undeliverable/ vacant	Total responses	Response rate
Russellville Commons	222	279	19	52	20%
Russellville Park (senior)	149 non-vacant	149	0	62	42%
Gresham Central	90	90	6	18	21%
Central Point	22	22	13	0	0%
Center Commons townhomes	26	26	1	4	16%
Center Commons	39	39	1	7	18%
Oneonta	20	20	1	8	42%
Bridal Veil	8	8	0	2	25%
Landmark	29	29	3	4	15%
Three Cedars	16	16	3	1	8%
Burnside Station	22	22	3	3	16%
Total	643	700	50	168	26%

In 2005, with one exception (The Merrick) we only included one survey for each unit. In addition, for some developments we randomly surveyed only half of the units. We calculated a unit response rate for these sites, as shown in Table 3-4, to be consistent across the sites. The response rates ranged from 24% to 43% at the building level and 31% overall.

Table 3-4 2005 response rates

	# units	# units sent surveys	Undeliverable/ vacant	Total units responding	Unit response rate
Merrick	150	150	0	65*	43%
Club 1201	210	105	9	23	24%
Orenco Station - MFH	114	114	13	28	26%
Orenco Station - SFH	332	166	0	52	32%
Arbor Station	65	65	7	16	28%
Arbor Gardens	434	217	4	68	32%
Elmonica Station Condominiums	120	120	10	26	24%
Beaverton Round	63	63	12	13	25%
Total	1488	1000	55	291	31%

*We received 76 surveys from 65 units.

4 Who lives in TODs?

Demographic characteristics of the respondents are summarized in Table 4-3 , with comparison data from the cities in Table 4-2. The comparison data is from the 2011 five-year estimates from the American Community Survey, about the mid-point of when these surveys were conducted. The demographic characteristics shown are likely to affect travel behavior.

Overall, the TOD households are smaller than the general population. Except for in the West Suburbs, about 90% or more of respondents living in the households had only one or two people; in the West Suburb group it was 80%. These shares are much higher than for the cities surrounding the TODs, even compared to renter-occupied households in those cities. This may be the result of smaller housing units in the TODs. The East Portland group and West Suburb group had higher percentages of respondents in households with children under 16 (13% and 15%, respectively) compared to other groups. Though all of these shares are much lower than the households in the cities.

Some of our TODs had large shares of older adults. This was particularly true in Gresham where 75% of the respondents were over 64 years old. Only 14% of the Gresham population is over 64. Just over one-quarter (27%) of the East Portland group respondents were over 64, compared to 13% of Portland's population. This higher rate among respondents is due, in part, to one of the TODs (Russellville Park) being a community for older adults. For the Portland Center and West Center groups, the share of TOD residents over 64 was lower (5% for both) compared to the surrounding cities (13% in Portland, 13% in Beaverton, and 10% in Hillsboro). While this may be due, in part, to response bias, it also likely reflects the characteristics or style of some of the newer TODs in the urban areas. The age distribution is likely correlated with the share of respondents who indicated that they have a physical or anxiety condition that prevents them from driving a vehicle or using public transit. The shares of respondents indicating such a condition was low (3-10%) for all areas except Gresham, where over 20% of respondents had such a condition.

The majority of all respondents were women (62%), with the highest rates of female respondents in East Portland and Gresham. This is likely due to response bias and the age demographics in those areas. In Portland Center and West Center, the gender split (50% and 55%, respectively) is close to that of the cities. The West Suburb respondents were 66% female. For several of these surveys, we only included on survey form per household. Our experience is that women are more likely to complete the survey in such situations, so this result may be due mainly to response bias.

The economic characteristics in Table 3-1 show that respondents in East Portland and West Center had lower median income level compared to other groups. Overall, 19% of the respondents had incomes under $25,000, with rates higher in the two Portland groups. Note that these dollar figures are not adjusted for inflation.

Our TOD respondents appear to have higher levels of education than the surrounding cities. Overall, 61% of our respondents had a four-year college degree or higher, though it ranges from 38% in Gresham to 72% in the West Center group.

Table 4-1 Demographic characteristics of TOD residents

	Portland Center	East Portland	Gresham	West Center	West Suburb	Total
Average # people per household	1.6	1.7	1.4	1.6	1.9	1.7
% of respondents in 1-person households	48%[a]	44%	60%	51%	36%	45%
% of respondents in 2-person households	47%	44%	37%	40%	46%	44%
% of respondents in homes with people under 16	5%	13%	4%	3%	14%	10%
% of respondents 20-34 years old	57%	39%	7%	52%	43%	42%
% of respondents over 64	5%	27%	75%	5%	12%	21%
% female	50%	71%	67%	55%	66%	62%
Person of color[b]	23%	21%	6%	41%	21%	21%
Median Income (category)	$50,000-$74,999	$35,000-$49,999	$35,000-$49,999	$75,000-$99,999	$50,000-$74,999	$50,000-$74,999
% of respondents with income under $25,000	20%	28%	19%	16%	14%	19%
% of respondents with 4-year college degree	66%	54%	38%	72%	69%	61%
Has a physical or anxiety condition that prevents them from driving a vehicle	5%	8%	24%	5%	4%	8%
Has a physical or anxiety condition that prevents them from using public transit	3%	10%	22%	5%	4%	7%
n	324-346	248-275	134-159	58-65	373-395	1138-1240

Notes:

[a] Cells include % of respondents. About 12% of the respondents are from households where two or more adults responded to the survey.

[b] Person of color is here defined as non-white and not Hispanic/Latinx.

Table 4-2 Demographic characteristics of surrounding cities

	Portland	Happy Valley	Gresham	Beaverton	Hillsboro	Tigard
Of all housing units:						
% 1-person households	36%	7%	26%	30%	24%	28%
% 2-person households	34%	26%	32%	34%	32%	34%
Of renter-occupied housing units:						
% 1-person households	47%	9%	35%	38%	30%	36%
% 2-person households	30%	29%	26%	31%	28%	31%
% of homes with own children under 18	23%	56%	32%	29%	36%	32%
% of adults age 20-34	33%	20%	31%	31%	37%	27%
% of adults over 64	13%	11%	14%	13%	10%	15%
% of population 18+ female	51%	49%	51%	52%	50%	52%
% people not one race, white	23%	21%	20%	28%	28%	17%
Median Household Income	$50,177	$100,647	$47,852	$55,115	$64,197	$62,521
% of households with income under $25,000	25%	4%	25%	19%	16%	17%
% of pop. 25 years and older with a bachelor's degree or higher	42%	46%	18%	43%	34%	40%

All data from 2011 five-year estimates, American Community Survey (ACS)

Table 4-3 provides more detail that compares the income distribution for the groups. On average, the income bracket between $50,000-$74,999 had the highest percentage compared to other income brackets (21%). East Portland and Gresham had lower median income level (based on Table 3-1). Portland Center had more households (50%) earning less than $35,000 compared to other groups. West Center and West Suburb had higher percentage of households with income between $75,000 and $150,000.

Table 4-3 Household income category

	Portland Center	East Portland	Gresham	West Center	West Suburb	Total
Less than $15,000	7%	14%	3%	9%	7%	8%
$15,000-$24,999	13%	14%	16%	7%	6%	11%
$25,000-$34,999	10%	22%	19%	3%	10%	13%
$35,000-$49,999	16%	17%	31%	9%	11%	16%
$50,000-$74,999	21%	17%	17%	22%	23%	21%
$75,000-$99,999	16%	9%	9%	24%	20%	15%
$100,000-$149,999	15%	5%	4%	17%	17%	12%
$150,000 and over	3%	2%	2%	9%	5%	4%
n	321	248	134	58	373	100%

Note: Cells include % of respondents. About 12% of the respondents are from households where two or more adults responded to the survey.

The majority of the respondents work or go to school outside of home (Table 4-4). Respondents in Portland Center and West Center had the highest percentages of working or taking courses outside home. Of those who did commute to work or school, they commuted an average of 4.0-4.5 days per week.

Table 4-4 Commuting frequency

	Portland Center	East Portland	Gresham	West Center	West Suburb
I work outside of home	76%	65%	77%	76%	67%
I attend school outside of home	13%	5%	2%	16%	11%
No, I do not work or take courses outside my home	16%	33%	23%	10%	23%
n	325	249	43	58	348
Average # of days/week commuting to work or school (of those commuting)	4.5	4.5	4.0	4.4	4.5
n	268	166	32	53	268

Note: Respondents could choose both "work outside of home" and "attend school outside of home."

Overall, just over 30% of our respondents had lived in the TOD for six months or less and about half had lived there for one year or less (Table 4-5). The length of time in the residence did vary by geographic group, which was a function of when the surveys were conducted relative to when the developments were constructed. Many of the Gresham TODs were surveyed several years after construction.

Table 4-5 Length of time in home

	Portland Center	East Portland	Gresham	West Center	West Suburb	Overall
Up to 6 months	33%	28%	22%	60%	31%	31%
>6 months to 1 year	27%	19%	15%	13%	13%	18%
>1 year to 3 years	40%	43%	26%	23%	37%	37%
Over 3 years	<1%	10%	37%	3%	19%	13%
n	329	259	144	60	385	1117

Overall, 80% of our respondents rent their current home (Table 4-6). Respondents in the West Suburb group were more likely to own their homes (45%), which is a result of the developments included in the sample; there were several townhomes and condominiums in that group. Perhaps surprisingly, only 66% of the respondents indicated that they previously rented, indicating that many TOD residents shifted from ownership to renting in their move to the TOD. Overall, of those who answered both questions, 22% switched from owning to renting, while 10% switched from renting to owning. Only respondents in West Suburb increased the percentage of home ownership compared to the previous residence. The shift from owning to renting was most prevalent among people 60 years and older; 49% of those respondents

switched from owning to renting. Those demographic differences help explain the large shift in the East Portland and Gresham groups, where respondents were older than the other groups. The changes of housing tenure after relocation are possibly associated with increased housing affordability.

Table 4-6 Rent or own home

	Portland Center	East Portland	Gresham	West Center	West Suburb	Overall
Current Residence						
Rent	90%	97%	90%	85%	55%	80%
Own	10%	3%	10%	15%	45%	20%
n	334	268	154	60	391	1207
Previous Residence						
Rent	84%	72%	29%	63%	62%	66%
Own	16%	28%	71%	37%	38%	34%
n	295	225	132	56	361	1069

5 How do TOD residents travel?

5.1 Vehicle ownership and use

The large majority of TOD residents live in a household with zero or one motor vehicle available (Table 5-1). At least one-third of the residents live in a household with fewer vehicles than people or driving age (defined as persons 16 or older), with an average of 0.77 vehicles per adults in the TODs sites overall. Residents in West Center and West Suburb have a higher average number of vehicles per adult compared the other groups. Gresham's respondents have the highest percentage with fewer cars than adults and smallest average number of vehicles per adult. Vehicle availability of households in the surrounding cities is shown in Table 5-2. Figure 5-1 compares the TOD residents with one- and two-person households in the cities. From that figure, it is clearer that the TOD residents are more likely to live in a one-vehicle vs. two-vehicle household relative to the cities' households. This may be due to differences in the share of one- vs. two-person households, as well as decisions among the TOD residents to own fewer vehicles.

Table 5-1 Vehicle availability

	Portland Center	Portland East	Gresham	West Center	West Suburb	Total
Number of vehicles available to household						
0	17%	16%	27%	15%	6%	14%
1	59%	58%	61%	54%	56%	58%
2	22%	21%	9%	23%	32%	24%
3	2%	4%	0%	6%	5%	4%
4+	0%	0%	0%	2%	1%	<1%
Total	344	266	154	65	394	100%
Average number of vehicles per adult	0.75	0.76	0.62	0.82	0.84	0.77
% with fewer cars than adults	39%	37%	54%	37%	34%	39%

Note: Cells include % of respondents. About 12% of the respondents are from households where two or more adults responded to the survey. "Adult" defined here as persons 16 and over (driving age).

Table 5-2 Number of vehicles available to household of surrounding city residents

	Portland	Gresham	Beaverton	Hillsboro	Tigard	Happy Valley
All households						
0	15%	9%	8%	6%	6%	1%
1	40%	36%	42%	35%	33%	12%
2	33%	37%	37%	43%	43%	52%
3	9%	12%	10%	12%	13%	23%
4+	3%	6%	3%	5%	5%	13%
1- and 2-person households						
0	19%	11%	10%	9%	8%	1%
1	47%	47%	53%	47%	44%	21%
2	28%	34%	31%	37%	37%	53%
3	5%	6%	5%	6%	7%	22%
4+	1%	2%	1%	1%	3%	3%

All data from 2011 five-year estimates, American Community Survey (ACS)

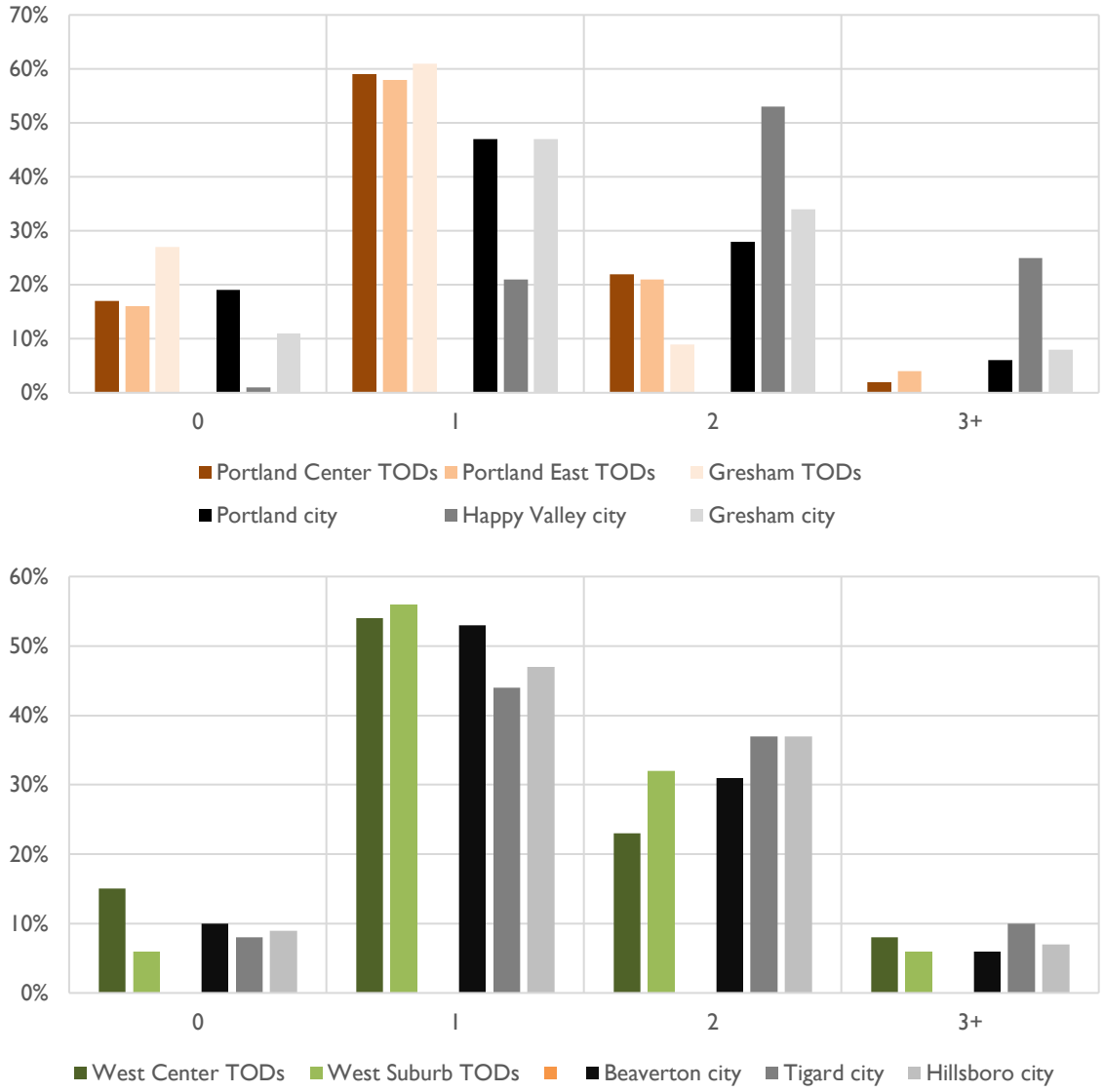


Figure 5-1 Comparison of vehicle ownership, TOD residents vs. city households with one or two people

We asked respondents to estimate how many miles they drive in a typical week, including weekends. The median and mean values with a 95% confidence interval are shown in Figure 5-2. The data are not normally distributed, with a few respondents entering very high numbers, over 400 miles a week. This skews the data, making the median values a more useful indicator of driving among the respondents.

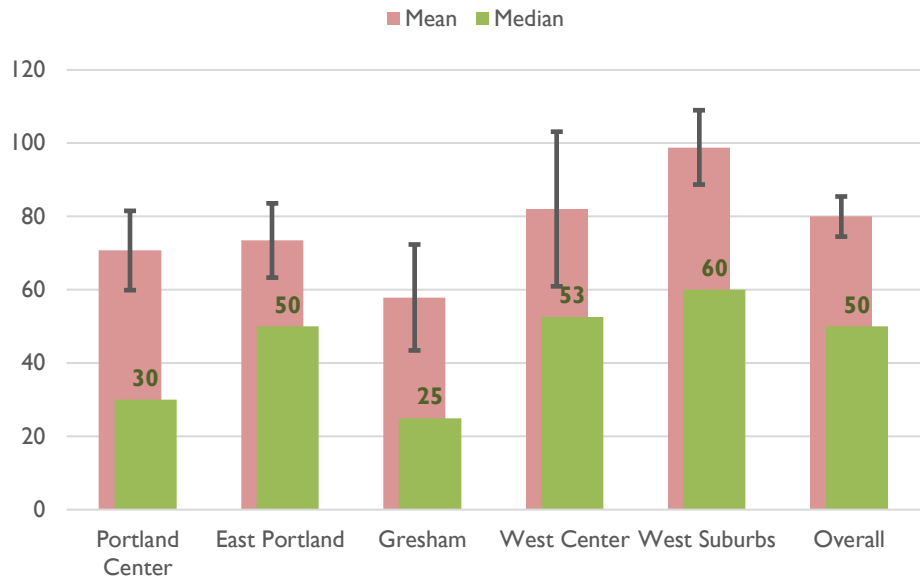


Figure 5-2 Miles driven in a typical week, mean per person

5.2 Commuting to work

We collected information on the frequency of use of various modes for commuting to work and/or school. We assigned a primary commute mode based on the most frequently used mode. If two or more modes were tied for most frequently used, the respondent was designated as "combination or other." Figure 5-3 shows that at least half of the respondents primarily commuted by private vehicle (usually alone), though there were some differences by geographic group. In particular, the Gresham group is an outlier, with 84% commuting by private vehicle (alone or carpool), though there were only 32 respondents who commuted to work or school. Among the four other groups, there are not significant differences in the shares primarily commuting by transit, which ranges from 19% to 27%. The share walking or biking to work/school is highest in the Portland Center group (15%), significantly higher than in East Portland (5%) and the West Suburb group (4%).

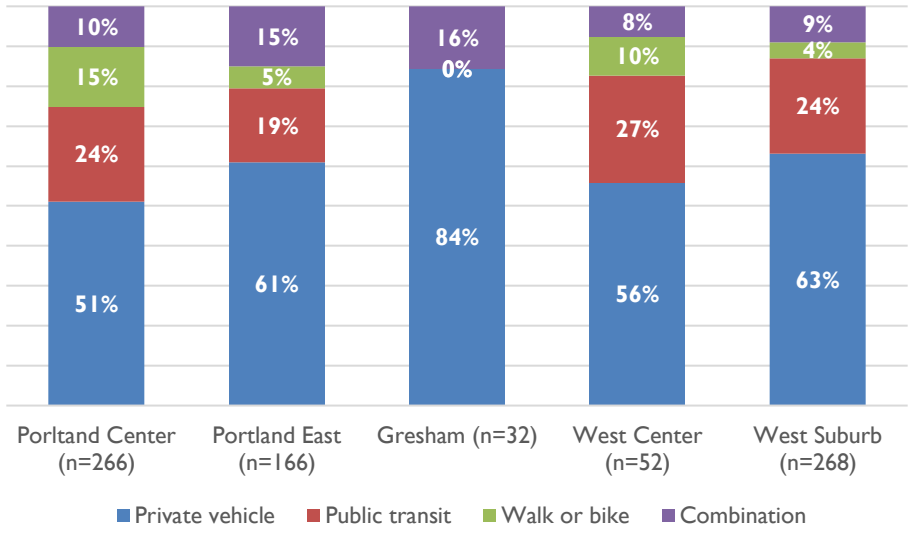


Figure 5-3 Primary commute mode of TOD residents

More details on commuting are shown in Table 5-3. Respondents in East Portland had the highest rate of commuting by MAX light rail four to five days a week (27%), though that was not significantly higher than the other groups (except Gresham). The significant differences between the four groups (other than Gresham) with respect to commuting by MAX light rail are for using it at least once a week, but less than four days a week. The East Portland group was less likely to use MAX at that frequency. This may indicate that those residents are less likely to use multiple modes for commuting. All four groups were equally likely to commute by MAX never or very infrequently. Residents in the West Suburb group were significantly less likely to use the bus or walk to work/school.

Table 5-3 Current commute mode frequency

		Portland Center	East Portland	Gresham	West Center	West Suburb	Total
Commute Mode: Drive alone (including motorcycle)	4 to 5 days / week	37%	58%	65%	52%	51%	48%
	At least 1x / month; up to 3 days / week	27%	17%	26%	19%	28%	25%
	Less than 1x / month; or never	36%	25%	10%	29%	21%	27%
Commute Mode: Carpool	4 to 5 days / week	6%	7%	11%	4%	7%	6%
	At least 1x / month; up to 3 days / week	12%	10%	11%	10%	11%	11%
	Less than 1x / month; or never	81%	84%	78%	86%	82%	82%
Commute Mode: MAX light rail	4 to 5 days / week	18%	27%	11%	20%	24%	22%
	At least 1x / month; up to 3 days / week	20%	10%	11%	22%	17%	17%
	Less than 1x / month; or never	61%	63%	79%	59%	59%	61%
Commute Mode: TriMet Bus	4 to 5 days / week	8%	9%	11%	4%	3%	6%
	At least 1x / month; up to 3 days / week	13%	13%	16%	16%	5%	10%
	Less than 1x / month; or never	79%	78%	74%	80%	92%	84%
Commute Mode: Walk	4 to 5 days / week	18%	17%	0%	12%	6%	12%
	At least 1x / month; up to 3 days / week	18%	14%	6%	14%	5%	12%
	Less than 1x / month; or never	64%	69%	94%	74%	89%	75%
Commute Mode: Personal Bike	4 to 5 days / week	7%	4%	0%	4%	2%	4%
	At least 1x / month; up to 3 days / week	14%	5%	11%	4%	5%	8%
	Less than 1x / month; or never	79%	91%	89%	92%	94%	88%
n range		248 to 260	134 to 254	18 to 31	48 to 51	248 to 262	713 to 760

Not shown: Portland Streetcar, car sharing, ride hailing/TNC, other.

The commute modes for the surrounding cities are shown in Table 5-4 based on the five-year American Community Survey (ACS) estimates from 2011. A direct comparison to our data must be qualified because the survey questions are different, as is the list of modes included. For example, the ACS includes motorcycle with taxi and other, while we include that as driving alone. The ACS also has a work-at-home category, though our survey only collects commute data from respondents who work or go to school outside of home. Even with these caveats, it is clear that the TOD residents commute by transit at higher rates than residents in the surrounding cities. Figure 5-4 shows the transit commute rates, with the ACS data adjusted by removing the work-at-home respondents. The Portland Center TOD respondents commute by transit at about twice the rate of city of Portland residents, while TOD residents on the Westside commute by transit at about three times the rate of residents in the cities of Beaverton, Tigard, and Hillsboro.

Table 5-4 Commute mode in surrounding cities

	Portland	**Happy Valley**	**Gresham**	**Beaverton**	**Tigard**	**Hillsboro**
Drove alone	60%	82%	73%	71%	75%	73%
Carpool	9%	8%	11%	9%	10%	11%
Transit	12%	1%	8%	8%	4%	7%
Walk	5%	1%	3%	5%	3%	3%
Bike	6%	0%	0%	1%	1%	1%
Taxi, motorcycle, other	1%	1%	1%	2%	1%	1%
Work at home	7%	7%	4%	5%	6%	5%

All data from 2011 five-year estimates, American Community Survey (ACS)

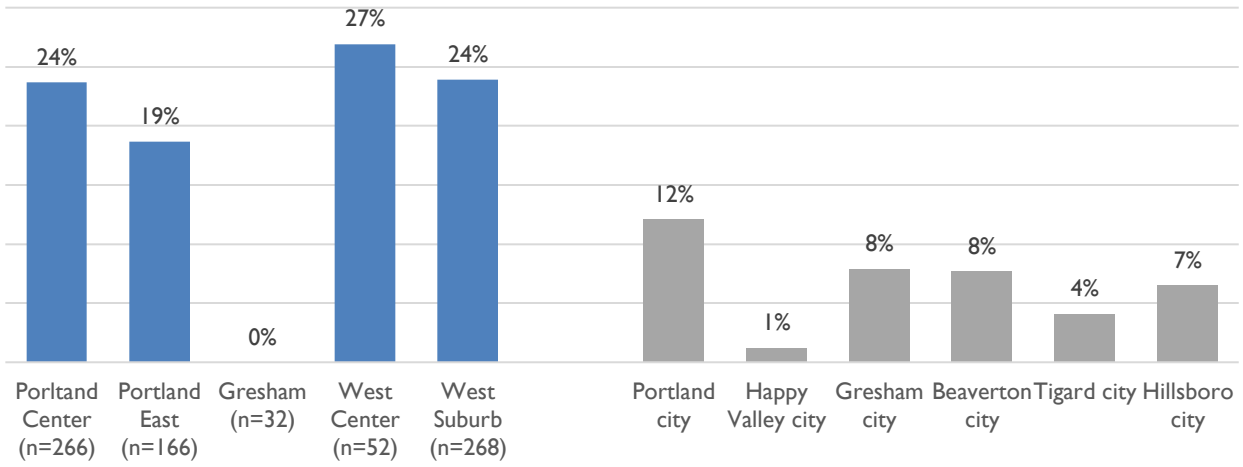


Figure 5-4 Commuting by transit, TOD respondents vs. city residents

5.3 Non-commute trips

While the TOD residents are using transit to commute to work or school, they are not using transit to get to other destinations very frequently (Table 5-5). Our survey asked how often respondents used transit and walking/biking to various non-commute destinations in a typical month of good weather as well as in wetter, colder weather. For this analysis we focus on the good-weather responses and the frequency of once a week or more. The most common non-commute transit destinations are stores/shopping (12%) and restaurants (11%). In general, respondents in Portland Center used transit for non-commute purposes more often than other groups, sometimes by a significant difference. This is likely related to the higher number of destinations accessible by transit, particularly in nearby downtown Portland. Residents in Portland Center were significantly more likely than all other groups, except West Center, to take transit to a restaurant or shopping once a week or more.

Table 5-5 Transit for non-commute purposes, once a week or more in good weather

	Portland Center	East Portland	Gresham	West Center	West Suburb	Total
service provider	9%	9%	5%	6%	4%	7%
restaurants, bars, coffee	20%	9%	2%	13%	8%	11%
stores/shops	19%	13%	7%	10%	9%	12%
gym/indoor recreation	9%	5%	3%	3%	4%	5%
park/open space	10%	4%	2%	5%	5%	6%
visit friends or family	10%	6%	1%	10%	3%	6%
entertainment	12%	6%	2%	6%	3%	6%
take someone else to school or daycare	3%	3%	1%	0%	<1%	2%
n range	254 to 328	248 to 254	126 to 133	60 to 62	383 to 388	

The TOD residents were more likely to walk or bike to those same non-commute destinations at least once a week or more in good weather (Table 5-6). Overall, 43% of the respondents walked or biked from home with no destination, 41% walked or biked to restaurants once a week or more in good weather, and 39% did so for shopping. One-third walked or biked to a park/open space. The differences between the groups likely reflect the differences in the number of destinations within walking distance in these neighborhoods. The most significant differences between the groups were for restaurants, to which two-thirds of the Portland Center residents walked weekly, significantly higher than all other groups. The Portland East and Gresham residents were significantly less likely to walk to restaurants compared to the other three groups. The differences for shopping were not quite as stark. The Portland Center, West Center, and West Suburb residents were all equally likely to walk to shop weekly, significantly more than the Gresham residents. The Portland Center and West Suburb rates of walking to shop were also significantly higher than East Portland. Portland Center and West Suburb residents were significantly more likely to walk to parks/open spaces than the other three groups.

Table 5-6 Walking and biking for non-commute purposes, once a week or more in good weather

	Portland Center	East Portland	Gresham	West Center	West Suburb	Total
service provider	19%	13%	13%	18%	13%	15%
restaurants, bars, coffee	66%	26%	21%	43%	35%	41%
stores/shops	49%	28%	23%	38%	44%	39%
gym/indoor recreation	27%	10%	12%	26%[d]	18%	18%
park/open space	40%	21%	15%	25%	42%	33%
walk/bike with no destination	48%	34%	39%	36%	46%	43%
visit friends or family	20%	12%	16%	15%	13%	15%
entertainment	18%	7%	7%	8%	4%	9%
take someone else to school or daycare	5%	2%	1%	5%	3%	3%
n range	251 to 328	243 to 251	119 to 129	59 to 62	382 to 389	

As another measure of walking in the neighborhood, the survey asked "How many times in the last 30 days did you take a walk, jog, or stroll around your neighborhood – for example to get exercise or walk the dog?" and "How many times in the last 30 days did you take a walk from your home to a business or store in the neighborhood?" Overall, just under one-third did so either one to five times or six to20 times (Table 5-7). The average was 13.9 times in the past 30 days. The only significant difference in the overall mean rate was between Gresham and the West Suburb group. The differences were more significant for walking to nearby businesses. Residents in Portland Center walked more frequently to nearby businesses than residents in the other TOD areas, except West Center. The Gresham residents were the least likely to walk to nearby businesses.

Table 5-7 Frequency of taking a walk, jog, or stroll around the neighborhood in the past 30 days

	Portland Center	**East Portland**	**Gresham**	**West Center**	**West Suburb**	**Total**
Walk, jog, or stroll around the neighborhood (e.g., for exercise or to walk the dog)						
0	15%	20%	29%	15%	13%	17%
1-5	30%	34%	31%	41%	30%	32%
6-20	33%	32%	25%	23%	31%	31%
21+	21%	15%	15%	21%	26%	20%
Mean	15.2	11.5	9.9	14.2	15.8	13.9
Median	8	5	4	5	10	6
n	329	259	137	61	388	1174
Walk to a business or store in the neighborhood						
0	7%	26%	42%	12%	18%	19%
1-5	33%	40%	32%	43%	43%	38%
6-20	49%	29%	23%	38%	31%	35%
21+	11%	5%	3%	8%	8%	8%
Mean	11.1	5.6	4.6	8.5	7.7	7.9
Median	8	3	1	5	5	5
Total	328	263	137	61	386	1175

6 Did moving to a TOD change travel behavior?

6.1 Changes in commute mode

The survey asked about the respondents' commute mode at their prior residence. The majority of respondents in all TOD groups previously commuted by private vehicle, with 15-21% using transit at their previous residence (Table 6-1). Compared to the current primary commute mode (Table 6-2), respondents in Portland Center experienced a large change of private vehicle commuting (from 66% to 51%), as did West Center residents (78% to 56%). Transit as a primary commute mode went up from 15% to 24% in Portland Center, 15% to 27% in West Center, and 15% to 24% in West Suburb TODs. There were not similar large shifts in walking and biking to work/school.

Table 6-1 Previous residence primary commute mode (inferred)

	Portland Center	East Portland	Gresham	West Center	West Suburb	Total
Private Vehicle	66%	64%	76%	78%	67%	67%
Public Transportation	15%	21%	18%	15%	15%	16%
Walk or Bike	14%	9%	3%	7%	8%	10%
Combination	6%	7%	3%	0%	10%	7%
Total	289	187	38	54	319	887

Table 6-2 Current primary commute mode (inferred)

	Portland Center	East Portland	Gresham	West Center	West Suburb	Total
Private Vehicle	51%	61%	84%	56%	63%	59%
Public Transportation	24%	19%	0%	27%	24%	22%
Walk or Bike	15%	5%	0%	10%	4%	8%
Combination	10%	15%	16%	8%	9%	11%
Total	266	166	32	52	268	784

Table 6-3 shows changes in primary commute mode from previous residence for the respondents who answered both questions, which eliminates, for example, people who retired and moved to the TOD. There is a net decrease in the share of people whose primary commute mode is a private vehicle: 10% switched from commuting primarily by private vehicle to transit, 4% switched from private vehicle to walking or bicycling, and 6% switched from private vehicle to a combination of modes, for a total of 20%. In contrast, 11% switched from those options to a private vehicle. Overall, 40% of the respondents changed their primary commute mode after moving to the TOD.

Table 6-3 Change in primary commute mode from previous residence

	Commute Mode	Old Mode				
		Private Vehicle	Public Transit	Walk or Bike	Combination	Total
New Mode	Private Vehicle	48%	4%	5%	2%	59%
	Public Transportation	10%	8%	2%	2%	22%
	Walk or Bike	4%	1%	3%	1%	9%
	Combination	6%	2%	1%	2%	11%
	Total	68%	16%	10%	6%	721

6.2 Self-reported changes in travel behavior

A series of questions asked residents about how their daily travel by mode compared to their previous residence. Overall, the TOD residents claim to be driving less and using transit and walking more than where they used to live (Table 6-4). Well over half claim that they drive less now, including 44% claiming to drive "a lot less." Gresham had the highest share of respondents reporting to drive a lot less (62%), though that may be the result, in part, of older residents retiring when they moved to the development. Thirty percent (30%) of all respondents claim they use public transit a lot more now, and 28% claim they walk a lot more now. About equal shares claim to bike less (25%) and bike more (20%). This may reflect shifts from bike to transit or walking. The residents in the West Center and West Suburb areas had the highest rates of claiming to use transit a lot more, significantly higher than residents in East Portland and Gresham. The East Portland residents were the least likely to indicate that they take transit or walk a lot more now.

Table 6-4 Use of modes compared to previous residence

How much to you _____ now compared to where you live at your prior residency?		Portland Center	East Portland	Gresham	West Center	West Suburb	Total
Drive	A lot less now	43%	45%	62%	49%	37%	44%
	A little less now	18%	15%	16%	24%	18%	18%
	About the same	27%	26%	16%	15%	28%	25%
	A little more now	6%	4%	0%	5%	7%	5%
	A lot more now	6%	10%	5%	7%	10%	8%
Use public transit (bus or rail)	A lot less now	7%	15%	24%	8%	11%	12%
	A little less now	9%	6%	6%	8%	4%	6%
	About the same	29%	34%	36%	25%	29%	31%
	A little more now	24%	21%	11%	17%	22%	21%
	A lot more now	31%	23%	21%	41%	35%	30%
Walk in your neighborhood	A lot less now	7%	19%	26%	10%	6%	11%
	A little less now	15%	14%	10%	10%	8%	12%
	About the same	26%	30%	19%	30%	32%	28%
	A little more now	24%	19%	18%	27%	19%	21%
	A lot more now	29%	17%	26%	23%	35%	28%
Ride your bike	A lot less now	14%	32%	34%	21%	17%	21%
	A little less now	6%	6%	3%	0%	3%	4%
	About the same	52%	49%	52%	55%	60%	55%
	A little more now	11%	6%	4%	9%	6%	8%
	A lot more now	16%	6%	6%	15%	14%	12%
n range		305-338	205-262	94-136	53-60	341-392	

To see if there were shifts in vehicle ownership caused by moving to the TOD, the survey asked "Did the number of vehicles available for daily travel by your household change as a result of the characteristics of your current neighborhood?" For about two-thirds of the respondents (73%), moving did not impact the number of vehicles in the household (Table 6-5). However, 14% of the respondents did indicate that they got rid of a vehicle because of the characteristics of the neighborhood, compared with 2% who got an additional vehicle because of the neighborhood. Another 9% are considering getting rid of a vehicle. As to the vehicle mileage they drive in a typical week, it shows that West Suburb drove more mileage on average compared to other groups. Even if Gresham reported the shortest mileage of driving per week, they reported a higher frequency of using a vehicle for the commute trip.

Table 6-5 Change in vehicle ownership after moving

	Portland Center	East Portland	Gresham	West Center	West Suburb	Total
No, but I/we are considering getting rid of a vehicle because of the characteristics of the neighborhood.	13%	10%	15%	7%	6%	10%
No, but I/we are considering getting another vehicle because of the characteristics of the neighborhood.	1%	1%	0%	4%	2%	2%
No, moving to this place has had no impact on the number of vehicles available to my household.	70%	72%	61%	73%	77%	72%
Yes, I/we got rid of a vehicle because of the characteristics of the neighborhood.	15%	12%	21%	13%	13%	14%
Yes, I/we got an additional vehicle because of the characteristics of the neighborhood.	1%	4%	3%	4%	1%	2%
Total	293	210	33	55	244	835

Note: Each subscript letter denotes a subset of categories whose column proportions DO NOT differ significantly from each other at the .05 level (Chi Square, Z-test)

7 What other factors influence travel behavior of TOD residents?

7.1 Residential preference

One section of the survey attempted to gauge how important various factors were to the respondents in choosing to live in their current home. The results are shown in Table 7-1, ranked from most to least important based on the average score. This list of questions changed some over the five surveys. The questions that did not appear on all five surveys have a sample size (n) smaller than 1,000. The factors most relevant to our research questions related to TODs are shaded in light grey.

High-quality living unit was a priority for most of the residents (3.5 out of 5), which was followed by affordability of the living unit and safe neighborhood for walking. Good public transit service (bus or rail) (3.1) ranked among the top factors. In 2014 we changed the wording of this question to separate questions about access to MAX light rail, the Portland Streetcar, and TriMet buses. For the 2014 and 2018 surveys, access to MAX ranked the highest, with an average of 2.7, followed by access to TriMet buses (2.2) and access to the streetcar (1.7). However, when we limited the analysis based on which type of transit station was closest, the importance of MAX access went up to a mean of 2.8, streetcar to 2.6, and TriMet buses to 2.3. Still, the lower level of importance of transit access in the later surveys is notable and something to explore more.

The respondents also value the accessibility the TODs are intended to provide. In particular, having shopping areas within walking distance was rated an average of 2.9 and was more important than access to a regional shopping mall (2.4).

There were significant differences between the five TOD groups for many of these factors (one-way ANOVA tests, $p<0.05$). For access to good public transit, Gresham respondents rated this significantly lower than the four other areas. There were no significant differences in the importance of having shopping areas within walking distance. The West Suburb respondents were significantly more concerned about having a low crime rate within the neighborhood, a low level of car traffic on neighborhood streets, and access to parks and recreation spaces. Those residents were also more concerned about having a safe neighborhood for walking compared to the other groups, except the West Center. Not surprisingly, the Portland Center respondents placed more importance on access to downtown.

Table 7-1 Importance of factors in choosing current residence

	Portland Center	East Portland	Gresham	West Center	West Suburb	Overall	n
High-quality living unit	3.5	3.3	3.6	3.5	3.5	3.5	1173
Affordable living unit	3.2	3.5	3.5	3.3	3.4	3.4	1181
Safe neighborhood for walking	2.9	3.2	3.1	3.3	3.4	3.3	738
High level of upkeep in neighborhood	2.8	3.1	2.9	3.1	3.3	3.1	751
Good public transit service (bus or rail)*	3.3	3.2	2.8	3.6	3.2	3.1	734
Low crime rate within neighborhood	2.7	3.1	3.0	3.0	3.4	3.1	1153
Relatively new living unit	3.0	3.0	3.0	2.9	3.2	3.1	1170
Attractive appearance of neighborhood	2.8	2.9	3.1	2.8	3.3	3.0	1164
Sidewalks throughout the neighborhood	2.8	2.9	3.2	2.7	3.1	2.9	1164
Good street lighting	2.6	3	2.9	2.9	3.0	2.9	747
Shopping areas within walking distance	2.9	2.8	2.7	2.9	3.0	2.9	1170
Quiet neighborhood	2.1	2.8	2.7	2.8	3.0	2.8	1153
Easy access to downtown	3.3	2.5	2.5	2.9	2.7	2.8	744
Parks and open spaces nearby	2.7	2.7	2.4	2.7	3.1	2.8	1158
Access to MAX*	2.8	2.6		2.8	2.3	2.7	420
Availability of off-street parking (garages or driveways)	2.6	2.7	2.7	2.6	2.6	2.6	1124
Close to where I work	2.8	2.5	1.7	3.1	2.7	2.6	1160
Easy access to the freeway	2.5	2.6	2.5	2.6	2.6	2.6	1163
Amenities in the building	2.7	2.5	1.9	2.7	2.5	2.5	1156
Easy access to a regional shopping mall	2.3	2.7	2.5	2.4	2.3	2.4	751
Low level of car traffic on neighborhood streets	2.1	2.3	2.3	2.1	2.6	2.3	1152
Lots of people out and about within the neighborhood	2.4	2.1	2.4	2.2	2.3	2.3	1155
Economic level of neighbors similar to my level	2.2	2.2	2.4	2.3	2.4	2.3	740
Diverse neighbors in terms of ethnicity, race, and age	2.3	2.3	2.2	2.8	2.3	2.3	1149
Close to friends or family	2.3	2.4	2.5	2.0	2.2	2.3	1141
Safe neighborhood for kids to play outdoors	1.9	2.4	2.0	1.9	2.4	2.2	724

	Portland Center	East Portland	Gresham	West Center	West Suburb	Overall	n
Access to TriMet Busses*	2.3	2.1		2.3	2.2	2.2	419
Variety in housing styles	2	2	1.9	2	2.4	2.2	741
Lots of interaction among neighbors	2.0	2.0	2.4	2.0	2.2	2.1	1153
Bike lanes and paths nearby	2.3	1.9	1.7	2.0	2.2	2.1	1143
Good investment potential	1.3	1.6	1.6	2.6	2.5	2.0	728
Big street trees	1.7	1.9	2.0	1.7	2.0	1.9	737
Access to Streetcar*	1.9	1.4		1.3	1.5	1.7	416
Living unit on cul-de-sac rather than through street	1.2	1.5	1.4	1.6	1.6	1.5	415
Access to car share vehicles*	1.7	1.3		1.2	1.5	1.5	717
High-quality K-12 school	1.2	1.4	1.3	1.2	1.5	1.4	1151
Large back yard	1.3	1.5	1.3	1.1	1.3	1.3	727
Large front yard	1.3	1.5	1.3	1.1	1.3	1.3	727
n range	101 to 337	105 to 262	114 to 139	15 to 59	37 to 386		

*The wording on the survey changed in 2014. Instead of asking about access to transit generally, the survey asked about MAX, buses, and Streetcar separately. Access to car-share vehicles was added in 2014.

Residents were asked how well the residence and its location met the current needs of their household, and over 70% of respondents indicated that the residence met their needs "well" or "very well" across four different criteria: location of the neighborhood in the region; characteristics of the neighborhood; location of the residence within the neighborhood; and characteristics of the residence itself (Table 7-2). Focusing on the "very well" responses, the East Portland respondents were significantly less satisfied than most of the other groups for all four items.

Table 7-2 How well do you think your residence and its location meet the current needs of your household?

		Portland Center	East Portland	Gresham	West Center	West Suburb	Total
Location of your neighborhood in the region	Very poorly	1%	3%	1%	4%	1%	1%
	Poorly	1%	4%	2%	0%	3%	3%
	Neither poorly nor well	8%	31%	21%	14%	16%	17%
	Well	33%	23%	23%	25%	26%	26%
	Very Well	57%	38%	54%	57%	54%	52%
Characteristics of the neighborhood itself	Very poorly	1%	5%	1%	4%	1%	2%
	Poorly	9%	9%	3%	11%	2%	5%
	Neither poorly nor well	17%	41%	38%	7%	16%	24%
	Well	36%	25%	20%	46%	26%	28%
	Very Well	36%	20%	39%	32%	55%	42%
Location of your residence within your neighborhood	Very poorly	1%	4%	1%	7%	<1%	1%
	Poorly	6%	4%	1%	4%	2%	3%
	Neither poorly nor well	12%	36%	26%	4%	15%	19%
	Well	39%	30%	25%	21%	27%	30%
	Very Well	43%	27%	47%	64%	56%	47%
Characteristics of the residence itself	Very poorly	2%	2%	1%	4%	1%	1%
	Poorly	3%	3%	1%	0%	2%	2%
	Neither poorly nor well	11%	31%	20%	7%	15%	17%
	Well	41%	28%	19%	14%	31%	30%
	Very Well	43%	35%	58%	75%	51%	48%
n range		216-217	169-172	143-150	28	377-379	955-967

7.2 Travel preference

Some recent research examining the links between land use, urban form, and travel behavior has found that people's attitudes and preferences regarding travel can significantly influence decisions. To help examine this further, the survey included a set of questions about travel preferences:

> We'd like to ask about your preferences with respect to **daily travel**. Please indicate the extent to which you agree or disagree with each of the following statements on a scale from "strongly disagree" to "strongly agree." There are no right and wrong answers; we want only your true opinions.

Respondents ranked a series of statements from "strongly disagree" (1) to "strongly agree" (5). Several of the items were about travel modes. From these questions, we created four scales using the average of the ratings for three or four questions, as shown in Table 7-3.

Table 7-3 Variables measuring attitudes towards travel modes

Question wording	New Scale
Public transit can sometimes be easier for me than driving.	Transit attitudes: higher value indicates more positive attitudes towards transit
I like taking transit.	
I prefer to take transit rather than drive whenever possible.	
I prefer to bike rather than drive whenever possible.	Biking attitudes: higher value indicates more positive attitudes towards bicycling
Biking can sometimes be easier for me than driving.	
I like riding a bike.	
I like walking.	Walking attitudes: higher value indicates more positive attitudes towards walking
I prefer to walk rather than drive whenever possible.	
Walking can sometimes be easier for me than driving.	
We could manage pretty well with one fewer car than we have (or with no car) (reverse coded).	Car attitudes: higher value indicates more positive attitudes towards cars and driving
Getting to work without a car is a hassle.	
I like driving.	
I need a car to do many of the things I like to do.	

Overall, our TOD residents were most positive about walking (3.6) and driving (3.6) and least positive about bicycling (2.6). Attitudes towards transit were in the middle (3.2). With a 1-5 scale, any average score above 3.0 is positive. The Gresham (2.7) and East Portland (2.9) residents were significantly less positive about transit than respondents in the other three groups. The Portland Center residents were the most positive about walking, significantly more so than the other groups except West Center.

Table 7-4 Attitudes towards different travel modes

Modal Attitude	Mean, 1-5 scale (5 most positive)					
	Portland Center	East Portland	Gresham	West Center	West Suburb	Overall
Transit	3.4	2.9	2.7	3.4	3.3	3.2
Biking	3.0	2.4	2.0	2.6	2.6	2.6
Walking	3.8	3.4	3.2	3.7	3.6	3.6
Car	3.3	3.6	3.5	3.3	3.5	3.5
n range	325-334	244-249	112-122	58	375-383	1129-1144

The average scores from several of the other travel-related attitudes are shown in Table 7-5. These respondents place a high priority on getting some physical exercise every day (mean score of 4.3). They also place importance on minimizing travel, as shown in their relatively high average scores for organizing their errands so that they can make as few trips as possible (4.2), when I need to buy something, I usually prefer to get it at the closest store possible (3.7), and I often use the telephone or the Internet to avoid having to travel somewhere (3.6).

Table 7-5 Additional travel attitudes

	Mean, 1-5 scale (5 most positive)						
	Portland Center	**East Portland**	**Gresham**	**West Center**	**West Suburb**	**Overall**	n
It is important to me to get some physical exercise every day.	4.3	4.2	4.2	4.4	4.3	4.3	664
I prefer to organize my errands so that I make as few trips as possible.	4.1	4.2	4.3	3.9	4.2	4.2	1149
Fuel efficiency is an important factor for me in choosing a vehicle.	3.6	3.9	3.8	3.7	4.0	3.9	710
Traveling by car is safer overall than riding a bicycle.	3.7	3.7	3.9	4.1	3.7	3.7	728
When I need to buy something, I usually prefer to get it at the closest store possible.	3.6	3.8	3.7	3.6	3.7	3.7	1148
I often use the telephone or the Internet to avoid having to travel somewhere.	3.4	3.5	3.5	3.4	3.8	3.6	1134
The trip to/from work is a useful transition between home and work.	3.3	3.3	3.2	3.4	3.3	3.3	1068
The price of gasoline affects the choices I make about my daily travel.	2.7	3.6	3.2	2.8	3.3	3.2	717
I try to limit my driving to help the environment.	3.2	3.1	3.2	3.3	3.2	3.2	1125
I use my trip to/from work productively.	3.2	3.1	2.5	3.4	3.1	3.1	1056
Travel time is generally wasted time.	2.8	2.7	2.6	3.3	3.0	2.9	722
Traveling by car is safer overall than walking.	2.6	3.1	3.1	2.8	2.7	2.8	1138
The only good thing about traveling is arriving at your destination.	2.6	2.8	3.0	2.6	2.7	2.7	1135
Traveling by car is safer overall than taking transit.	2.6	2.8	3.0	2.5	2.6	2.7	714
My household spends too much money on owning and driving our cars.	2.6	2.5	2.6	2.5	2.5	2.6	718
I would like to own at least one more car.	1.9	1.9	1.9	1.8	1.9	1.9	1137
	30-333	135-253	90-125	16-58	342-383	177-1149	

In 2018 we added questions about attitudes towards new modes (Table 7-6). On average, the respondents neither agreed nor disagreed with the statement about new transportation services making it easier for them and they were somewhat open to trying new services or technologies.

Table 7-6 Attitudes towards new travel modes

	Mean, 1-5 scale (5 most positive)					
	Portland Center	**East Portland**	**Gresham**	**West Center**	**West Suburb**	**Overall**
New transportation services (e.g., Uber, Lyft, car share, bike share) make it easier for me to do many of the things I like to do.	3.2	3.0	Not included	2.8	3.1	3.0
I like to stick to transportation modes I know rather than trying new services or technologies.	2.4	2.9	Not included	2.7	2.9	2.7
n	43	89		31	14	177

7.3 Self-selection

The idea behind "self-selection" is that the people who move to TODs already prefer to use transit and, therefore, the characteristics of the TOD and the neighborhood are not necessarily changing their behavior. This topic has been debated extensively in the research on relationships between the built environment (including TODs) and travel behavior. Researchers have employed a number of techniques to try to account for the role self-selection might play in travel behavior relative to the influence of the built environment (Mokhtarian and Cao, 2008; Mokhtarian and van Herick, 2016). Reviews of this research generally find that self-selection is a factor, but that the built environment still exerts some independent influence on travel behavior (Cao, Mokhtarian, and Handy, 2009). Moreover, other scholars have argued that too much focus has been placed on the issue of self-selection. In particular, in the U.S. context there is often a shortage of TOD-style housing for people who want to select to live there. So, providing more does influence travel behavior by allowing people to better match their attitudes with their environment (Levine, Inam, and Torng, 2005).

To explore the potential role that self-selection might play in the travel behavior of our sample of TOD residents, we created a simple measure of self-selection based on the answer to the question about how important transit access was in choosing their home. As noted above, the wording on our question changed in 2014 from a single question about transit to separate questions about the type of transit (MAX, Portland Streetcar, buses). To create a single measure, we took the maximum rating from the three questions in 2014 and 2018 and the single answer from the previous surveys. Overall, 13% of our respondents rated transit a one "not at all important" on our scale, 15% rated a two, 27% rated a three, and 45% rated transit access a four, "extremely important."

Comparing respondents' preference for transit access and their self-reported changes in travel behavior since moving does reveal a relationship. Of the respondents who rated transit as extremely important, 45% said they were using transit a lot more now and 54% said they were driving a lot less now (Table 7-7). This supports the notion that TODs allow people to act on their travel preferences.

Table 7-7 Transit preference in home choice and travel behavior

	Importance of access to transit in choosing current residence				
	1 Not at all important	**2**	**3**	**4 Extremely Important**	**Overall**
How much do you use public transit (bus or rail) now, compared to when you lived at your previous residence?					
A lot less now	15%	13%	12%	10%	12%
A little less now	3%	5%	6%	7%	6%
About the same	63%	44%	29%	19%	31%
A little more now	15%	24%	28%	18%	21%
A lot more now	4%	14%	26%	45%	30%
n	139	167	294	517	1117
	100%	100%	100%	100%	100%
How much do you drive now, compared to when you lived at your previous residence?					
A lot less now	30%	25%	40%	54%	43%
A little less now	20%	21%	20%	14%	18%
About the same	37%	35%	24%	21%	36%
A little more now	5%	7%	6%	4%	5%
A lot more now	9%	12%	10%	7%	9%
n	148	171	298	500	1117
	100%	100%	100%	100%	100%
Commuting behavior					
Takes transit to work once a week or more	3%	9%	26%	61%	36%
Transit is primary commute mode	2%	6%	11%	39%	22%
n	95	115	210	346	766
Transit was primary commute mode at previous residence	3%	6%	12%	25%	16%
n	108	130	235	395	868

The shares of respondents who said they were using transit a lot more now goes down as the importance of transit access in their home selection goes down. However, it does not drop to zero. In fact, of the people who rated transit access a two on our 1-4 scale, 14% said they were using transit a lot more now and 24% said they were using transit a little more now. Even among those who rated transit not at all important, 19% claim to be riding a little or a lot more now. Some of these respondents may be inflating their behavior, but it appears that other

factors aside from transit self-selection may be influencing some changes in travel behavior. In addition, there seems to be a weaker relationship between transit access preferences and reducing driving since moving. At least one-quarter of the respondents who rated transit access low in choosing their home state that they are driving a lot less now.

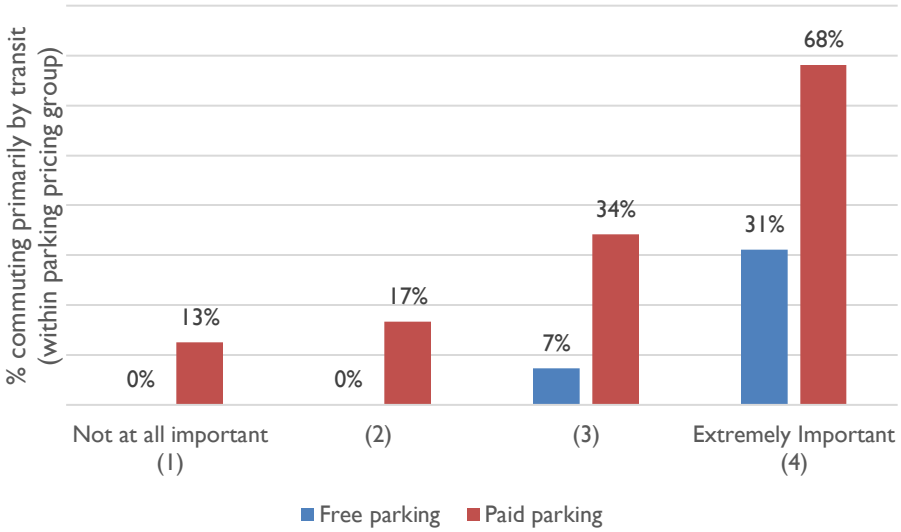
There is also a strong positive relationship between preference for transit access and transit commuting, though a small share of those who rated transit access low still do commute by transit regularly. In addition, the move to the TOD appears to have allowed many of those residents who placed very high importance on transit access to increase their level of commuting by transit. Only 25% of them commuted primarily by transit from their previous home, compared to 39% from their current home in the TOD.

7.4 Parking pricing at work

There is ample evidence that having to pay for parking influences people's mode choice. Our survey asked the respondents who did commute to work or school whether they would have to pay to park at work or school if they drove. Overall, 27% of the respondents who answered that question would have to pay to park. Of those, 67% used transit to commute at least once a week and 48% commuted primarily by transit, compared to 24% and 12%, respectively, of those who had free parking.

Figure 7-1 shows the influence of paid or free parking in relationship to the importance the respondent placed on transit access in choosing their home. We limited this analysis to the respondents who indicated that their work location was within a 20-minute walk of a MAX station. Of those who rated transit access extremely important *and* would have to pay to park at work/school, 68% primarily commute by transit. Of those in that same transit access category, but with free parking, only 31% commute primarily by transit. This demonstrates the impact of parking pricing. Even among those who might reasonably commute by transit and who have a preference for transit, the availability of free parking appears to suppress their use of transit. Of course, there are other factors influencing their choice to not use transit, such as work schedules, need to drop children at school or daycare, etc. In addition, in the context of Portland, only employees working in downtown Portland are likely to have to pay to park. Therefore, the other aspects of commuting to downtown also influence the choice to use transit, such as congestion.

However, what is perhaps more interesting is the left side of this figure. Among those who did not choose their home in the TOD because of transit access, if they had to pay for parking at work/school,13-17% do commute primarily by transit. These rates are generally higher than transit commuting rates in the cities surrounding our TODs.



Note: Limited to respondents who indicated that their work location was within a 20-minute walk of a MAX station.

Figure 7-1 Relationships between transit access preferences and parking pricing on commuting by transit

8 How do characteristics of a TOD correlate with differences in travel behavior?

As explained in Section 2.6.2, in addition to breaking the TODs into geographic groupings, we also grouped TODs using two dimensions that are traditionally associated with transit-oriented development and providing non-SOV travel opportunities – population and jobs density and transportation access, including walkability and transit. Four groups resulted, including a high density (over 23 people and or jobs per acre) and high transportation access (more walkable and better transit access) group – "high density high transportation" or "high-high" – that would be expected to be more amenable to the TOD goals of reducing SOV trips. Other groups include a "high density low transportation" or "high-low" group, "low density high transportation" or "low-high" group, and "low density low transportation" or "low-low" group (see Table 2-12 for which TODs are in each group).

This section describes select findings relating to travel options, behavior, and housing preference for these groups. As noted in Section 2.6.2, the number of respondents in the high-low category is small (n=54). Therefore, we recommend focusing on the other three types when reading our findings. In addition, we did not include the TODs limited to senior residents in this analysis.

8.1 Vehicle ownership and mileage

Table 8-1 shows the share of households by number of motor vehicles, along with the mean reported number of miles driven for each TOD type group. In general, the high-high group had fewer cars and drove less than the mean of all respondents, while the low-low groups had more cars and drove more than the mean of all respondents. The share of respondents in zero-vehicle households is the same for the TOD groups, except for the low-low TODs (lower share, 7%). The share of respondents in households with fewer vehicles than adults (people of driving age) is highest in the high-high TODs (43%), which is significantly higher than the high-low and low-low TODs, but about the same as the low-high TODs. The average number of vehicles per adult is also lowest in the high-high TOD, though this is only significantly lower than the low-low TODs. The residents living in the low-low TODs drove significantly more miles (100) in a typical week than the three other TOD groups (70-73).

Table 8-1 Vehicle availability, by TOD type

	High Density High Transp.	High Density Low Transp.	Low Density High Transp.	Low Density Low Transp.	Overall
Number of motor vehicles in the household					
0	15%	18%	16%	7%	12%
1	57%	52%	60%	55%	57%
2	23%	30%	21%	32%	27%
3+	5%	0%	3%	6%	5%
Total	100%	100%	100%	100%	100%
n	262	54	221	497	1034
Average number of vehicles per adult	0.75	0.79	0.77	0.84	0.80
% with fewer cars than adults	43%	28%	36%	33%	36%
Mean # miles driven in a typical week	72	70	73	100	86

Note: Cells include % of respondents. About 12% of the respondents are from households where two or more adults responded to the survey. "Adult" defined here as persons 16 and over (driving age).

8.2 Commuting

Table 8-2 shows commute-related information, including primary commute mode, for each of the TOD types. The residents in high-high TODs were most likely to commute primarily by transit (27%), through only significantly more than the low-high TOD residents (17%). They were also the least likely to use a private vehicle for commuting (50%), significantly lower than the low-high and low-low TOD residents.

The low-low TOD residents are commuting by transit at about the same levels as all other TOD residents, but use active transportation less. Overall, 36% of the residents used transit to commute at least once a week, with no significant differences between the TOD types. This is a much higher use of transit in all cases than self-reported transit use for commuting in respondents' prior homes. Overall, 16% of the residents commuted by transit at their previous home, with no significant differences between the TOD types. The low-high TOD residents were the least likely to switch from commuting by private vehicle to transit after moving to the TOD (5% did so); this was significantly lower than the 12% of high-high TOD residents that made that switch upon moving.

Table 8-2 Commute mode, by TOD Type

	High Density High Transp.	High Density Low Transp.	Low Density High Transp.	Low Density Low Transp.	Overall
Primary commute mode (current)					
Private vehicle	50%	58%	64%	63%	59%
Public transit	27%	19%	17%	22%	22%
Walk or bike	12%	17%	8%	5%	8%
Combination	12%	6%	12%	11%	11%
Total	100%	100%	100%	100%	100%
n	211	48	156	363	778
Uses transit at least once a week for commuting	41%	33%	32%	35%	36%
Previously commuted primarily by transit	14%	19%	19%	16%	16%
n	225	48	180	407	860
Switched from primarily private vehicle commute to transit	12%	13%	5%	10%	10%
n	197	46	143	330	716

8.3 Non-commute travel

There were some significant differences in the use of transit for non-commute trips, particularly for the residents of the high-high TODs (Table 8-3). Residents in high-high TODs were significantly more likely to use transit at least once a week to restaurants, bars and coffee shops (21%) compared to the low-high and low-low TOD residents (12% and 9%, respectively). They were also significantly more likely to do so for shopping (20%), compared to the low-low TOD residents (10%). The high-high and low-high TOD residents were significantly more likely to take transit to visit friends/family than the low-low TOD residents (11% and 8% vs. 4%, respectively).

Table 8-3 Transit for non-commute purposes, once a week or more in good weather, by TOD Type

	High Density High Transp.	High Density Low Transp.	Low Density High Transp.	Low Density Low Transp.	Overall
service provider	8%	8%	10%	5%	7%
restaurants, bars, coffee	**21%**	**10%**	**12%**	**9%**	**13%**
stores/shops	**20%**	**18%**	**13%**	**10%**	**13%**
gym/indoor recreation	6%	6%	9%	4%	5%
park/open space	8%	6%	10%	5%	7%
visit friends or family	**11%**	**6%**	**8%**	**4%**	**7%**
entertainment	**12%**	**6%**	**10%**	**5%**	**8%**
n range	183-255	49-51	208-211	485-486	925-1000
Commutes by transit 1x/week or more	40%	34%	31%	35%	36%

Bold indicates significant differences, Chi-Square p<0.05

The patterns for walking or bicycling once a week to these same destinations are somewhat different than for transit (Table 8-4). In particular, there are no differences in the levels of walking/biking to stores/shops, with 43% of the TOD residents overall doing so weekly in good weather, or to visit people (45%). However, there were significant differences in walking to parks or open spaces, with more of the low-high and low-low TOD residents doing so compared to the high-high residents (38% and 40% vs. 28%, respectively). This may be a result of the number and/or quality of parks and open spaces in the neighborhoods. On the other hand, the low-low TOD residents were significantly less likely to walk/bike to restaurants, bars, or coffee shops (35%) or entertainment (13%) compared to all three of the other TOD types. They were also less likely to walk to a gym or indoor recreation compared to the high-high and low-high TOD residents.

Table 8-4 Walk or bike for non-commute purposes, once a week or more in good weather, by TOD Type

	High Density High Transp.	High Density Low Transp.	Low Density High Transp.	Low Density Low Transp.	Overall
service provider	**20%**	**14%**	**16%**	**12%**	**15%**
restaurants, bars, coffee	**60%**	**53%**	**53%**	**35%**	**46%**
stores/shops	48%	44%	39%	42%	43%
gym/indoor recreation	**27%**	**24%**	**22%**	**15%**	**19%**
park/open space	**28%**	**37%**	**38%**	**40%**	**37%**
visit friends or family	41%	47%	44%	46%	45%
entertainment	**17%**	**26%**	**19%**	**13%**	**16%**
n range	180-255	49-52	202-211	482-492	918-1004

Bold indicates significant differences, Chi-Square p<0.05

Table 8-5 shows the number of walk trips per month, either just around the neighborhood or to a business or store, by TOD type. There were no significant differences in how frequently

the TOD residents walked, strolled, or jogged in their neighborhood for things like exercise or to walk the dog. There were some differences in frequency of walking to businesses or stores in the neighborhood. Low-low TOD residents walked to a business an average of 7.8 times in the past 30 days, which was significantly lower than the high-high TOD residents (10.2).

Table 8-5 Frequency of taking a walk, jog, or stroll around the neighborhood in the past 30 days, by TOD type

	High Density High Transp.	High Density Low Transp.	Low Density High Transp.	Low Density Low Transp.	Overall
Walk, jog, or stroll around the neighborhood, e.g. for exercise or to walk the dog					
0	18%	17%	11%	13%	14%
1-5	36%	31%	31%	31%	32%
6-20	29%	29%	38%	31%	32%
21+	17%	23%	19%	25%	22%
Total	100%	100%	100%	100%	100%
Mean	13.0	13.3	14.9	15.4	14.6
Median	5	7	8	8	4
n	255	52	211	489	1007
Walk from your home to a business or store in the neighborhood					
0	10%	6%	10%	16%	13%
1-5	37%	35%	38%	43%	40%
6-20	42%	47%	46%	33%	38%
21+	11%	12%	7%	8%	9%
Total	100%	100%	100%	100%	100%
Mean	10.2	10.5	9.1	7.8	8.8
Median	6	7	6	5	5
n	256	51	208	490	1005

8.4 Changes in mode use

There were no significant differences in stated changes in driving compared to their previous residence, with 40% overall stating that they are driving a lot less now (Table 8-6).

There are some small, though statistically significant, differences in the shares who say they have changed how much they use transit. In particular, 35% of the high-high residents say they are using transit a lot more now, which is significantly higher than the low-high residents (27%). With respect to walking, the high-high TOD residents were the least likely to state that they are walking a lot more now (22%), which was significantly lower than the low-low TOD residents (34%). On the other hand, the high-high TOD residents were more likely to say they were walking a little more now (27%) compared to the low-low TOD residents (18%). It could be that the high-high TOD residents were walking more in their previous neighborhood, relative to the low-low TOD residents, so it was less likely that they would walk "a lot" more now. The notable and significant change in bicycling is that 25% of the low-high TOD residents indicate that they are riding a lot less now, which is more than the high-high (13%) and low-low (16%) residents.

Table 8-6 Use of modes compared to previous residence, by TOD type

How much to you _____ now compared to where you live at your prior residency?		High Density High Transp.	High Density Low Transp.	Low Density High Transp.	Low Density Low Transp.	Overall
Drive	A lot less now	43%	50%	42%	37%	40%
	A little less now	17%	17%	17%	19%	18%
	About the same	25%	23%	27%	27%	27%
	A little more now	6%	4%	7%	6%	6%
	A lot more now	9%	6%	8%	12%	10%
Use public transit (bus or rail)	A lot less now	7%	10%	10%	10%	9%
	A little less now	7%	12%	7%	5%	6%
	About the same	27%	41%	31%	31%	31%
	A little more now	24%	6%	25%	21%	22%
	A lot more now	35%	31%	27%	32%	32%
Walk in your neighborhood	A lot less now	9%	6%	11%	7%	8%
	A little less now	16%	8%	12%	9%	12%
	About the same	26%	30%	26%	32%	29%
	A little more now	27%	23%	22%	18%	21%
	A lot more now	22%	34%	30%	34%	30%
Ride your bike	A lot less now	13%	22%	25%	16%	18%
	A little less now	7%	4%	5%	4%	5%
	About the same	55%	46%	50%	60%	56%
	A little more now	10%	17%	9%	7%	9%
	A lot more now	15%	11%	13%	13%	13%
n range		224-261	46-53	199-216	428-489	897-1019

8.5 Housing preferences and attitudes

Living close to transit was "extremely" important for nearly half of our TOD residents, and that did not vary significantly across the TOD types (Table 8-7). This indicates that these TODs are attracting residents who recognize and value the access to transit it provides. It may seem odd that, for example, among those living in lower-density TODs, the residents with higher transportation access did not place more importance on transit access; 46% of both groups found it extremely important. However, we do not know how satisfied the residents are with the level of transit service provided. The lower levels of transit access may not be satisfying those for whom access was extremely important. Alternatively, the access at the particular TOD may be low on our scale, but it may work very well for the resident's particular travel needs.

Table 8-7 Importance of transit access in choosing home, by TOD type

	High Density High Transp.	High Density Low Transp.	Low Density High Transp.	Low Density Low Transp.	Overall
1: Not at all important	11%	11%	11%	14%	12%
2	11%	21%	16%	16%	15%
3	30%	30%	27%	24%	26%
4: Extremely important	48%	38%	46%	46%	46%
Total	100%	100%	100%	100%	100%
n	256	53	212	485	467

9 Trip generation

For several of our surveys, we collected data that we used to calculate a trip generation rate, representing the estimated number of private motor vehicle trips made by TOD residents that would start or end at the TOD. The aim was to compare this to commonly used estimates of trip generation. This section explains the common approach to trip generation and presents the similar data from our surveys. While our method of collecting the data is different from the traditional method, the comparison can give an indication as to whether the TOD residents are traveling by private motor vehicles more or less than what is assumed based on some national averages.

9.1 ITE Trip Generation Manual

The Institute of Transportation Engineers (ITE) Trip Generation Manual (TGM) is widely used to assess the expected traffic impacts of new developments. The TGM provides trip generation rates that estimate the number of trips, typically motor vehicle trips, to or from a site based on the type of land use and size of the development. Given the use of the TGM in decisions about land use, potential development charges, and mitigation requirements, having accurate trip generation rates in the TGM is important. The TGM motor vehicle data is based on "trip generation studies submitted voluntarily to ITE by public agencies, developers, consulting firms and associations" (9th Edition, 2012). Research has found that the data may not accurately reflect observed motor vehicle trip generation, particularly for certain urban contexts (Currans, 2017; Currans and Clifton, 2018). Until recently, the TGM did not provide much distinction between various characteristics of a development or apartment building, including factors such as neighborhood context or mixed-use.

In the TGM 9th Edition (2012), the set of residential building types representing the best comparable examples to the developments included in our surveys are shown in Table 9-1, along with a few characteristics of the studies included in the TGM for each building type. The 9th Edition does not account for any building-specific or geographic traits that might be related to being "transit-oriented," and many studies included in the calculations were decades old. Despite these limitations, the available data do show that certain building types generate differing levels of motor vehicle trips. Daily rates were not available for mid-rise apartments; however, based on peak hour trips (not shown), mid-rise apartments appear to be similar to high-rise apartments (both generated an average of 0.3 trips in an AM peak hour), and high-rise condos.

Table 9-1 ITE Trip Generation Manual (2012) comparable residential building categories

ITE Code	Name	Description	Average Rate	Range of Rates	# of studies
210	Single-Family Detached		9.52	4.31-21.85	50+
220	Apartment	# levels not specified	6.65	1.27-12.5	33
221	Low-Rise Apt.	1 or 2 levels	6.59	5.1-9.24	13
222	High-Rise Apt.	10 or more levels	4.2	3-6.45	9
223	Mid-Rise Apt.	3-9 levels	n/a	n/a	1
230	Condo/ Townhouse	# of levels not specified	5.81	1.53-11.79	25
231	Low-Rise Condo/ Townhouse	1-2 levels condo or townhouse	n/a	n/a	5
232	High-Rise Condo/ Townhouse	3+ levels condor or townhouse	4.18	3.91-4.93	5
251	Senior Adult detached		3.68	2.9-5.7	10
252	Senior Adult Housing Attached		3.44	2.59-4.79	8

Source: ITE Trip Generation Manual, 9th Edition, 2012.

The 10th Edition of the TGM (2017) sought to address the lack of urban and neighborhood context factors. Importantly, the 10th Edition disaggregates trip generation data for urban, suburban and rural settings. Further, land uses that would have been more comparable in the past have been reclassified. In particular, land uses for apartments and condos were reclassified into Multifamily Housing (Low-Rise), Multifamily Housing (Mid-Rise), and Multifamily Housing (High-Rise). New land uses were added, including the following potentially relevant categories: Mid-Rise Residential with 1st Floor Commercial, High-Rise Residential with 1st Floor Commercial, and Off-Campus Student Apartment. The updated land uses are also broken down into General Urban/Suburban, Dense Multi-Use, or Center-City Core. Table 9-2 shows the trip generation data for mid-rise multifamily housing types, which are closest to the types of buildings typically considered to be TOD in the Portland context, and in our study. One challenge with the updated method of calculating rates in different contexts is that there are still few studies in most of these categories – for four of the types there are just a single study. However, most of the trip generation rates, when taking into account considerations of the neighborhood setting, are considerably lower than the rates previously applied to apartments (6.65), and closer to or below the rates applied to high-rise apartments (4.2).

Table 9-2 2017 Trip Generation Manual: weekday

ITE Code	Unit Type	Setting/Location	Average Rate	Range of Rates	# of Studies
Multifamily Housing (Mid-Rise) (221)	Dwelling Units	General Urban/Suburban	5.44	1.27-12.50	27
	Occupied Dwelling Units	General Urban/Suburban	4.75	2.95-5.49	4
	Residents	General Urban/Suburban	1.84	1.16-3.28	6
	Dwelling Units	Dense Multi-Use Urban	2.59	2.59	1
	Occupied Dwelling Units	Dense Multi-Use Urban	3.83	2.39-6.18	3
	Residents	Dense Multi-Use Urban	1.42	0.92-1.66	2
	Occupied Dwelling Units	Center City Core	3.74	3.16-5.14	3
	Residents	Center City Core	0.88	0.88	1
Mid-Rise Residential with 1st-Floor Commercial (231)	Dwelling Units	General Urban/Suburban	3.44	3.44	1
	Occupied Dwelling Units	General Urban/Suburban	3.62	3.62	1

9.2 Survey trip generation calculations

From 2007 on, our surveys allowed us to calculate approximate trip generation rates per unit, although there were some slight changes to the method over the years. The 2007 survey included a one-page trip log asking the resident to count the number of trips they made from home to various destinations by mode for two specified weekdays. Assuming that every resident who leaves returns by the same mode (twice as many trips), the two-day numbers in the table also serve as an estimate of one-day trip generation per adult. The total number of personal vehicle trips per household was estimated in the following way. For each respondent, all SOV trips for all purposes were added to the number of carpool trips for all purposes divided by two (assuming two-person carpools). This per-person vehicle trip rate was multiplied by the number of people 16 and older in the household.

From 2010 on, the survey asked about trips made for the "most recent Tuesday." The survey mailings were timed to arrive on Tuesday or Wednesday so as to maximize accuracy in recall. The survey asked where the respondent was going, and what mode they used to get there for up to 10 trips. This method was similar to trip diaries included in many travel behavior surveys.

The estimated vehicle trip generation rates for the sites are listed in Table 9-3. As noted above, the methodology varied some between the years. More details about the methods and the numbers behind these estimates are available in the reports for each year. In addition, for some developments, the sample size is small. Therefore, we encourage readers to look at overall patterns, which are shown in Figure 2, along with the range of the ITE rates for the types of

buildings included. Overall, the rates we estimate for these TODs is usually lower than the ITE rates.

Table 9-3 Estimated trip generation

	Est. Vehicle Trips/unit	# of respondents
2007		
Center Commons (rental and townhomes)	6.4	10
Russellville Commons	4.6	47
Russellville Park (senior)	1.6	55
Gresham Central	5.1	17
Other townhomes/condos	3.8	17
2010		
Nexus	3.8	142
Russellville Park (senior)	1.5	104
Patton Park	2.5	30
Town Center Station	2.0	20
Broadway Vantage	5.2	15
3rd Central	3.8	10
The Beranger	5.5	5
Villa Capri West	1.3	4
2014		
Acadia Gardens	2.5	18
Central Eastside Lofts	1.6	27
Hollywood Apts.	1.8	17
K Station	1.3	39
The Knoll	1.1	27
Milano	1.1	26
Pettygrove	2.3	26
The Prescott	2.1	60
4th Main	0.9	11
2018		
Hub9	1.8	14
K-Street Apts.	2.3	5
Moreland Crossing	2.0	35
Northwood	2.6	30
The Rise at Old Town	1.8	29
The Rose	1.5	29
La Scala	3.0	8
Slate	1.7	27
Slogan	1.2	12

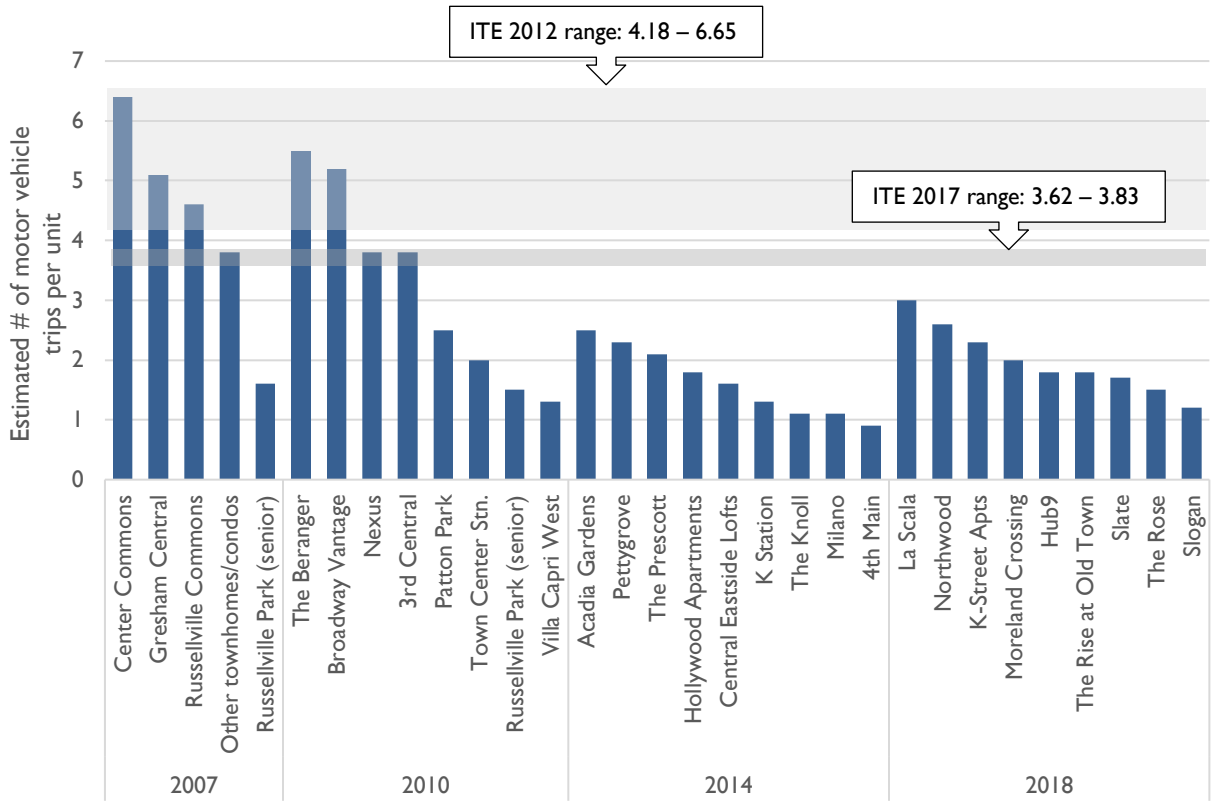


Figure 2 Estimated trip generation per unit vs. ITE rates

10 Discussion

TODs have become a key component of many city and regional efforts to reduce automobile dependence and increase transit use, often to help achieve larger goals addressing climate change and growth management. This report summarized the findings from surveys of TOD residents conducted between 2005 and 2018 in the Portland region. The overall objective of our surveys was to assess whether the TODs were achieving the intended goals of reducing private vehicle travel and increasing transit use. The surveys also provided some indications as to why residents' travel behavior does or does not differ from that of people living in other types of development. We summarize some of the key findings here.

The demographics of TOD residents differs some from the surrounding cities, which can influence travel behavior. Only 10% of the households had a child under 16, contributing to an average household size of 1.7 people. Excluding the age restricted TODs, TOD residents tended to be younger than the surrounding city residents. Income levels were similar to those in the surrounding city, though education levels were much higher. About one-fifth of the residents surveyed were people of color, which is similar to the surrounding cities.

Vehicle ownership is relatively low. Most of the TOD residents (60-75%) live in a household with zero or one vehicle, compared to 22% of small households in the surrounding cities. Over one-third (36%) of the TOD residents live in a household with fewer vehicles than people of driving age. The TOD appears to be influencing vehicle ownership; 23% of respondents got rid of or were considering to get rid of vehicle ownership due to the characteristics of the neighborhood after moving.

TOD residents are commuting by transit more than residents in the surrounding cities. Less than 50% of all TOD respondents were using private vehicles for commuting (48%), which was less than residents of the surrounding cities. Overall, 22% of TODs respondents regularly used public transportation (MAX light rail and TriMet bus) as commute modes, which is higher than those in the surrounding cities of Portland (12%), Beaverton and Gresham (8%), Hillsboro (7%), Tigard (4%) and Happy Valley (1%).

TOD residents do not use transit much for non-commute travel. While over 30% of the TOD residents used transit once a week or more for commuting, usually 10% or fewer did so for other types of trips, such as for shopping, eating out, and errands. The residents of TODs in higher-density areas with higher levels of transit were more likely to use transit for non-commute trips than residents of TODs in less dense and accessible areas.

TOD residents are walking to nearby destinations. Depending on the destination, at least 10% to over 40% of the TOD residents walked to non-commute destinations at least weekly. Overall, they walked nearly nine times to local businesses in the past 30 days. Rates were higher in the higher-density, higher-accessibility TODs.

The move to the TOD appears to have prompted shifts in travel behavior away from driving. Moving to the TOD resulted in a 5% shift in commute mode away from private vehicle (14% private mode in previous residence shifted to transit, walk and bike after moving; and 9% other modes shifted to private mode). Respondents indicate that they are driving a lot less (44%) and using transit (30%) and walking (28%) a lot more now compared to their previous residence.

Trip generation is likely lower than traditional ITE rates. We estimated that residents in most of the TODs generate from less than two to around three vehicle trips per unit per day. This is lower than the new ITE rates of about 3.6 to 3.8 per unit for similar land use types, and much lower than the older rates which did not distinguish based on urban or multiuse context. The difference in methodology may account for some of this difference.

Preference for transit (or "self-selection") plays a role in behavior but is not the only factor explaining shifts towards transit. Moreover, TOD is likely enabling people who want to use transit more to do so. Good public transit services (bus or rail) was an important factor for most TOD respondents in choosing their current home. People who had stronger preferences for living near transit were more likely to say they are now using transit a lot more. However, nearly one-quarter (23%) of those for whom transit access was not at all important claim they are using it more now that they live in the TOD. Parking pricing at work is also correlated with using transit for commuting.

There are variations in our findings, often related to geography and/or demographics of residents. For example, the travel patterns of respondents in Gresham were significantly different from the respondents in other geographic groups, which is expected since most of the respondents are seniors (over 64 years old) and the sample size for this group is smaller as well. Residents in TODs in high-density, high transportation access neighborhoods generally owned fewer cars, drove less, took transit more, and walked or biked to neighborhood destinations more. However, residents in the other TOD types, which were generally focused in the suburban locations of Beaverton, Hillsboro, and Gresham, still used transit much more and drove less than other residents in those cities.

Our research did not address issues of potential gentrification related to TODs. Recent research has found that TOD has the potential to exacerbate gentrification and displacement in some areas (Chapple and Loukaitou-Sideris, 2019), though at least two studies did not find such evidence of that in Portland (Baker and Lee, 2019; Dong, 2017). An assessment of gentrification or displacement impacts was outside the scope of our analysis. Many of the developments in our sample were on vacant property in more suburban locations. Some of the TODs had units that were income restricted, though the large majority were market rate. We did not collect data on rents or sales prices. We did find that income levels and the share of residents of color were similar to the surrounding cities.

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12 Appendices

12.1 Appendix: Building Background Information

Table 12-1 Portland TODs

Building Name	Survey Year	Constr. Year	# unit	Developer & Architecture	Site Sq. ft.	Comm. Sq. ft.	Station (MAX unless otherwise noted)
Slogan	2018	2017	25	Brown and Beyer LLC / COLAB	7,800	2,000	N Killingsworth St.
K-Street Apts.	2018	2017	34	UD+P / Works Partnership	10,075	2,774	NE 15th & Killingsworth (bus)
Moreland Crossing Apts.	2018	2015	68	Urban Evolution Dev / BAMA Architects	34,000	0	SE Tacoma / Johnson Creek
Northwood	2018	2016	57	8300 Interstate LLC / SERA Architects	19,741	1,652	Kenton/N Denver Ave
Radiator	2018	2015	N/A	Deco Diner LLC / PATH Architects	12,000	32,200	N Vancouver & Beech
Rose	2018	2015	90	Gordon Jones / Craig Monahan AIA	76,230	0	E 102nd Ave
Slate	2018	2017	75	Beam Dev. and UD+P / Works Partnership	18,640	39,675	NE M L King & E Burnside (streetcar)
Central Eastside Loft	2014	2012	70	Fowler & Andrews / Vallaster Corl Architects	20,000	7,000	SE Grand & E Burnside (Streetcar)
Hollywood Apts.	2014	2013	47	Urban Development Group / Myhre Group Architects	11,050	3,935	Hollywood/NE 42nd Ave Transit Center
Killingsworth Station	2014	2011	54	Winkler Development Corp. / Vallaster Corl Architects	32,000	9200	N Killingsworth St
Milano	2014	2012	60	Civitas Inc. / Ankrom Moisan Associated Architects	10,000	0	Rose Quarter Transit Center
University Point	2014	2012	287	Phase Two Development / William Wilson Architects	38,333	15,000	SW 5th & Hall
Pettygrove	2014	2012	95	Sierra Investments / Myhre Group Architects	15,000	1,730	NW 21st & Northrup (Streetcar)
The Prescott	2014	2013	155	American Campus Communities / SERA Architects	41,665	9,900	N Prescott St
Broadway Vantage	2010	2009	58	Innovative Housing Inc. / LRS Architects	50,520	2,670	NE 82nd Ave.
Patton Park	2010	2009	54	REACH / SERA Architects	23,958	3,000	N Killingsworth St.
Russellville Park (Senior)	2010, 2007	2009	283	Rembold Properties / MCM Architects	597,924	6,600	NE 102nd Ave.
Burnside Station	2007	1999	22		47,070	0	NE 172nd Ave.
Center Commons	2007	2001	39	Lenar Affordable Housing / Vallaster Corl Architects PC and OTAK	142,622	1,500	NE 60th Ave.

Building Name	Survey Year	Constr. Year	# unit	Developer & Architecture	Site Sq. ft.	Comm. Sq. ft.	Station (MAX unless otherwise noted)
Center Commons Townhomes	2007	2001	26	American Pacific Properties, Inc. / Vallaster Corl Architects PC and OTAK	33,237	0	NE 60th Ave.
Russellville Commons	2007	1998	222	Rembold Properties / MCM Architects	339,302	0	NE 102nd Ave.
Merrick	2005	2004	150	Trammel Crow / Robert Leeb Architects	39,204	15,000	Convention Center

Table 12-2 Hillsboro TODs

Building Name	Survey Year	Constr. Year	# unit	Developer & Architecture	Site Sq. ft.	Comm. Sq. ft.	Station
Hub9	2018	2015	124	Holland Partners / Leeb Architects	32,500	9,886	Orenco
4th Main	2014	2014	71	Tokola Properties / Paul Franks Architects	48,221	10,191	Hillsboro Central/SE 3rd
Nexus	2010	2007	422	Simpson Housing / Hensley Lamkin Rachel, Inc.	561,924	7,100	Orenco
Villa Capri West	2010	2002	20	Tualatin Valley Housing Partners / GEN Architects, Inc.	21,780	0	Washington/SE 12th Ave.
Arbor Gardens	2005	2002-2004	434		2,799,616	0	Orenco
Club 1201	2005	2000	210	Simpson Housing / McDonald Environment Planning, PC	516,211	0	
Orenco Station-MFH	2005	1997-2003	114		94,311	0	
Orenco Station- SFH	2005	1997-2003	332		N/A		
Sunset Downs	2005	1980-1996	68		~ 1,054,143		

Beaverton

Table 12-3 Beaverton TODs

Building Name	Survey Year	Constr. Year	# unit	Developer & Architecture	Site Sq. ft.	Comm. Sq. ft.	Station
La Scala	2018	2017	44	RKm Development / Carleton Hart Architecture	17,377	5,000	Beaverton TC
The Rise at Old Town	2018	2017	87	Rembold / Ankrom Moison	39,204	2,400	Beaverton Central
Arbor Station	2005	2004	65		540,693	0	Elmonica/SW 170th
Beaverton Round	2005	2003	63	City / BCB Group	46,380		Beaverton Central
Elmonica Station Condominiums	2005	2004-2005	120	Simpson Housing / Merryman Barnes Architects	147,794	0	Elmonica/SW 170th

Happy Valley

Table 12-4 Happy Valley TODs

Building Name	Survey Year	Constr. Year	# unit	Developer & Architecture	Site Sq. ft.	Comm. Sq. ft.	Station
Acadia Gardens	2014	2012	41	Geller Silvis Associates / SERA Architects	36,155	675	Clackamas Town Center
Town Center Station	2010	2010	52	Geller Silvis Associates / SERA Architects	60,113	0	

Gresham

Table 12-5 Gresham TODs

Building Name	Survey Year	Constr. Year	# unit	Developer & Architecture	Site Sq. ft.	Comm. Sq. ft.	Station
3rd Central	2010	2009	34	Tokola Properties / PF Architecture	28,314	5,450	Gresham Central
The Beranger	2010	2006	24	Rossman Development LLC / Myhre Group Architects	22,955		
Bridal Veil	2007	2000	8		12,000	0	
Central Point	2007	2000	22	Peak Development / Ankrom Moisan Architects	11,761	3,500	
Gresham Central	2007	1996	90		124,324	0	
Landmark	2007	2007	29		52,139	0	
Oneonta	2007	1995	20		51,969	0	
Three Cedars	2007	2000	16		18,615	0	

Tigard

Table 12-6 Tigard TOD

Building Name	Survey Year	Constr. Year	# unit	Developer & Architecture	Site Sq. ft.	Comm. Sq. ft.	Station
The Knoll	2014	2010	48	Community Partners for Affordable Housing / Carleton Hart Architecture	37,897	0	Tigard Transit Center

12.2 Appendix: Instrument Difference Comparison

Section A: Info on your household

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
Including yourself, how many people live in your household?	✓	✓	✓	✓	✓
Of these, how many are 16 years or older?	✓	✓	✓	✓	✓
	How many motorized vehicles are available for use by members of your household? (do not include Flexcar)	Same as 2005 Survey	How many motorized vehicles are available for use by members of your household? (do not include Zipcar)	How many motorized vehicles are available for use by members of your household? (do not include Zipcar/car2Go, etc.). If 1 or more: Where is your vehicle(s) usually parked? Do you pay to park your vehicle at/near your home? Yes/No	How many motorized vehicles are available for use by members of your household? (do not include Zipcar/car2Go, etc.). If 1 or more, where do you park at home: a. off-street space -- including with my rent; b. off-street space -- that I pay for separately; c. free on-street parking; d. others.
How many working bicycles are available to you and members of your household?	✓	✓	✓	✓	✓
	Are you a member of Flexcar?	Same as 2005 Survey	Are you a member of Zipcar?	Are you a member of carsharing services? Check all that apply: Zipcar, Getaround, car2go, other	Are you a member of these transportation services? Check all that apply: Ride-hail service (e.g. Uber, Lyft); Carshare (e.g. ZipCar, Car2Go, ReachNow); Bike share (e.g. BIKETOWN)
	Does your household have a pet that needs regular walks?	Same as 2005 Survey	Same as 2005 Survey	In Section E	In Section E

Section B: Your daily travel

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
	In 2005, one-day travel diary is included. It included the information of each destination (purpose, address, city and zip), the time they left (from the previous destination to next place), travel mode for each place, the time they arrive, and the type of activities they did for each place.	In 2007, survey included a trip log asking respondents their trip purpose and travel modes for each trip on Thursday June 7 and Friday June 8.	On Tuesday of this week, the first time you left your home, where were you going?	Same as 2010 Survey	Same as 2010 Survey
			How did you get there? Drove alone; drove or rode with someone else; walked; bicycled; MAX ((How did you get to the MAX station from home? walk, drive vehicle, ride as passenger, ride bus, ride bicycle, or other); TriMet bus; TriMet LIFT service or RideConnection; other	How did you get there? Drove alone; drove or rode with someone else; walked; bicycled; MAX (How did you get to the MAX station from home? walk, drive vehicle, ride as passenger, ride bus, ride bicycle, or other); ***Streetcar***; TriMet bus; TriMet LIFT service or RideConnection; other	How did you get there? Drove alone; Drove or rode with someone else; Ride hail (Uber/Lyft); Walked; Personal bike; Bike share; ***MAX/Streetcar (How did you get to the MAX/Streetcar station from home?*** walked, drove vehicle, rode with someone, ride hail, bus, personal bicycle, bike share or other); TriMet bus; other
			When you came back home, how did you get there?	Consider where you went after that. Where were you going?	Same as 2014 Survey
			On Tuesday of this week, the next time you left your home, where were you going?	How did you get there? Drove alone; drove or rode with someone else; walked; bicycled; MAX (How did you get to the MAX station from home? walk, drive vehicle, ride as passenger, ride bus, ride bicycle, or other); ***Streetcar***; TriMet bus; TriMet LIFT service or RideConnection; other	How did you get there? Drove alone; Drove or rode with someone else; Ride hail (Uber/Lyft); Walked; Personal bike; Bike share; ***MAX/Streetcar (How did you get to the MAX/Streetcar station from home?*** walked, drove vehicle, rode with someone, ride hail, bus, personal bicycle, bike share or other); TriMet bus; other
			How did you get there?	Consider where you went after that. Where were you going?	Same as 2014 Survey
			When you came back home, how did you get there? (If you made more than three trips on	How did you get there? Drove alone; drove or rode with someone else; walked; bicycled; ***MAX*** (***How did***	How did you get there? Drove alone; Drove or rode with someone else; Ride hail (Uber/Lyft); Walked;

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
			Tuesday, please use to table below to indicate where you went and how you traveled for each additional trip)	***you get to the MAX station from home?*** walk, drive vehicle, ride as passenger, ride bus, ride bicycle, or other); ***Streetcar***; TriMet bus; TriMet LIFT service or RideConnection; other (If you made more than three trips on Tuesday, please use to table below to indicate where you went and how you traveled for each additional trip)	Personal bike; Bike share; ***MAX/Streetcar (How did you get to the MAX/Streetcar station from home?*** walked, drove vehicle, rode with someone, ride hail, bus, personal bicycle, bike share or other); TriMet bus; other (If you made more than three trips on Tuesday, please use to table below to indicate where you went and how you traveled for each additional trip)
Please think about your current daily travel and your daily travel when you lived at your previous residence not long before you moved. We would like to know about how your travel has changed, for whatever reason. Please answer for your own travel only.	✓	✓	✓	✓	✓
In a typical month with good weather, how often do you walk or bike from your home to each of the following places for purposes	✓	✓	✓	✓	✓

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
other than work or school?					
	During wetter, colder weather, how often do you walk or bike from your home to each of the following places for purposes other than work or school?	Same as 2005 Survey			
In a typical month with good weather, how often do you take transit (bus, MAX, or Streetcar) from your home to each of the following places for purposes other than work or school?	✓	✓	✓	✓	✓
	During wetter, colder weather, how often do you take transit (bus, MAX, or Streetcar) from your home to each?	Same as 2005 Survey			
How many times in the last 30 days did you take a walk, jog, or stroll around your neighborhood – for example to get exercise or walk the dog?	✓	✓	✓	✓	✓
How many times in the last 30 days did you take a walk from	✓	✓	✓	✓	✓

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
your home to a business or store in the neighborhood?					
				How many times in the last 30 days did you ride a bicycle from your home to a business or store in the neighborhood?	Same as Survey 2014
					Added: Please tell us a little bit about how recently introduced travel options, such as ride-hailing, car-sharing or bike sharing services, have changed how much you travel by transit, driving, or walking/bicycling.

Section C: Information on your place of work/school and commuting

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
Do you work or go to school outside your place of residence?	Choices: 1. Yes, I work outside of home; 2. Yes, I attend school outside of home; 3. No, I work/take course at home; 4. No, I am not employed or in school	Same as 2005 Survey	Same as 2005 Survey	Choice: 1. Yes, I work outside of home; 2. Yes, I attend school outside of home; 3. No, I do not work or take courses outside my home	Same as 2014 Survey
	Does your employer/school: (check all that apply): allow you to work flexible hours; allow you to work from home; provide a car for use during the day; provide free parking; help pay for transit; help pay for tolls, fuel or other commuting costs	Same as 2005 Survey			
If you do drive (or if you were to drive) to work/school, would you have to pay to park?	✓	✓	✓	✓	✓
	About how long would it take you to walk from work/school to the closest MAX light rail station? (minutes or don't know)	Same as 2005 Survey	Same as 2005 Survey	About how long would it take you to walk from work/school to the closest MAX light rail station; TriMet Bus Stop; and Streetcar station? (minutes or don't know)	Same as 2014 Survey
On average, how many days per week do you commute to work/school?	✓	✓	✓	✓	✓
	How often do you stop somewhere on the way to work/school?	Same as 2005 Survey			
	How often do you stop somewhere on the way home from work/school?	Same as 2005 Survey			

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
	How often do you work at home instead of making the trip to work?	Same as 2005 Survey			
At this time of year, how often do you use each of the following as your primary means of transportation to work/school? By "primary" we mean the means of transportation you use for the longest portion of your trip.	Options: Drive alone (including motorcycle), Carpool, MAX light rail, Streetcar TriMet Bus, Walk, Bicycle, other)	Same as 2005 Survey	Same as 2005 Survey	Same as 2005 Survey	Options changed: Drive alone (including motorcycle), carpool, ***carshare, ride hail,*** MAX light rail, TriMet Bus, ***Streetcar***, Walk, ***personal bicycle***, **bike shar**e, other)
If you currently commute by MAX light rail or streetcar at least once a month, how do you normally get (from home to the station; from station to your workplace/school)	Options: walk, drive vehicle, ride as passenger, ride bus, bicycle, other, I do not commute by MAX or Streetcar	Same as 2005 Survey	Same as 2005 Survey	Same as 2005 Survey	Option changed: walk, drive vehicle, ride with someone, ride hail (Uber/Lyft), ride bus, personal bicycle, bike share, other, I do not commute by MAX or streetcar
					Added: Do you have a TriMet monthly pass?
					Added: Do you have TriMet or Hop Fastpass apps on your phone?

Section D: Information on commuting from your prior residence

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
Where did you live prior to this location?	✓	✓	✓	✓	✓
For your prior residence, did you work (or go to school) at the same place as you do now?	✓	✓	✓	✓	✓
At your prior residence, how often did you usually use the following modes to commute to work/school?	Options: Drive alone (including motorcycle), carpool, rail transit, bus, walk, bicycle, other	Same as 2005 Survey	Same as 2005 Survey	Same as 2005 Survey	Options changed: Drive alone (including motorcycle), carpool, carshare, ride hail, rail transit, bus, walk, personal bicycle, bike share, other)
If you previously commuted by rail transit (ex: subway, light rail, street car) once a month from your prior residence, how did you normally get	✓	✓	✓	✓	

Section E: Information on your current place of residence

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
When did you move to your current residence?	✓	✓	✓	✓	✓
Do you rent or own your residence? (current and previous residence)	✓	✓	✓	✓	✓
	About how long would it take you to walk from home to the closest MAX light rail station?	Same as 2005 Survey	Same as 2005 Survey	About how long would it take you to walk from home to the closest: MAX light rail station; TriMet Bus Stop; Streetcar station?	Same as 2014 Survey
	Same as 2014 Survey	In Section A	In Section A	Does your household have a pet that needs regular walks?	Same as 2014 Survey
How well do you think your residence and its location meet the current needs of your household?	Location of your neighborhood in the region Characteristics of the neighborhood itself Location of your residence within your neighborhood Characteristics of the residence itself	✓	✓	✓	
					Added: How many bedrooms does your current home have?
	Please indicate the extent to which you agree or disagree with each of the following statements on a scale from "strongly disagree" to "strongly agree." There are no right and wrong answers; we want only your true opinions. (I think my neighborhood is a good place for me to live; People in this neighborhood	Same as 2005 Survey			

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
	do not share the same values; My neighbors and I want the same thing from this neighborhood; etc.)				
				Is your current residence smaller or larger (i.e. square footage) than your prior residence?	
				Is your current residence more or less expensive (monthly costs) than your prior residence?	
				Is your commute to work/school shorter or longer at your current residence compared to your prior residence?	
In this question, we'd like to know what was important to you when you were looking for your current residence. Please indicate how important each of the factors was when you were looking for your current residence on a scale from "not at all important" to "extremely important." (**Bold** are common choices across these surveys) **(ALSO SEE "imp&pref" tab)**	Choice: **Affordable living unit; Affordable living unit; Relatively new living unit**; Good investment potential; **High quality K-12 schools; Attractive appearance of neighborhood;** Variety in housing styles; High level of upkeep in neighborhood; Large front yard; Large back yard; Big street trees; **Lots of off-street parking (garages or driveways); Sidewalks throughout the neighborhood;** Good bicycle routes beyond the neighborhood; **Easy access to the freeway;** Living unit on cul-de-sac rather than through street; Good public transit service (bus or rail); **Parks and open spaces nearby; Shopping areas within walking distance;**	Same as 2005 Survey	Same as 2005 Survey	Different choices (added): amenities in the building; Access to MAX; Access to Streetcar; Access to TriMet Buses; Access to car share vehicles; Low level of car traffic on neighborhood streets	Same as 2014 Survey

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
	Other amenities such as a pool or a community center available nearby; Easy access to a regional shopping mall; **Easy access to downtown; Close to where I worked; Close to friends or family; Low level of car traffic on neighborhood streets;** Quiet neighborhood; Good street lighting; Safe neighborhood for walking; Safe neighborhood for kids to play outdoors; **Low crime rate within neighborhood; Lots of interaction among neighbors; Lots of people out and about within the neighborhood;** Diverse neighbors in terms of ethnicity, race, and age; **Economic level of neighbors similar to my level;** other				

Section F: Information on your travel preference

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
We'd like to ask about your preferences with respect to daily travel. Please indicate the extent to which you agree or disagree with each of the following statements on a scale from "strongly disagree" to "strongly agree." There are no right and wrong answers; we want only your true opinions. (**Bold** are common choices across these surveys)	Choice: **Walking can sometimes be easier for me than driving;** **I would like to own at least one more car;** Travel time is generally wasted time; **I prefer to take transit rather than drive whenever possible;** **I like riding a bike;** **I use my trip to/from work productively;** **I like taking transit;** **Traveling by car is safer overall than walking;** Air quality is a major problem in this region; **I need a car to do many of the things I like to do;** **I prefer to walk rather than drive whenever possible;** I am willing to pay a toll or tax to pay for new highways; **I like driving;** **I prefer to bike rather than drive whenever possible;** Traveling by car is safer overall than riding a bicycle; **Public transit can sometimes be easier for me than driving;** **I try to limit my driving to help improve air quality;** Traveling by car is safer overall than taking transit; **Getting to work without a car is a hassle;** **I like walking;** **Biking can sometimes be easier for me than driving;** **The only good thing about traveling is arriving at your destination;** **I prefer to organize my errands so that I make as few trips as possible;** The price of gas affects the choices I make about my daily travel; **The trip to/from work is a useful transition between home and work;** Fuel efficiency is an important factor for me in choosing a vehicle; **I often use the telephone or the Internet to avoid having to travel somewhere;** **We could manage pretty well with one fewer car than we have (or with no car);** Vehicles should be taxed on the basis of the amount of pollution they produce; **When I need to buy something,** **I usually prefer to get it at the closest store possible;**	Same as 2005 Survey	Same as 2005 Survey	Those are **bold** in 2005 Survey	Bold in 2005 Survey and added two options: a. New transportation services (e.g. Uber, Lyft, carshare, bikeshare) make it easier for me to do many of the things I like to do; b. I like to stick to transportation modes I know rather than try new services or technologies

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
	The region needs to build more highways to reduce traffic congestion; My household spends too much money on owning and driving our cars; It is important to me get some physical exercise every day.				

Section G: Your household vehicle

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
Approximately how many miles do you drive in a typical week (including weekends)?	✓	✓	✓	✓	✓
	Please think about the vehicles you had at your previous residence just before you moved. ***a. your household for daily travel just before you moved?*** b. Did the number of vehicles available for daily travel by your household change as a result of the characteristics of your current neighborhood?	Same as 2005 Survey	Please think about the vehicles you had at your previous residence just before you moved compared to now. Did the number of vehicles available for daily travel by your household change as a result of the current neighborhood?	Same as 2010 Survey	Same as 2010 Survey

Section H: Information about you

	2005 Survey	2007 Survey	2010 Survey	2014 Survey	2018 Survey
What is your gender?	✓	✓	✓	✓	✓
What is your age?	✓	✓	✓	✓	✓
Ethnicity or race: (check all that apply)	✓	✓	✓	✓	✓
Do you currently have a driver license?	✓	✓	✓	✓	✓
Current employment: (check all that apply)	✓	✓	✓	✓	✓
How many years of school have you completed? (circle one answer)	Choice: Grade school (1-8 grade); High School (9-12); College (13-16); Advanced Degree (17+)	Same as 2005 Survey	Choice: Some high school or less; high school diploma or GED; Some college; Trade/vocational school; Associate degree; Four-year college degree; other (specify)	Choice: Some high school or less; high school diploma or GED; Some college; Trade/vocational school; Associate degree; Four-year college degree; ***Graduate Degree***; other (specify)	Same as 2014 Survey
Do you have any physical or anxiety condition that seriously limits or prevents you from doing any of the following?	✓	✓	✓	✓	Options added: Taking a taxi or ride hail (Uber/Lyft)
Approximate household income before taxes?	✓	✓	✓	✓	✓
Is there anything you would like to add or explain?	✓	✓	✓	✓	✓