
OFF TRACK?

**An Assessment of Mixed-Income Housing
Around New Jersey's Transit Stations**



May 2015

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Executive Summary

New Jersey's extensive public transportation system and the neighborhoods that host its 244 stations – whether commuter rail, light rail, rapid transit (PATH and PATCO), ferry, or major bus terminals – are a valuable resource, allowing residents in many parts of the state to avoid driving on congested roads and to reduce their transportation expenses by substituting travel on foot or by public transportation in place of driving a private vehicle. But are the cost- and time-saving opportunities of transit-oriented development (TOD) accessible to everyone?

The state's transit-station neighborhoods are a diverse group of places and are not all created equal, in terms of the degree to which they offer the benefits of living near transit to households of all income levels. Some station areas are effectively accessible only to upper-income households, due in part to a lack of diversity in housing options. Given that public transportation relies on density to thrive – that is, it works best when the number of people within walking distance of it is maximized – it is surprising how many transit stations (109 out of the 244) have a higher percentage of single-family detached housing units in their surrounding neighborhoods than the statewide average. A housing supply skewed toward single-family detached units can price out many households of more modest means. In other higher-income places, such as along the Hudson County “Gold Coast,” the problem is not a lack of density but rather a strong real estate market in which demand is outstripping new supply, even where local officials generally welcome new development.

Other stations have the opposite problem, where real estate markets are weak and the neighborhood is characterized by concentrated poverty and the social ills that accompany it. In almost every case, a high concentration of households at the low end of the income spectrum is accompanied by a scarcity of households at the high end, illustrating the challenges involved in inducing middle- and upper-income households to locate into distressed areas. In fact, upper-income households are more uniformly rare in generally lower-income station areas than are lower-income households in more upper-income station areas.

In an effort to promote equitable TOD – transit-oriented development that makes room for people of all income levels – in future developments, this report identifies transit-station neighborhoods currently having income distributions that can be described as “inequitable,” because they host either a disproportionate share of higher-income households or a disproportionate share of lower-income households, relative to their respective regions. It also looks at trends in rents and home values in order to highlight transit neighborhoods where emerging demand might pose the threat of displacing lower-income households if preventive steps are not taken.

Introduction

New Jersey's extensive public transportation system is a valuable resource, allowing residents in many parts of the state to get from one place to another without having to drive on an increasingly congested highway network. The state hosts a total of 244 transit stations, operated by a variety of agencies and served by numerous modes, including commuter rail, light rail, subway-style "rapid transit," major bus terminals, and ferry terminals. Some of these 244 stations are served by more than one mode; Newark Penn Station, for example, is served by multiple commuter rail lines, the Newark Light Rail system, and the PATH rapid-transit system, and also serves as a major bus terminal.

The neighborhoods surrounding many of these stations offer the opportunity for residents to reduce their transportation expenses by substituting travel by public transportation in place of driving a private vehicle, sometimes enabling households to own fewer vehicles than they would otherwise need, or even no vehicles at all. And because many transit-hosting towns¹ were originally built in a compact, walkable pattern (to facilitate pedestrian access to the transit station) and with a mixed-use downtown that treats the transit station as its focal point, residents of these places can accomplish many of their daily activities with much shorter travel distances than is the case in car-dependent suburbs, even when they're driving or walking within town rather than riding transit to an external destination. The multiple mobility options offered by transit-oriented (and hence pedestrian-oriented) communities are especially important to lower-income households, for whom owning and operating a car can consume a significant share of disposable income. A [2013 analysis of data from Caltrans' California Household Travel Survey](#)² conducted by TransForm and the California Housing Partnership Corporation found that "Lower-income households drive 25-30% fewer miles when living within 1/2 mile of transit than those living in non-TOD [transit-oriented development] areas. When living within 1/4 mile of frequent transit they drove nearly 50% less."

But are the state's transit-adjacent neighborhoods offering these cost- and time-saving opportunities to everyone? Or are some of them effectively accessible only to upper-income households, due to a lack of diversity in housing options or to an insufficient supply of housing in general? Conversely, are some transit stations lying fallow in distressed neighborhoods, falling short of their potential to serve as hubs of activity and commerce for their communities? In the latter case, the benefits for lower-income households of living near transit can be counteracted by the social ills that are associated with concentrations of poverty.

¹ Of course, not every one of New Jersey's transit stations is surrounded by a compact, walkable, mixed-use center. See New Jersey Future's 2012 report *Targeting Transit: Assessing Development Opportunities Around New Jersey's Transit Stations* for a review of development patterns surrounding transit stations, at <http://www.njfuture.org/research-publications/research-reports/targeting-transit/>.

² "Why Creating & Preserving Affordable Homes Near Transit is a Highly Effective Climate Protection Strategy," at <http://www.infrastructureusa.org/why-creating-preserving-affordable-homes-near-transit-is-a-highly-effective-climate-protection-strategy/>

With the belief that transit-accessible neighborhoods ought to be open to households of all income levels, our goal for this project is to highlight TOD locations with inequitable income distributions in their surrounding neighborhoods and to promote local and state government actions that would result in greater income diversity. Different strategies will be called for in different places, depending on whether the existing income distribution is skewed toward the high end or the low end of the spectrum. It will also be useful to examine trends in real estate markets, in order to identify places that may currently have a diverse range of household incomes but are on a path toward becoming more homogeneous.

New Jersey's Transit Stations and Their Neighborhoods

For purposes of this report, we identify 244 distinct transit stations in New Jersey, including commuter rail, light rail, rapid transit (PATH and PATCO), ferry terminals,³ and major bus terminals.⁴ (See **Map 1**.) Eighteen of New Jersey's 21 counties host at least one of these stations, with the highest concentrations in the heavily urbanized counties closest to New York. The stations break down as follows, with respect to which modes and systems they are served by:

- There are **14 multi-modal stations**:
 - **One station** is a hub for all **five modes**: Hoboken Terminal is served by several NJ Transit commuter rail lines, the Hudson-Bergen Light Rail line (HBLR), and PATH; it contains a ferry terminal; and it serves as a major bus terminal.
 - **One station** is served by **four modes**: Newark Penn Station is served by many commuter rail lines, the Newark Light Rail system (formerly known as the Newark Subway), and PATH, and also serves as a major bus terminal.
 - **Two stations** are served by **three modes**:
 - The Trenton Transit Center is served by commuter rail trains from both NJ Transit and the Philadelphia-based SEPTA; the River Line light-rail system that runs between Trenton and Camden; and functions as a bus terminal.
 - The Walter Rand Transportation Center in Camden is served by the River Line (light rail) and PATCO (rapid transit, where the station is called Broadway) and functions as a bus terminal.
 - **Five stations** are **rail** stations that also function as major **bus** terminals: Commuter rail stations in New Brunswick, Metropark, Asbury Park, and Atlantic City, and the Journal Square PATH station, serve these dual roles.

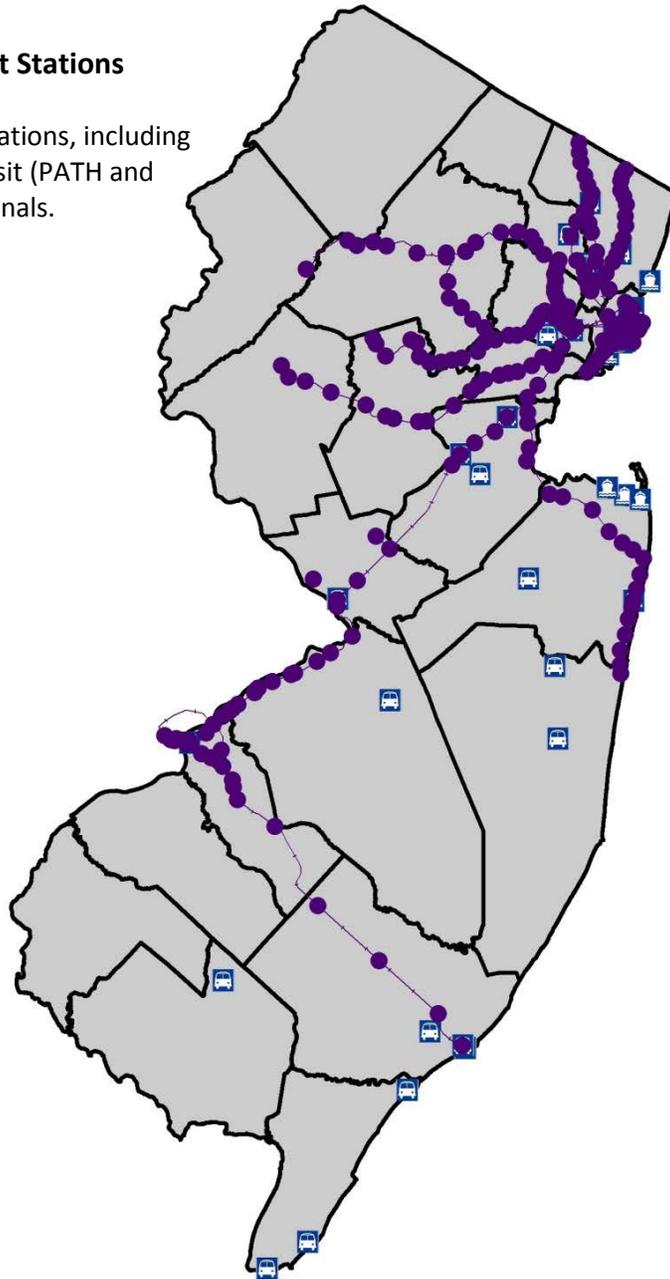
³ We excluded from the analysis ferries like the Cape May – Lewes Ferry or the Liberty Island Ferry (which carries visitors to the Statue of Liberty) that are used primarily for recreational rather than commuting purposes.

⁴ We defer to NJ Transit as to what qualifies as a major bus terminal, using the list that appears on their website at http://www.njtransit.com/ti/ti_servlet.srv?hdnPageAction=BusTerminalsTo

Map 1. New Jersey's 244 Transit Stations

New Jersey is host to 244 transit stations, including commuter rail, light rail, rapid transit (PATH and PATCO), ferry, and major bus terminals.

-  ferry terminal
-  bus terminal
-  rail transit station



- **Two stations** are served by **commuter rail and light rail**: Newark Broad Street is served by multiple commuter rail lines and Newark Light Rail, while the recently-opened Pennsauken Transit Center provides a link between the River Line and the Atlantic City commuter rail line.
- **Two stations** are served by **light rail and rapid transit**: Exchange Place and Newport are each served by both PATH (where the Newport station is called Pavonia/Newport) and HBLR.
- **One station** – Lindenwold – is served by **commuter rail** (the Atlantic City line) and **rapid transit** (PATCO).

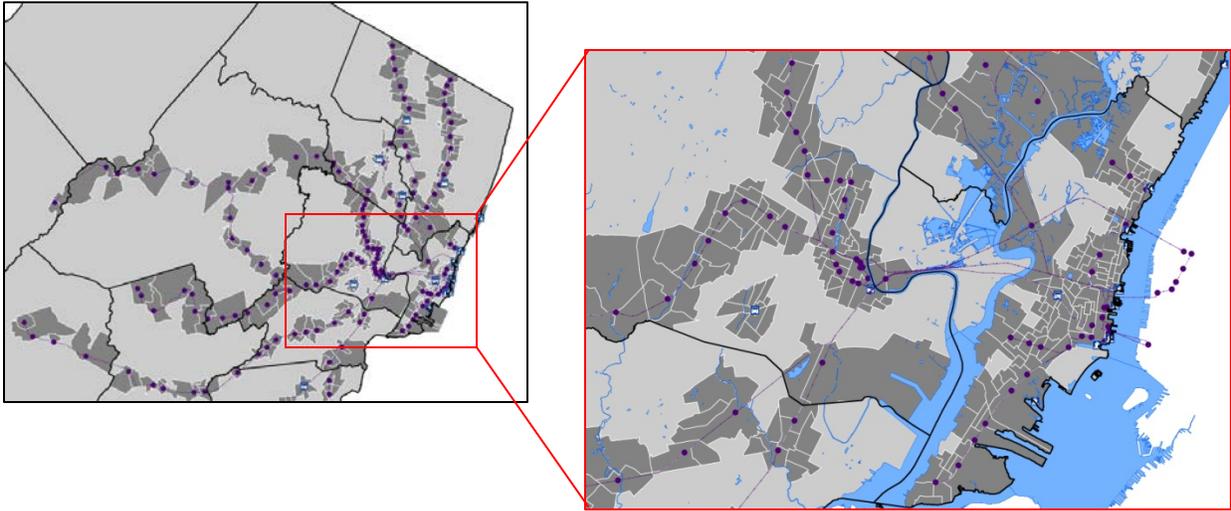
- **141 stations** are served by **commuter rail** only, including the rest of the NJ Transit commuter rail system as well as the West Trenton SEPTA station.
- **54 stations** are served by **light rail** only:
 - 21 on HBLR
 - 15 on Newark Light Rail
 - 18 on the River Line
- **Nine stations** are served only by one of the **rapid-transit** systems: seven by PATCO and two by PATH.
- **10 stations** are **ferry** terminals not served by any other mode.
- **16 stations** are major **bus** terminals not served by any other mode.

To delineate neighborhoods around the stations, we used census tracts as the building blocks, because they are small enough to capture sub-municipal variations in demographics but large enough that Census data are available for them on a regular and consistent basis. (Trend analysis is limited, however, because census tracts are redefined after each decennial Census, and changes in tract boundaries can be substantial; any meaningful trend analysis can therefore begin no earlier than the earliest year for which data were collected using the 2010 tract definitions.)

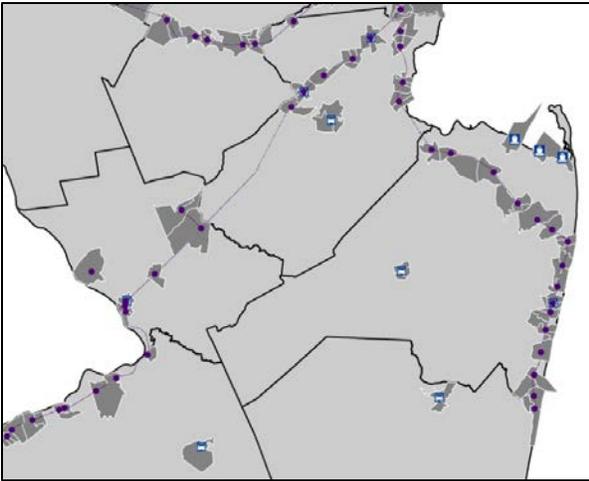
We began with a list of census tracts adjacent to rail transit stations, provided to us by NJ Transit and created by taking a radius of half a mile around each station and flagging all census tracts that intersected that radius, no matter how minimally. After supplementing this list with our own similar analysis of bus and ferry terminals, we then applied an additional screen to remove census tracts whose territories lying almost entirely outside of the half-mile radius around the associated station, leaving us with a final count of 615 relevant census tracts. See Appendix A for a full description of the methodology for paring down the list of transit tracts.

The 615 census tracts on New Jersey Future’s final list of transit tracts (See **Maps 2.1 through 2.3**) are together home to 2.6 million people, or 30 percent of the state’s total population. That is, three in ten New Jersey residents live roughly within walking distance of one of New Jersey’s 244 commuter rail, light rail, rapid transit, ferry, or major bus stations. These same tracts make up only 9 percent of total state land area. So New Jersey’s population is disproportionately concentrated in tracts hosting transit stations.

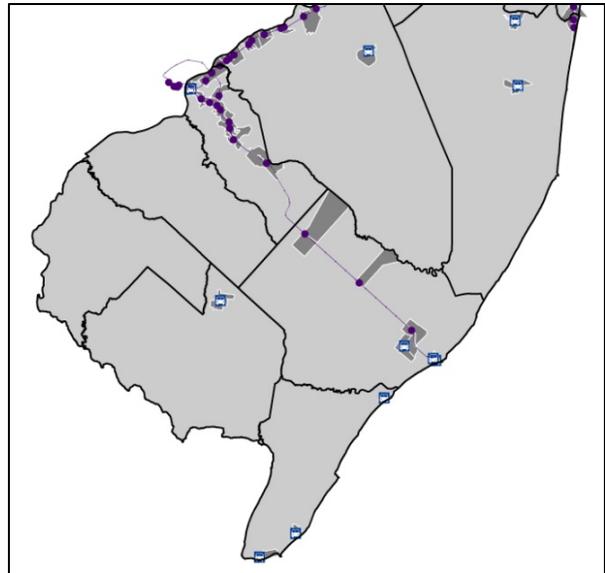
Map 2.1. Transit Tracts in Northern NJ



Map 2.2. Transit Tracts in Central NJ



Map 2.3. Transit Tracts in Southern NJ



-  ferry terminal
-  bus terminal
-  rail transit station

Quantifying “Equitable”

Having defined transit-station neighborhoods using census tracts, we are interested in differences among station areas in terms of the socioeconomic profile of each area’s residents, and we are interested in both current conditions and trends. We want to be able to identify station areas that currently feature an inequitable distribution of household incomes and also those that are in danger of becoming less affordable in the future.

If we are to promote equitable TOD, we need a working definition of what constitutes an “equitable” neighborhood around a transit station. Measuring equity in terms of the diversity of the housing stock may seem an attractive option at first, because “exclusionary” zoning – a zoning map that dissuades any residential development other than single-family detached homes on large lots – is the primary means through which local governments attempt to control the socioeconomic profile of new residents moving in. However, while the mix of housing types in an area is certainly one determinant of the types of households that are able to live there, it is not always a reliable predictor of income distribution, as illustrated by the high-rise luxury condos sprouting on the Jersey City waterfront (“multi-family” does not always imply “affordable”), or by the relatively low-value single-family homes that constitute the bulk of the housing supply around the River Line station in Beverly (“single-family detached” does not always imply “expensive”). Ultimately, social equity is concerned with *who* has access to an area (including TOD locations), so we should define it in terms of the actual residents of a place rather than by what the buildings look like. After all, most places with exclusionary zoning will end up having fairly homogenous populations as the end result, so a metric based on residents will still capture them.

In order to quantify social inequity, it helps to specify what an ideal end state would look like, and then define inequity in terms of the degree to which the actual situation diverges from the ideal. The hypothetical case of a perfectly equitable distribution of population would see disadvantaged groups (however they may be defined) spread evenly across the state, appearing in each geographic sub-unit (county, municipality, perhaps even census tract or block group) in precisely the same proportions in which they appear statewide. We can loosely define the spatial distribution of a disadvantaged group as “equitable” if it does not depart from such a uniform statewide distribution by more than a given tolerance threshold. Achieving perfect equity everywhere is not a realistic or even necessarily a desirable goal, but it serves as a useful benchmark. Under the perfectly equitable scenario, each geographic sub-unit looks like a microcosm of the state. At the local level, what this means is that the more closely a given geographic unit’s population mimics the statewide population in terms of the prevalence of individuals or households who are members of disadvantaged groups, the greater it should score on a measure of social equity.

For purposes of this study, we elected to use household income as the variable for measuring whether the area around a given transit station (or any geographic area) is realistically accessible to households from throughout the socioeconomic spectrum. (We are thus effectively using lower-income households as our “disadvantaged group” of interest.) More than anything else, a household’s income is what

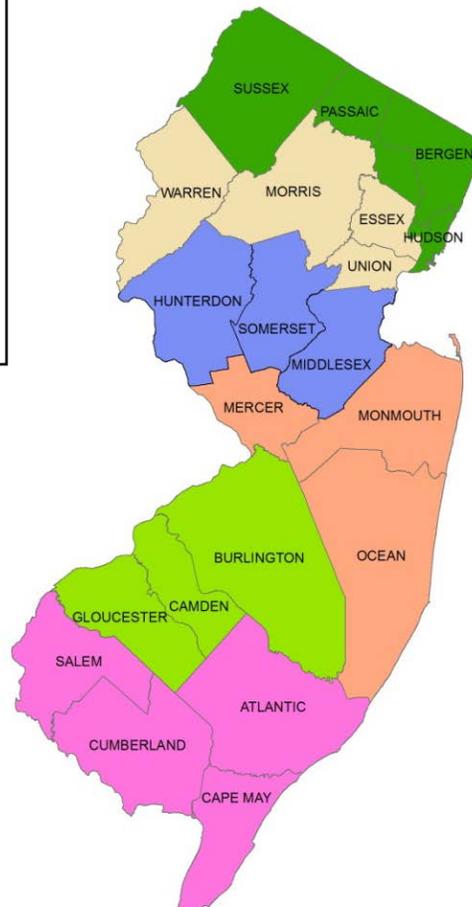
determines where it can and cannot locate and thence the resources and amenities to which it has access.

Because we are interested in characterizing the full range of household incomes in each station area in order to discover places with high concentrations of households at one end of the distribution or the other, it is insufficient to look only at a single summary statistic like median household income that indicates where the income distribution is centered (i.e. how well the “typical” household is doing) but provides no indication of its spread (i.e. the range of different incomes present and how widely they vary from “typical”). Other frequently used indicators like percent of households in poverty or rate of children on TANF (Temporary Assistance for Needy Families) would be useful in identifying concentrations of households at the low end of the spectrum but not the high end. Instead, we needed to devise a metric or metrics that summarize the shape of the entire income distribution relative to some standard.

Taking federal (Dept. of Housing and Urban Development [HUD]) fair-housing standards as a conceptual guide, in which incomes in a given locality are discussed in the context of the larger region, we compared the income distribution in each station area to a corresponding regional benchmark distribution that is presumed to represent what is average or normal for the region. Comparing to a

Map 3. Housing Regions Defined by the Council on Affordable Housing (COAH)

- Northeast: Bergen, Hudson, Passaic, Sussex
- Northwest: Essex, Morris, Union, Warren
- West Central: Hunterdon, Middlesex, Somerset
- East Central: Mercer, Monmouth, Ocean
- Southwest: Burlington, Camden, Gloucester
- South/Southwest: Atlantic, Cape May, Cumberland, Salem



single statewide distribution as the benchmark would yield an incomplete picture because it would obscure the fact that the cost of living differs from one part of the state to another, and hence that a given income has greater real purchasing power in some places than others. Counties, on the other hand, are probably too fine a level of geography to use as regional benchmarks, since some individual counties are fairly internally homogeneous with respect to income, whether at the higher end (as with Morris or Hunterdon) or the lower end (as with Hudson). As a middle ground, we chose to use as the regional benchmarks the six housing regions

(which comprise groups of counties – see **Map 3**) defined by the state Council on Affordable Housing (COAH), because these regions were specifically drawn to represent cohesive housing and employment markets and because they are large enough to possess some internal heterogeneity, thereby avoiding the pitfall of having an entire county’s worth of transit-station neighborhoods possibly fly under the radar and not register as having inequitable income distributions.

Taking another cue from HUD, we also wanted to describe income in each COAH region and in each station area in relative rather than absolute terms, using income ranges that are defined relative to the regional median household income rather than in terms of specific dollar-value cutoffs. (Again, this helps to correct for differences in cost of living in different parts of the state and facilitates more meaningful comparisons across regions.) Specifically, we wanted to characterize each station area’s income distribution in terms of five income ranges, as illustrated by the following diagram:

< 50% of COAH region median	50-80% of COAH region median	80-120% of COAH region median	120-200% of COAH region median	> 200% of COAH region median
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We will refer to these ranges as *HUD ranges*, since they are defined relative to a regional median, as is done in HUD assistance programs. Our goal was to estimate the percentage of households having incomes falling into each of these five HUD ranges in each COAH region, both for the region as a whole and for each transit-station area located in the region. All income distributions would then be expressed in terms of the HUD ranges rather than in terms of fixed dollar amounts.

However, the percentages of households falling into each of the five HUD ranges cannot be computed precisely using Census Bureau tabular data, because the Census Bureau reports household income using a standard set of dollar-value ranges rather than defining range cutoff points in relation to a regional median. We therefore developed a methodology to map the Census Bureau household income categories onto the five HUD ranges in each COAH region, resulting in a standard income distribution for each region that defines income ranges relative to the median for that region rather than in terms of fixed dollar amounts. These six regional distributions (based on the six regional medians) can then be used consistently within the regions for comparing individual station areas to each other and to the regional benchmark. See Appendix B for more detail on the methodology for converting Census Bureau income distributions into distributions defined in terms of HUD ranges.

Using the process described in Appendix B, we produced an approximate income distribution for each COAH region, using the HUD-defined range cutoff points. Using the same set of region-wide HUD-range cutoff points, we also produced an approximate income distribution for each transit-station neighborhood within the region. That is, for each COAH region and station area within it, we produced approximate percents of all households in the area that fall into each of the HUD-defined income ranges.

Having translated the Census Bureau income categories into HUD-type ranges for each COAH region, we can compare any individual transit-station neighborhood’s income distribution to that of its host region to see how closely it mimics the regional distribution – that is, to see how “equitable” the station area’s distribution is. To quantify the degree of similarity or difference, we looked at what percent of the *station area’s* households fall into each HUD income range, compared to what percent of the whole *COAH region’s* households fall into the corresponding range. For any given HUD range, the ratio of these percents indicates whether households in that income range are over-represented or under-represented in the station neighborhood, relative to its host region. We will refer to these ratios – the percent of the station neighborhood’s households falling into a particular income range divided by the percent of the whole region’s households that fall in that same range – as *equity ratios*. Any individual station area thus has five equity ratios, one for each of the five HUD income ranges. (We also computed an equity ratio for a sixth income range: income less than 80 percent of regional median, which combines the two lowest income categories for a broader definition of “lower income.”)

Table 1 illustrates how the equity ratios are computed for a single transit-station neighborhood, using the recently-opened Pennsauken Transit Center and its host COAH region as an example.

Table 1. Equity Ratios for Pennsauken Transit Center Station Neighborhood

		number and percent of households having household income...											
		< 50% of COAH region median		50% to 80% of median		80% to 120% of median		120% to 200% of median		> 200% of median		< 80% of median	
total households		number	percent	number	percent	number	percent	number	percent	number	percent	number	percent
southwest COAH region	458,572	109,735	23.9%	51,265	11.2%	80,938	17.7%	151,861	33.1%	64,773	14.1%	161,000	35.1%
Pennsauken Transit Center	3,079	915	29.7%	517	16.8%	559	18.2%	828	26.9%	260	8.4%	1,432	46.5%
equity ratio, Pennsauken T.C. vs. region			1.24 (= 29.7% ÷ 23.9%)		1.50		1.03		0.81		0.60		1.32

The equity ratio for a given transit-station neighborhood and for a given income range indicates whether households in that income range are over-represented (ratio > 1.0) or under-represented (ratio < 1.0) around that station, relative to the host COAH region.

A station area with a perfectly “equitable” income distribution relative to its host COAH housing region would be one in which the equity ratios for all of the five income ranges are 1.00 – that is, the percentages of the station area’s households that fall into each of the five income ranges are all identical to the corresponding COAH-region percentages. In such a case, the income distribution of the station area would exactly mimic the income distribution of the region as a whole. An “inequitable” distribution of household income in a given station area can likewise be interpreted as one that departs significantly

from the regional distribution, as measured by one or more of its equity ratios differing significantly from 1.00.

We are interested in two particular types of “inequitable” income distributions: those in which the station area’s households are disproportionately concentrated at the low end of the income spectrum, and those where incomes are concentrated at the high end. Specifically, we define these two types of inequitable distributions as follows:

- “higher-income” or “skewed high” = a distribution with an equity ratio of 1.20 or more for households having income greater than 200 percent of regional median
- “lower-income” or “skewed low” = a distribution with an equity ratio of 1.20 or more for households having income of less than 50 percent of regional median OR an equity ratio of 1.20 or more for households having income of less than 80 percent of regional median

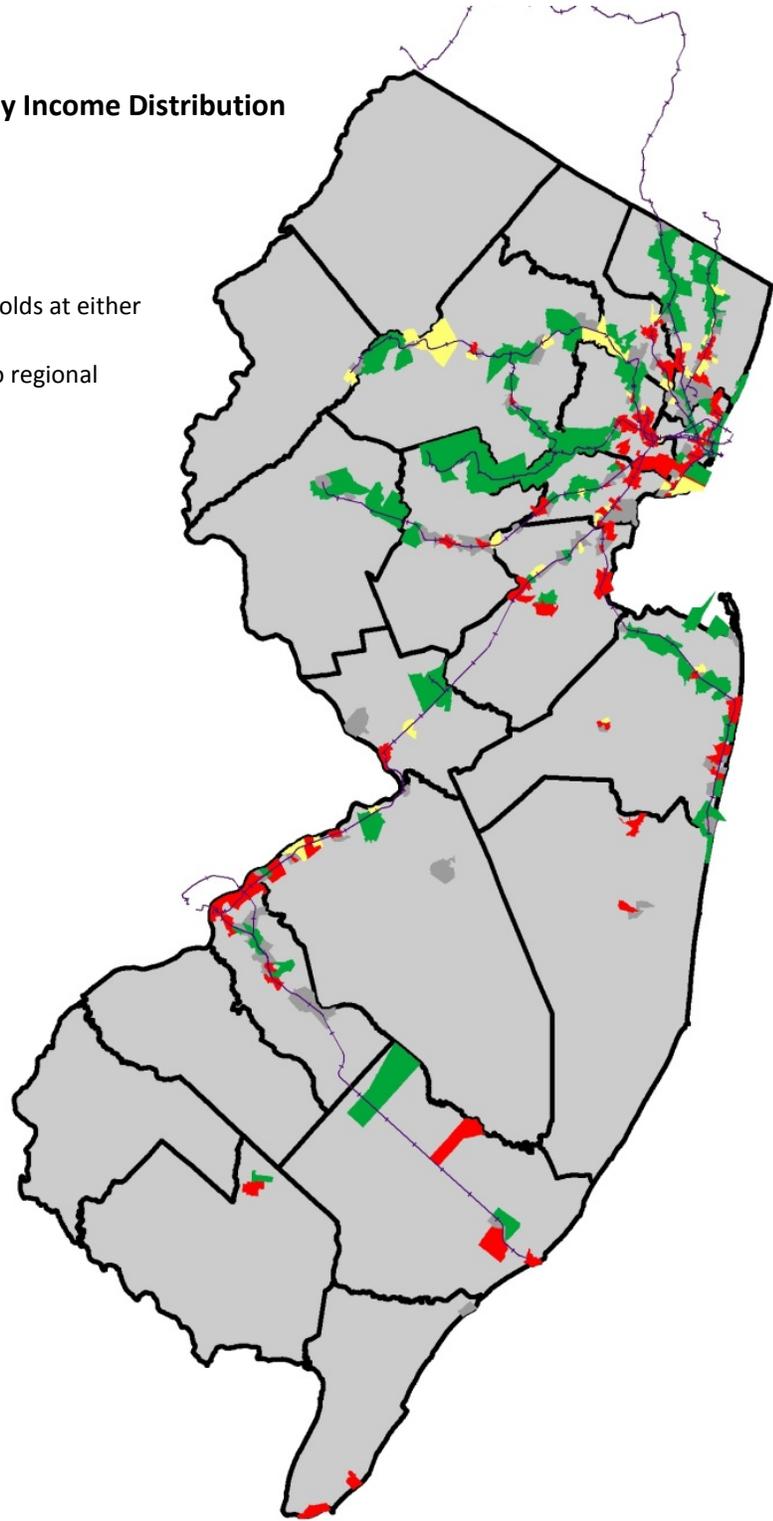
In the first case, households earning at least 200 percent of the regional median income will be at least 20 percent more prevalent in the transit-station neighborhood than they are in the region as a whole. In the second case, it is households in the two lowest income ranges that will be at least 20 percent more prevalent in the station neighborhood than in the region. Each of these two types of inequitable income distributions calls for different interventions to change the status quo.

Incidentally, there is a third type of income distribution that could be characterized as “inequitable” (though in an unconventional interpretation of the term), one that does not call out for any immediately obvious policy solutions but is interesting to note nonetheless. This is a distribution that we term “center-heavy,” with a high concentration of households with incomes near the middle of the spectrum but with relatively few households at either the high or the low end. We identify this type of distribution as one having equity ratios of less than 0.90 for both the upper (household incomes > 200 percent of regional median) and the lower (< 80 percent of regional median) income ranges.

To facilitate more fine-grained investigation, we also computed equity ratios for each individual station-area tract and identified tracts with inequitable income distributions of one of the three types described above. In station neighborhoods that comprise multiple tracts, looking at the income profiles of individual tracts can give an idea of how internally diverse the station neighborhood is. Also, because many station neighborhoods overlap and are therefore not easy to display graphically, computing equity ratios for the component tracts allows us to map income around New Jersey’s transit lines in a way that is easy to comprehend visually – see **Map 4**).

Map 4. Transit Tracts by Income Distribution

- income skewed high
- income skewed low
- income center-heavy
(relatively few households at either
high or low end)
- roughly comparable to regional
distribution



Income Distributions Around Transit Stations: A Snapshot

Stations with a concentration of lower-income households

Among New Jersey's 244 transit stations, there are 86 that are located in neighborhoods that we might describe as lower-income, where household incomes are skewed low as compared to the rest of the region, using the definition outlined in the previous section. Where are these 86 transit stations located? Many of their host municipalities will not be a surprise: All 16 of Newark's transit stations are on the list, as are all six of Camden's, all three of Trenton's, both of Paterson's, both of Passaic's, both of Elizabeth's, both of New Brunswick's, both of Atlantic City's, both of Orange's, both of East Orange's, and seven stations in Jersey City (all on the southern end of the Hudson-Bergen Light Rail, plus Journal Square – see **Map 6**). The whole northern end of the HBLR is on the list, too, near the point where Weehawken, Union City, and North Bergen meet: Tonnelle Avenue, Bergenline Avenue, and Port Imperial, plus the Port Imperial ferry terminal.

Also on the list, and also not terribly surprising, are stations in many of the state's smaller urban municipalities: the E. 22nd Street HBLR station in Bayonne; the Harrison PATH station; the Essex Street (in Hackensack), Garfield, Perth Amboy, South Amboy, Long Branch, Asbury Park, Delawanna (in Clifton), Plainfield, and Netherwood (in Plainfield) commuter-rail stations; the two River Line stations in Burlington city; and bus terminals in Irvington, Pleasantville, and Vineland.

A bit less predictably on the list are stations in a handful of small towns and older suburbs: bus terminals in Freehold, Lakewood, Toms River, Wildwood, and Cape May; the Silver Lake and Grove Street stops at the outer end of the Newark Light Rail, which are in Belleville and Bloomfield respectively; all three River Line stops in Pennsauken (including the newly-opened Pennsauken Transit Center, where the River Line interchanges with the Atlantic City commuter rail line); River Line stops in Cinnaminson and Beverly/Edgewater Park; the Ashland PATCO station in Voorhees Township; and the Watsessing (in Bloomfield), Somerville, Raritan, Bound Brook, Bridgewater, Red Bank, Bradley Beach, and Egg Harbor City commuter rail stations.

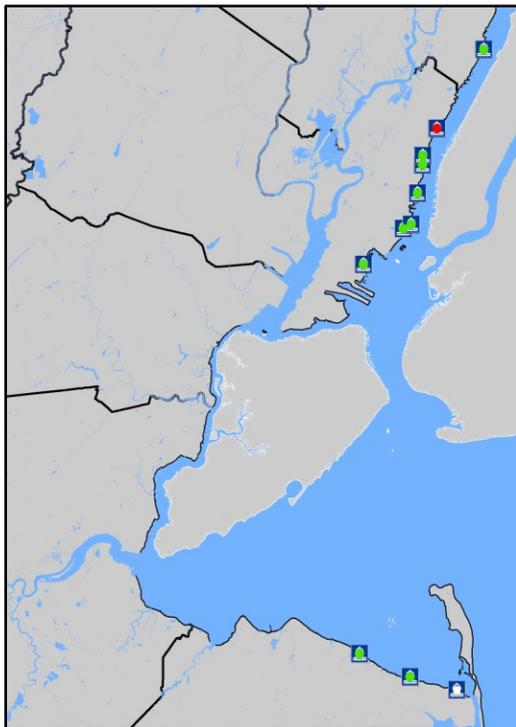
All of these stations are in neighborhoods that could be called “inequitable” from the standpoint of household incomes, since they have high concentrations (relative to the rest of their host regions) of households with incomes below 80 percent of regional median. While having lower-income households living near transit is generally a desirable situation, since many of these households cannot afford to rely exclusively on cars to get around, it is also not desirable to have a neighborhood consisting of nothing but lower-income households, whether it is near transit or not. Making income distributions more equitable in this group of stations, then, essentially comes down to the same problem facing areas of concentrated poverty throughout the state – how to get more middle-income households to locate into these areas.

The Cinnaminson River Line station stands out among the lower-income stations in that it also has an equity ratio greater than 1.00 (1.08, to be exact) for households earning more than 200 percent of regional household income. The Cinnaminson station neighborhood thus has an income profile in which households at both the lower end and the upper end of the scale are overrepresented relative to its host region (though only slightly so at the upper end), while middle-income households (with incomes between 80 percent and 200 percent of the regional median) are underrepresented. No other lower-income station exhibited this phenomenon; in fact, only four more of them – the bus terminals in Vineland and Cape May, and the ferry and HBLR stations in the Port Imperial section of Weehawken – even manage an equity ratio of 0.75 or larger for households in the highest income range. So in almost every case, a high concentration of households at the low end of the income spectrum is accompanied by a scarcity of households at the upper end.

Stations with a concentration of higher-income households

At the other end of the scale are the 91 transit stations in neighborhoods whose income distributions are skewed high, where households earning more than 200 percent of regional median household income are significantly more prevalent than they are in the broader region. Where are they located?

Ferry terminals constitute an interesting subgroup, with nine out of eleven of them appearing on the list of 91 higher-income stations. (See **Map 5.**) This includes terminals in several municipalities that are otherwise not particularly wealthy overall: Hoboken Terminal and the 14th Street terminal in Hoboken; Lincoln Harbor in Weehawken; and Liberty Harbor, Paulus Hook, and Port Liberté in Jersey City. (The Port Liberté ferry terminal, in fact, holds the distinction of being the station whose neighborhood



Map 5. New Jersey's Ferry Terminals Tend to be Surrounded By Higher-Income Neighborhoods

-  = ferry terminal in higher-income neighborhood
-  = ferry terminal in lower-income neighborhood
-  = ferry terminal neither high nor low income

income distribution was most skewed toward the high end among all 244 transit stations in the state.) The other three higher-income ferry terminal neighborhoods are Belford (in Middletown Township), Edgewater, and Atlantic Highlands. Only two ferry terminals do not appear on the high-income list – Port Imperial (in Weehawken), whose income distribution is actually concentrated toward the low end, and Highlands.

The direction of causality in the relationship between ferry service and higher-income residents is not clear. Do

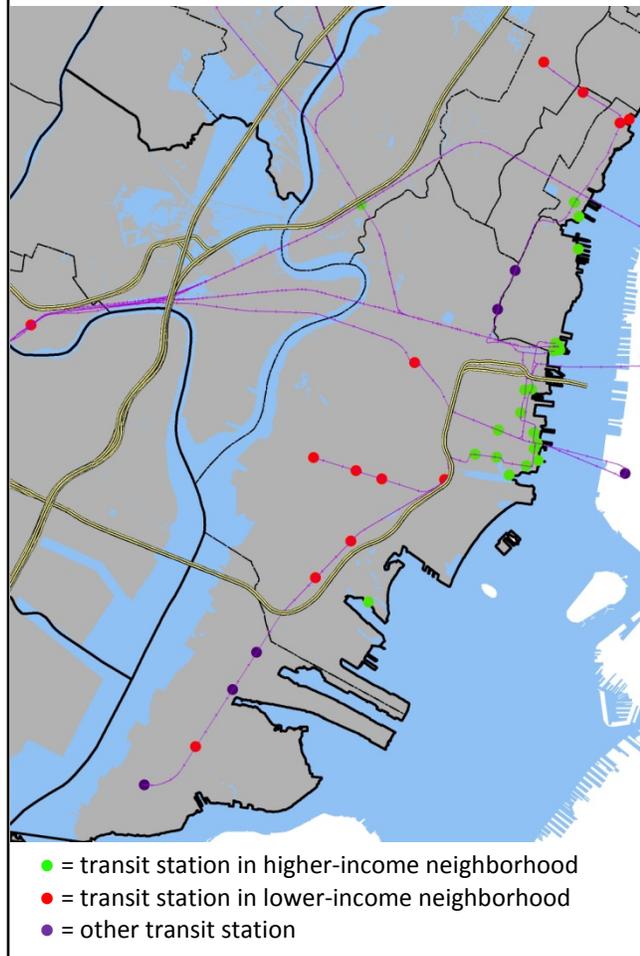
existing ferry terminals tend to attract higher-income workers whose jobs are located near the Manhattan end of the ferry route? Or do ferry operators tend to inaugurate new routes when they notice coastal areas where incomes are already growing?

Further illustrating the pockets of prosperity that are growing along the Hudson County “Gold Coast” are nine PATH and HBLR stations, all but one of which are in Jersey City, that appear among the 91 higher-income station neighborhoods: Lincoln Harbor (in Weehawken), Newport, Harsimus Cove, Harborside, Exchange Place, Grove Street, Essex Street, Marin Boulevard, and Jersey Avenue. In fact, every transit station in Jersey City that is east/south of the New Jersey Turnpike Extension makes the higher-income list, while none of the HBLR or PATH stations elsewhere in Jersey City appears (see **Map 6**). (On the contrary, recall that the other seven transit stations in Jersey City all appeared on the *lower*-income station list). The income profiles of the neighborhoods surrounding its transit stations really do tell the tale of two Jersey Citys, one east and one west of the Turnpike Extension.

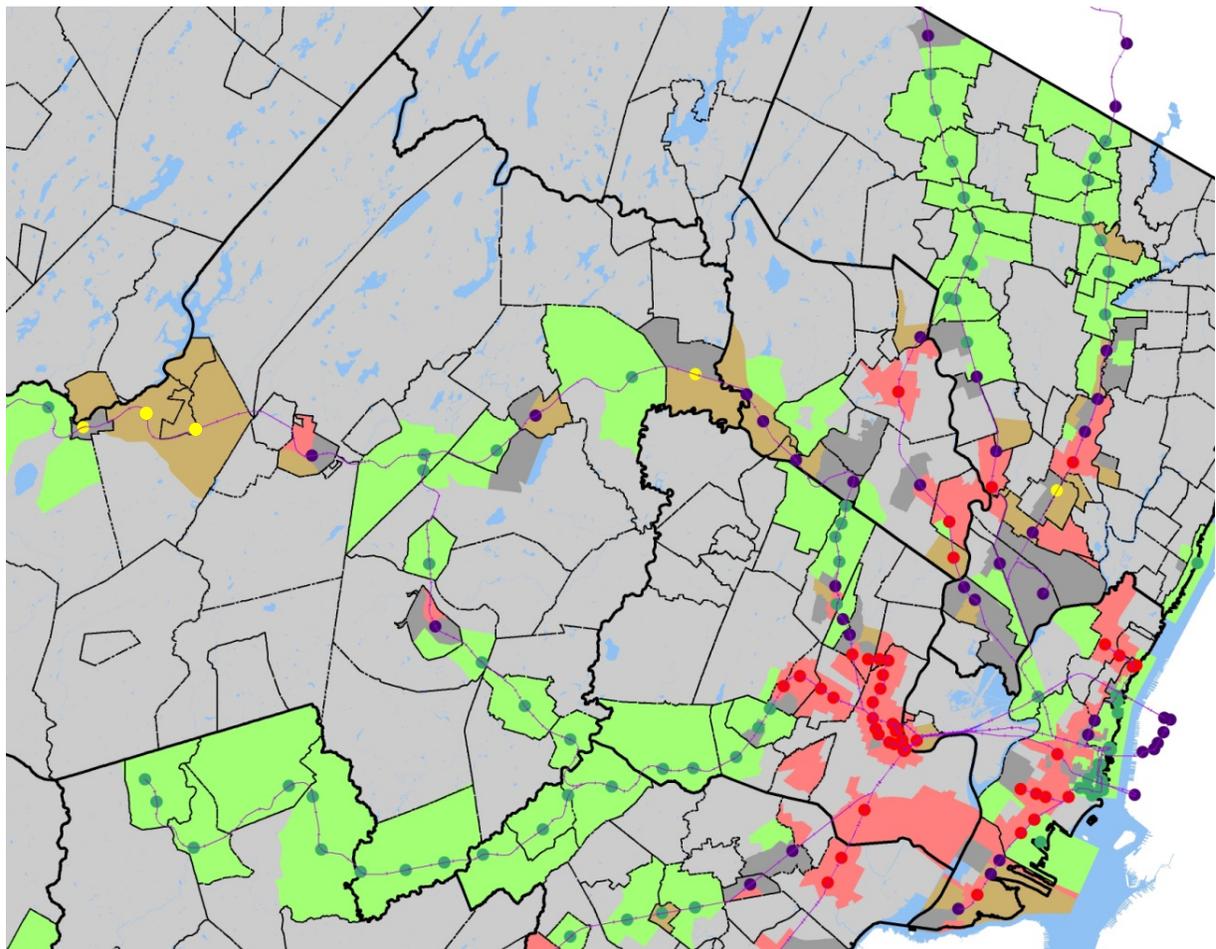
Looking beyond the Gold Coast, some of the other higher-income stations are more predictable, where some of the commuter rail lines pass through continuous swaths of wealthier suburbs. All 12 of the stations on the Gladstone line (which wends its way through the Watchung Hills in western Union, southern Morris, and northern Somerset counties) make the list. So do all the stations on the middle section of the Morristown line, from Mountain Station (in South Orange) all the way out to Denville, with the exception of Morristown itself. So does the entire outer end of the Main and Bergen County lines, everything from Radburn north (and including the Ridgewood bus terminal), except for Mahwah, right at the New York border. Similarly, the outer seven New Jersey stations on the Pascack Valley line (from Oradell out to Montvale) are on the list, while none of the stations south of Oradell is. (See **Map 7**.)

Map 6. A Tale of Two Jersey Citys

Every transit-station neighborhood in the part of Jersey City that lies to the east and south of the Turnpike Extension has a disproportionate percentage of *higher*-income households, while every transit-station neighborhood in the rest of Jersey City has a disproportionate percentage of *lower*-income households.



Map 7. High-Income Transit Stations Dominate Several North Jersey Commuter Rail Lines

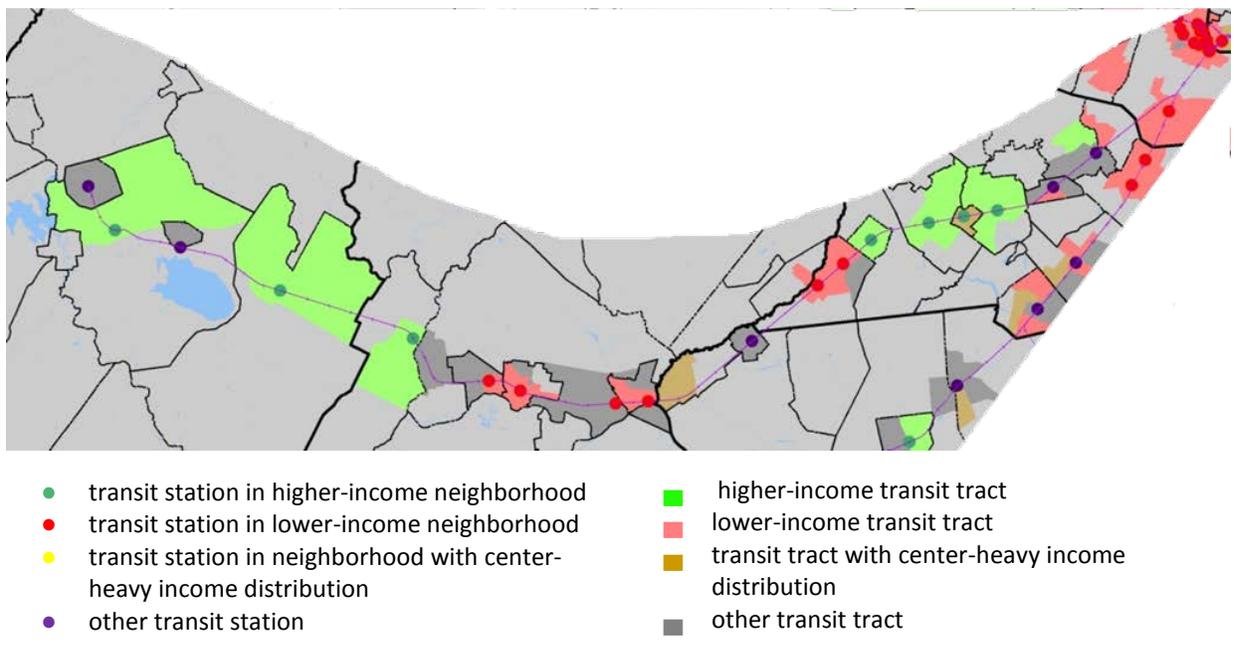


- transit station in higher-income neighborhood
- transit station in lower-income neighborhood
- transit station in neighborhood with center-heavy income distribution
- other transit station
- higher-income transit tract
- lower-income transit tract
- transit tract with center-heavy income distribution
- other transit tract

In South Jersey, the one identifiable cluster of higher-income station areas is a group of three consecutive stops on the PATCO rapid-transit line: Westmont (in Haddon Township), Haddonfield, and Woodcrest (in southern Cherry Hill Township).

Higher-income station areas on the other commuter rail lines are not as geographically clustered. On the Montclair-Boonton line, five of the six stations within the township of Montclair are among the 91 higher-income stations statewide (all except Walnut Street), but beyond there, the three other stations that make the list – Towaco, Mountain Lakes, and Mount Olive – are not adjacent to one another. On the Raritan Valley line, four consecutive stations in Union County have concentrations of wealthier residents – Cranford, Garwood, Westfield, and Fanwood – but then the line’s other higher-income stations don’t appear until close to the end of the line, and not all in order – North Branch, White House,

Map 8. Raritan Valley Line Station Neighborhoods Are Not as Uniformly Wealthy as Other North Jersey Commuter Rail Lines



and Annandale. (See **Map 8.**) The outer stations on the Raritan Valley line are not as uniformly wealthy as was the case with the Main/Bergen and Pascack Valley lines.

On the North Jersey Coast line, the outer end tends to be wealthy shore resort communities, with Bay Head, Manasquan, and Spring Lake (though not Point Pleasant Beach) having neighborhood income distributions that skew high, but the other higher-income stations on the line – Allenhurst, Elberon (located in the south end of Long Branch), Monmouth Park, Little Silver, Middletown, and Hazlet – are interspersed with less-wealthy stations, including some with concentrations of residents at the lower end of the income spectrum, like Red Bank, Long Branch, and Asbury Park. (See **Map 9.**)

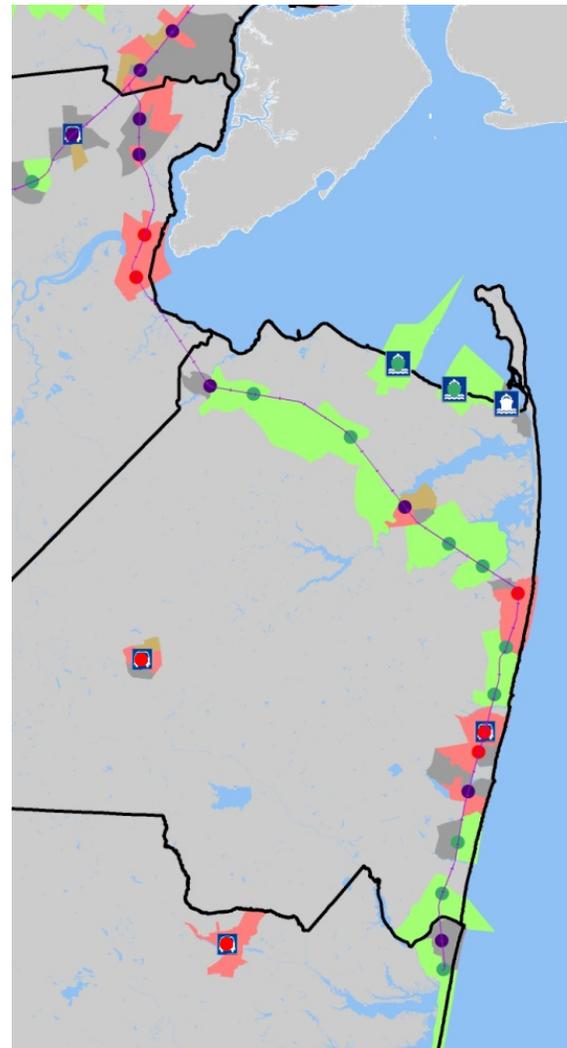
Only three Northeast Corridor stations make the higher-income list – Metuchen, Princeton Junction, and Princeton.

The final three higher-income station areas in the state are the Secaucus Junction terminal (where the housing stock has increased by 65 percent just in the last two years, apparently mostly at the high end of the market), the Florence station on the River Line, and the Hammonton station on the Atlantic City line.

There is a counterpart among the 91 higher-income stations to Cinnaminson’s unique status among the lower-income stations (recall that Cinnaminson also had an equity ratio of greater than 1.0 for the highest income category): White House, on the Raritan Valley line, which has an equity ratio of 1.62 for the highest income category but also has an equity ratio of 1.03 for the lowest income category,

Map 9. On North Jersey Coast Line, Higher-Income Station Neighborhoods Alternate With Lower-Income Ones

- transit station in higher-income neighborhood
- transit station in lower-income neighborhood
- transit station in neighborhood with center-heavy income distribution
- other transit station
- higher-income transit tract
- lower-income transit tract
- transit tract with center-heavy income distribution
- other transit tract



meaning that lower-income households are actually slightly more common in this station area than they are in the larger region. And while no other higher-income station has an equity ratio exceeding 1.0 for the lowest income category, there are 21 others in which the equity ratio at least exceeds 0.75 for lower-income households. These 22 stations (including White House) demonstrate that lower-income households are not quite as uniformly rare in generally upper-income station areas as upper-income households are in lower-income station areas. (Recall that only five lower-income station areas had an equity ratio of 0.75 or larger for households in the highest income range.)

Having even a slight overrepresentation of households at both ends of the income spectrum, relative to the host region, is exceedingly rare. Besides White House and Cinnaminson, the only other station with equity ratios greater than 1.0 for income categories at both the upper and lower ends is 9th Street/Congress Street on the HBLR in Hoboken. In fact, only 14 other stations even manage to have equity ratios of 0.90 or greater for income categories at both ends of the spectrum: the Port Imperial and Highlands ferry terminals; the bus terminal in Ocean City; the 2nd Street (in Hoboken) and Lincoln Harbor (in Weehawken) HBLR stops; the Bordentown station on the River Line; three stations on the Atlantic City commuter rail line (Lindenwold, Atco, and Hammonton); three stations on the Coast line (Red Bank, Elberon, and Point Pleasant Beach); and the Basking Ridge (in Bernards Township) and Glen Ridge commuter rail stations. In the vast majority of transit-station neighborhoods, a concentration of lower-income households tends to correspond with a lack of higher-income households, and vice versa.

Stations with household incomes concentrated in the center of the regional distribution

We earlier mentioned a third type of “inequitable” income distribution, a “center-heavy” distribution in which household incomes are concentrated in the middle, with relatively few households at either the high or the low end. There are 10 transit-station neighborhoods with income distributions that fit this description, and they are surprisingly geographically clustered. Eight of the 10 are on the outer (non-electrified) end of the Montclair-Boonton line: the two stations in Wayne (Route 23 and Mountain View), Lincoln Park, Boonton, Mount Arlington, Lake Hopatcong, Netcong, and Hackettstown. The other two are Hamilton (on the Northeast Corridor) and Wood-Ridge (on the Pascack Valley line). It is not clear what these stations may have in common, other than so many of them appearing on a single commuter rail line.

Incomes and Housing Stock

High incomes tend to be associated with a high percentage of single-family detached housing

A high percentage of single-family detached housing in a transit-station neighborhood tends to be associated with an income distribution skewed toward the high end when examined across all transit stations. Statewide, 53.9 percent of all housing units are single-family detached. A surprising number of transit-station neighborhoods – 109 out of 244 – have a greater percentage of single-family detached units than the statewide average. In fact, there are 54 transit-station areas (almost a quarter of all station neighborhoods) where the single-family detached percentage exceeds 70 percent. Of these 54, 44 have equity ratios greater than 1.20 for the highest income category, while only two (Pennsauken Transit Center and the Toms River Park & Ride bus terminal) have equity ratios greater than 1.20 at the low end of the income scale. (The remaining eight station areas with high percentages of single-family detached housing manage to have income distributions that more closely mimic the distributions of their host regions.) A station area with a high percentage of single-family detached housing, then, is much more likely to host a concentration of higher-income households than a concentration of lower-income households. This disparity points toward an obvious solution for diversifying the income profile of many station areas that are currently skewed toward the high end: diversify the housing stock and create housing options other than single-family detached homes, so that households of more modest means have options that they can afford.

High Density, High Income

While the top of the list of transit-station areas when sorted by single-family detached percentage is dominated by higher-income stations, the *bottom* of the list (where single-family detached units are rare) is *also* dominated by another cluster of higher-income stations. The 12 stations with the lowest percentages of single-family detached housing units all have equity ratios of greater than 1.20 for the highest income category, indicating disproportionately high rates of higher-income households: Hoboken Terminal; the Liberty Harbor, Paulus Hook, Port Liberté, and Hoboken 14th Street ferry

terminals; and the Newport, Exchange Place, Grove Street, Harsimus Cove, Harborside, Essex Street, Jersey Avenue, and Marin Boulevard rail stations (served by PATH, HBLR, or both). All of these are located along the Hudson County "Gold Coast" in Hoboken and Jersey City (see **Map 6**), where single-family detached homes were already exceedingly rare among the generally older housing stocks, and where new housing has tended to be in large multi-family buildings. In all of these station areas, more than half of all housing units are in structures with 20 or more units, except Hoboken 14th Street, which just misses, at 49.0 percent. As a result, they are all also among the most densely populated station neighborhoods in the state. Unlike with most of the other higher-income station neighborhoods, the problem here is not a lack of housing options caused by largely single-family-detached zoning; in fact, these stations' host municipalities are doing exactly what should be done to maximize the number of households that can take advantage of public transit. Instead, even with very high housing densities, demand is outstripping supply in these places, because of their proximity and excellent transit connections to New York City. The challenge is how to provide lower-cost housing in strong-market places where even high-income households are perfectly willing to live at very high densities in exchange for urban amenities -- and where they bid prices up accordingly.

Trends in Housing Markets

In addition to a snapshot of current conditions regarding regional equity, we are also interested in describing trends. We are particularly interested in station areas that may be on a path toward losing their income diversity by becoming more uniformly upper-income, a phenomenon often colloquially described as "gentrification." More precisely, we are concerned about the possibility that a station area could be gaining higher-income residents *due to displacement of lower-income residents* rather than simply gaining them by having them move into newly-constructed housing. It is important to maintain a distinction between gentrification and displacement. Gentrification, when defined simply as an increase in a neighborhood's median household income due to higher-income households moving in, is not necessarily a cause for concern in and of itself – in fact, it should generally be viewed as a positive, in terms of improving the social and fiscal health of an area. What local officials need to guard against is rising property values in the area forcing long-time lower-income households to move elsewhere.

Changes in the distribution of household income tend to be a lagging variable with respect to changing market conditions. Home values in a neighborhood may suddenly start rising, but this will not immediately show up as an increase in household incomes because homeowners' mortgage payments are fixed, meaning that many households will be able to continue living in the neighborhood at their present income levels, even if the increased real estate values mean that those households would have difficulty buying into the neighborhood if they had to do so today. Renters, too, may not necessarily move out of the neighborhood right away. For one thing, caps on rent increases for existing tenants can mean that those tenants will not see their rents rise immediately to the new market level that landlords can charge to people who are just moving in. And even in the face of rising rents, some tenants will choose to bite the bullet at least temporarily and pay a larger proportion of their income in housing costs rather than go through the hassle of moving.

Rather than using income to measure trends in addition to current conditions, we will instead identify market trends by looking at changes in three variables that tend to respond more quickly to changing market conditions:

- median home value (for homeowner households)
- median gross rent (for renters)
- the percent of households experiencing a housing cost burden, defined as spending more than 30 percent of gross household income on housing costs (including both owners and renters)

We will normalize station-area trends by comparing to the statewide trend, so as to correct for economic factors that are affecting the entire state and identify only those station areas where the market is changing relative to statewide conditions.

Because the boundaries of census tracts are redrawn after every decennial census, we are limited in our analysis to just a two-year trend; the first and most recent five-year American Community Surveys⁵ to use the 2010 census tract boundaries are the 2006-2010 and the 2008-2012 surveys, respectively. However, even just the two-year trends reveal important phenomena.

With respect to changes in median home value, it should be noted first that as a group, transit-station areas outperformed the state overall, reinforcing the already observed pattern that [transit-accessible places have generally weathered the recession better than elsewhere](#). Estimated median home value for the state actually declined by 6.8 percent from the 2008 one-year American Community Survey to the 2010 survey.⁶ But 185 of the 224 transit-station areas, or 75 percent of them, had changes in estimated median home value from the 2006-2010 ACS to the 2008-2012 ACS that were more favorable than the statewide change, with 41 station areas bucking the statewide downturn and actually posting increases.

Median gross rent, on the other hand, went up by 4.3 percent at the state level, reflecting the broad trend of people moving from homeownership to renting as a result of the housing market crash, putting upward pressure on rents until additional supply can be added. Median gross rent increased faster than the state rate in 135 of the transit-station areas, or a little bit more than half of them. On this measure, then, transit-station areas were not as different from the rest of the state as they were on the change in median home value.

⁵ It is necessary to use the five-year version of the American Community Survey in order to get estimates at the census tract level, from which the transit-station-level estimates are produced.

⁶ The five-year version of the American Community Survey, used for creating estimates at lower levels of geography like the census tract, averages five years' worth of data to construct its estimates. To compare a five-year ACS estimate to an estimate for a higher level of geography (like a state or most counties) from the one-year version of the survey, it is best to use the five-year survey whose midpoint year is the same as the single year reference point for the one-year survey. Thus, the 2008 one-year ACS would be used for comparisons to the 2006-2010 five-year ACS, and the 2010 one-year survey corresponds to the 2008-2012 five-year survey.

The transit-station neighborhoods on the whole similarly mirrored the state on the change in the percent of cost-burdened households: At the state level, the percent of households paying more than 30 percent of their gross income on housing costs ticked up slightly, from 44.4 percent to 45.1 percent, an increase of 0.7 percentage points. About half (117) of the station areas saw their cost-burdened percentage go up by more than 0.7 percentage points, while the other half (the other 127 stations) saw their percentages either decrease (106 stations) or rise by less than 0.7 percent (21 stations).

Of particular interest are station areas where housing markets appear to be improving at well above the state rate. Let us consider station areas where at least two of the following three things are true:

- the median home value actually increased between 2008 (as measured by the 2006-2010 five-year ACS) and 2010 (as measured by the 2008-2012 survey), in contrast to a statewide decrease of 6.8 percent – this was true of 41 station areas
- median gross rent increased by at least double the statewide increase of 4.3 percent – this was true of 60 station areas
- the percent of cost-burdened households increased by at least 1.14 percentage points, double the statewide increase of 0.7 percent – this happened in 97 station areas

There were six station areas in which all three of these conditions were true, and another 30 where at least two of them held. In these 36 station areas, housing markets appear to be improving much faster than statewide.

Nine of these 36 already have equity ratios of greater than 1.20 for the highest income category; that is, they already have a high concentration of upper-income households. In this group are the Port Liberté and Atlantic Highlands ferry terminals; both the commuter rail station and the bus terminal in Ridgewood; the Woodcrest PATCO station in Cherry Hill; and commuter rail stations in Woodcliff Lake, Chatham, Spring Lake, and Bay Head. If housing values and costs are on the rise in these areas where lower-income households are already underrepresented, they are in danger of pushing out the relatively few such households that remain.

At the other end are 14 station areas characterized by relatively low incomes – those with equity ratios of greater than 1.20 for incomes below 80 percent of regional median – but where housing markets poised for a rebound may soon put lower-income households at risk of displacement. Almost half of them are in Camden – the Walter Rand Transportation Center (which serves both PATCO and the River Line), the City Hall and Ferry Avenue PATCO stations, and the Cooper Street/Rutgers, Entertainment Center, and Aquarium stops on the River Line. In other words, all six of Camden’s transit stations are on this list. So are three River Line stations nearby, at Pennsauken/Route 73, Cinnaminson, and Burlington South. The remaining five are the Liberty State Park HBLR station, the Harrison PATH station, the Vineland bus terminal, and the two commuter rail stations in New Brunswick (New Brunswick and Jersey Avenue). Whatever is happening around these station areas to cause housing values and costs to increase, local (and perhaps state) officials need to take steps to ensure that the rising tide does not price out long-time lower-income residents.

Conclusions

New Jersey's 244 transit stations and their surrounding neighborhoods are a diverse group of places, calling for a diverse set of policy prescriptions. **Table 2** summarizes how many transit-station neighborhoods are characterized by an income distribution skewed toward the low end, how many have relative concentrations of higher-income households, how many are overwhelmingly middle-income with very few households at either end of the income spectrum, and how many have income distributions that more or less reflect their larger host regions.

A few key observations:

Despite the demand for walkable, mixed-use, transit-accessible living that has resurfaced in the wake of the Great Recession, not every transit station has been able to capitalize on the renewed interest in transit-oriented development. The neighborhoods around many transit stations are characterized by chronic disinvestment and remain populated mostly by lower-income households. Redevelopment should be incentivized in these weaker-market places, encouraging gentrification by finding ways to increase the housing supply without displacing long-time residents.

Table 2. Characteristics of New Jersey's Transit Station Neighborhoods, Broken Out By Income Levels

	# of stations	median (over all stations in group) of equity ratios for households earning:					
		< 50% of COAH region median	50-80% of COAH region median	80-120% of COAH region median	120-200% of COAH region median	> 200% of COAH region median	< 80% of COAH region median
lower-income stations [equity ratio > 1.20 for households earning < 80% of regional median]	86	1.70	1.28	0.94	0.60	0.29	1.59
higher-income stations [equity ratio > 1.20 for households earning > 200% of regional median]	91	0.56	0.63	0.74	1.09	1.95	0.58
stations with center-heavy income distribution [equity ratio < 0.90 for both households earning < 80% of regional median and households earning > 200% of regional median]	10	0.71	1.03	1.28	1.39	0.72	0.82
stations with relatively "equitable" distribution	57	0.93	1.07	1.15	1.03	0.81	0.98
all transit stations	244	0.90	0.99	0.94	0.97	0.83	0.95

A greater array of housing options is needed around many high-income stations, so that they can become affordable to households with more modest incomes. A high percentage of single-family detached housing units is associated with a concentration of higher-income households when examined across all transit stations, indicating that lack of diversity in the housing stock is likely a contributing factor to the lack of income diversity.

Some entire rail corridors are effectively out of reach for households of more modest means. Stations on the Gladstone line and the outer stations on the Pascack Valley, Main/Bergen, and Morristown lines all need to consider creating a wider range of housing options so that the benefits of living near transit are open to all households.

Even in some municipalities that are not generally wealthy overall, there are clusters of particularly desirable transit stations where the surrounding neighborhoods are dominated by higher-income households. This is particularly true along the Hudson County “Gold Coast.” Host municipalities should be trying to make sure that these station areas’ newfound popularity is made available to households of all incomes, such as by implementing inclusionary affordable-housing ordinances that require a certain percentage of units in new developments to be priced within reach of more moderate-income households. Municipal leaders should also be alert to the prospect of this new demand spreading outward to the next ring of stations and should be taking proactive steps to ensure it does not displace lower-income households in those neighborhoods.

Lower-income households tend to be present in greater numbers in transit neighborhoods dominated by higher-income households than higher-income households are in transit neighborhoods dominated by lower-income households. This suggests that inducing middle-class households to move into historically distressed transit-station neighborhoods may be as big a challenge as creating housing opportunities for lower-income households in more upscale transit communities.

Appendix A: Defining Transit-Station Neighborhoods Using Census Tracts

To define neighborhoods around each of New Jersey’s transit stations for the purpose of data analysis and presentation, New Jersey Future began with an inventory of census tracts supplied to us by New Jersey Transit. The inventory was developed by NJ Transit’s GIS department by drawing a radius of one-half mile around each NJ Transit commuter-rail and light-rail station, each PATH station, and each PATCO station, and identifying all census tracts that intersected each radius, no matter how minimally. Because NJ Transit performed the analysis separately for each system (NJT commuter rail, NJT light rail, PATH, and PATCO), a few stations appeared in more than one file – for example, Newark Penn Station is served by NJ Transit commuter rail, the Newark Light Rail system, and PATH and hence appeared in all three files. We removed these duplicate records from the inventory before proceeding with further analysis. We also supplemented the list of tracts by performing our own similar GIS analysis for the 16 major bus terminals and 10 ferry terminals (and SEPTA’s West Trenton commuter rail station) that were not included in the NJ Transit analysis. After accounting for multi-service stations, removing duplicate sets of station-area tracts, and drawing new buffers and adding new tract records for the bus and ferry terminals, 244 distinct station areas and their associated tracts remained.

The unduplicated NJ Transit inventory contained 1,185 census tract records before the bus and ferry terminals were added (our rules for deleting tracts – described below – were developed using the original NJ Transit data and were later also applied to the buffers we drew around the bus and ferry terminals). Not all of these records were unique, because many tracts appear in the half-mile buffers around more than one station. This is particularly true in parts of the state where stations are very close together, where two stations’ half-mile buffers overlap parts of the same tract and may even overlap each other. It can also happen in parts of the state where population is sparse and census tracts are geographically large, so that even if stations are not particularly close together, a single tract can be large enough to intersect the buffers around two adjacent stations. Accounting for these overlaps, the 1,185 records in the inventory actually represented only 687 unique tracts. Of the 687 unique tracts, 394 were associated with only one station (i.e. intersected only one station’s half-mile buffer), another 181 were at least partially contained in 2 station areas, and the rest intersected 3 or more stations’ buffers.

Preliminary analysis was performed on this list to determine how effectively this methodology represented the geography of “station areas.” We were concerned that some stations’ neighborhoods might be overstated via the inclusion of census tracts having only very small areas of intersection with the station’s half-mile buffer. (In such situations, the entire tract is counted as being part of the station’s neighborhood, when in fact only a very small portion of the tract is actually within walking distance of the station.) NJ Transit supplied us with calculations indicating the area of each tract that actually fell within the half-mile buffer around the associated station(s) – we refer to this area as the tract’s “intersect” – and this figure was used to determine the percentage of the tract included in the buffer (by dividing the intersect by the tract’s total land area). An analysis of this metric indicated that a

large majority of the intersect areas comprised a small percentage of the respective tract's total area. The median intersect percentage for the 1,185 tract observations was 18.38 percent of the tract contained in the buffer. The first quartile value (the value below which 25 percent of the observations fell) was an intersect area of only 4.16 percent of the total tract area. Even the third quartile (i.e. the 75th percentile) was fairly low at 44.23percent. "Station-area" tracts for which even half of their area fell within half a mile of the associated transit station were thus relatively rare. These findings demonstrate that significant overestimation, with respect to both land area and demographic characteristics, will occur if "station areas" are defined using *all* census tracts intersecting the half mile buffer.

Some degree of overstatement is unavoidable, since a half-mile radius drawn around any station is not going to conform neatly to census tract boundaries, but including all tracts that intersect the half-mile buffer seemed too loose a standard. Based upon our initial findings, further analysis was undertaken to determine what the impact would be of removing all observations with less than 5 percent intersect areas – that is, removing all tracts for which only 5 percent or less of the tract's area was actually within half a mile of the station with which the tract was initially associated. This would still be a fairly generous definition of "walking distance" from the station, since a tract could have up to 95 percent of its land area farther than half a mile away and still be included; however, people will often be willing to walk a bit more than half a mile if the surrounding area has a good grid street network with continuous sidewalks, as many stations do in the more densely populated parts of the state. Focusing on tracts with less than 5 percent of their area within the half-mile buffer would allow us to weed out the most conspicuous overstatements. Removing such tracts resulted in a reduction in the number of observations from 1,185 to 873, with 547 unique census tracts, down from 687.

This 5-percent cutoff did, however, result in the elimination of both the Egg Harbor City and Mount Olive station areas from the inventory entirely, clearly an undesirable result. This happened because these two station areas comprise solely of census tracts with very large areas, to the extent that none of the constituent tracts had more than 5 percent of its area contained within the buffer. Egg Harbor City and Mount Olive thus pointed to a need to look at other criteria beyond what percent of each initial station-area tract fell within the buffer; the percent of the buffer accounted for by each tract intersection is important as well, so as not to lose the entire buffer when trimming the list of tracts.

Again using the tract intersect areas provided by NJ Transit, the percentage of the buffer comprised by each tract intersect was calculated, by dividing the tract intersect by the total buffer area. This percentage was then summed over all intersects in the buffer after the tracts with less than 5 percent intersect areas were eliminated, to determine what percentage of the buffer itself remained when using the 5-percent cutoff. For most station areas, a large majority of the half-mile buffer was retained, with even the 25th percentile being 94.46 percent (that is, in only 25 percent of cases did the buffer decrease to less than 94.46 percent of its initial area when the tracts with less than a 5 percent intersect were removed). However, there were a small number of station areas that were significantly compromised, with 10 station areas having retained less than 80 percent of the buffer and five station areas having retained less than 60 percent of the buffer (including, as already indicated, the buffers around Egg Harbor City and Mount Olive completely disappearing).

The impact of the proposed 5-percent cutoff was also measured in terms of the magnitude by which the overstatement of the geographic extent of “station areas” was reduced. This was done by calculating the ratio of the full initial station area (the NJ Transit definition including *all* tracts that intersected the buffer) to the reduced station area containing only intersected tracts that overlapped the buffer by more than 5 percent. The median for this ratio was 1.3 (meaning that the inclusion of tracts with less than 5 percent of their areas within the buffer had initially made the median station area definition 30 percent larger), with an inter-quartile range between 2.2 and 1.01. In total, removing tracts with less than 5 percent intersect areas reduced the total area of all New Jersey census tracts defined as being within a half mile of some form of rail station from 997.47 square miles to 559.67 square miles, a 44 percent reduction. It is clear that the initial definition, based on including *all* intersecting tracts, was producing a substantial overstatement of the area that is actually within reasonable walking distance of transit, and that a significant reduction in the overestimation of the extent of transit accessibility could be accomplished via the imposition of a fairly modest minimum tract/buffer overlap requirement of 5 percent.

Problematic, however, was the fact that many of the top 10 largest overstatement reduction ratios coincided with many of the smallest retained buffer areas. The 10 largest ratios (aside from Egg Harbor City and Mount Olive, which retained none of their buffers, as discussed above) looked as follows:

Station ID	Ratio of initial station area to revised station area	Percentage of ½-mile buffer retained after removing tracts with less than 5% intersect
Roebling	40.75	51.5%
Lebanon	24.88	44.7%
Bordentown	12.83	48%
Convent Station	9.88	80.17%
Berkeley Heights	8.89	75.11%
Netcong	8.51	90.9%
Park Ridge	8.27	90.03%
Raritan	7.05	93.94%
Lyndhurst	6.5	69.65%
Hackettstown	6.36	91.67%

To avoid the problem of losing too much of the half-mile buffer area when tracts having only marginal overlap (relative to total tract size) with the buffer are deleted, we adopted a rule that for any station area in which removal of all tracts with an intersect area of 5 percent or less resulted in a loss of more than 10 percent of the actual buffer area, we would manually inspect the tracts being removed and make a judgement as to whether some or all of the deleted tracts should be added back in. There were few enough such stations that manual inspection of all of them was not time-prohibitive. (In total, 33 station areas were manually inspected.)

The general rules for exclusion of a tract from the station area are as follows:

1. Initially define a “station area” as the set of all census tracts that intersect (no matter how marginally) a circle (“buffer”) of radius one half-mile around the station
2. For each candidate station-area tract, compute the ratio of 1) the tract’s intersect with the buffer to 2) the tract’s total area; i.e., compute the percent of the tract’s area that actually lies within half a mile of the station
3. Provisionally exclude from a station’s neighborhood definition any tract with less than 5 percent of its total area within the buffer, and re-compute station areas using the revised list of tracts
4. Compute the percent of the original buffer area that is retained after the proposed exclusion of the tracts in Step 3 by summing the buffer intersect areas of all remaining tracts and dividing this sum by the initial buffer area (i.e. divide by the area of a circle of radius one-half mile)
5. If the exclusion of tracts in Step 3 (if any) results in the retention of more than 90 percent of the buffer area, no further analysis is necessary and the tract(s) can be permanently excluded.
6. For station areas where excluding tracts in Step 3 results in retaining less than 90 percent of the buffer area, perform visual inspection of aerial imagery of the station area to determine if any of the provisionally excluded tracts warrant being retained. In practice, tracts that primarily consisted of water, wetlands, other undeveloped land, or industrial properties, and tracts that were cut off from the actual transit station by bodies of water or major roadways, were typically excluded. On the other hand, tracts whose buffer intersects contained residential or commercial development contiguous with development in adjacent tracts were typically re-included if their intersects comprised a significant percentage of the buffer.

After adding in tracts around bus and ferry terminals and then deleting tracts having only minimal intersects with the half-mile buffers around stations, we were left with a total of 615 tracts that we considered to be within half a mile of a transit station, compared with 762 such tracts using the initial NJ Transit rail-only list. Taken together, these 615 tracts have a total land area of 663 square miles, compared to the 1,155 square miles covered by the larger initial set of 762 tracts. New Jersey Future’s procedure for eliminating peripheral tracts thus resulted in a reduction of 42.6 percent in the total area of all station-area tracts, despite the bus and ferry terminals not being included in NJ Transit’s initial analysis. Because we erred on the side of inclusion and allowed tracts having as little as 5 percent of their total area within the half-mile buffer around a station to be classified as transit tracts, our final set of 615 tracts is still an overstatement of the true area that lies within half a mile of one of New Jersey’s transit stations. The total area of 244 circles of half-mile radius is actually only 191.6 square miles. Our 615 transit tracts overestimate this “true” area by a factor of about 3.5 ($= 663/191.6$), but this is a far less significant overstatement than was true of the initial NJ Transit list, which exceeded the “true” area by a factor of more than 6.

After the lists of tracts comprising each station area were finalized, there were a few cases in which two different stations in the inventory had the same list of station-area census tracts. In a few other cases,

two nearby stations with the same name had slightly different lists of station-area tracts. What follows is a list of judgement calls as to how these cases were resolved:

- As mentioned earlier, there were several cases where the same station is served by multiple rail systems and hence appeared in each of NJ Transit’s system-specific station-area definitions. NJ Future’s analysis treats these as a single station:
 - Newark Penn Station – served by NJ Transit commuter rail, Newark Light Rail, and PATH
 - Newark Broad Street – served by NJ Transit commuter rail and Newark Light Rail
 - Hoboken Terminal – served by NJ Transit commuter rail, Hudson-Bergen Light Rail, and PATH
 - Trenton Transit Center – served by NJ Transit commuter rail and the River Line light rail system
 - Pennsauken Transit Center – served by NJ Transit commuter rail and the River Line light rail system
 - Walter Rand Transportation Center – served by the River Line light rail system and PATCO (where the station is called Broadway)
 - Lindenwold – served by NJ Transit commuter rail and PATCO

- These stations also serve more than one system (or, in one case, more than one line on the same system) but are not unambiguously the same facility with the same entrances from the street. However, because of their physical proximity and the fact that their sets of station-area tracts are identical, in addition to having the same name, NJ Future treated them as the same station:
 - Exchange Place – served by PATH and Hudson-Bergen Light Rail
 - Newport – served by PATH (where the station is called Pavonia / Newport) and Hudson-Bergen Light Rail
 - The Glen Rock commuter rail station(s) also falls into this category – the NJ Transit file contained entries for both Glen Rock – Main and Glen Rock – Boro Hall, which do indeed have separate boarding platforms and in fact are located on two separate commuter rail lines – the Main Line (Main) and the Bergen County Line (Boro Hall), respectively – just south of where the two lines merge/split. However, because 1) they are located only a block apart, 2) NJ Transit ridership reports present statistics only for Glen Rock (effectively treating them as a single station), and 3) they have identical sets of station-area tracts, we treated them as effectively functioning as a single station.

- In these cases, two distinct stations are located close enough together, or are located in tracts that are geographically large enough, that the half-mile radii around the two stations intersect the same set of tracts. Although their tract-based “neighborhoods” thus end up being identical, they are treated as separate stations (and have separate ridership statistics):
 - Gillette and Stirling on the M&E Gladstone Branch
 - Peapack and Gladstone on the M&E Gladstone Branch
 - Palmyra and Riverton on the River Line

- Atlantic Street and Washington Park on the Newark Light Rail
- Essex Street on the Hudson-Bergen Light Rail and the Exchange Place PATH/HBLR station
- There are two ferry terminals¹ – Lincoln Harbor and Port Imperial – that each have the same name as a nearby station on the Hudson-Bergen Light Rail, but the pairs of same-named stations are physically far enough apart that their lists of tracts within half a mile of the station are slightly different. The ferry terminals were therefore treated as separate stations from the HBLR stations that share their names. The Hoboken ferry terminal, on the other hand, is treated as being co-located with Hoboken Terminal.

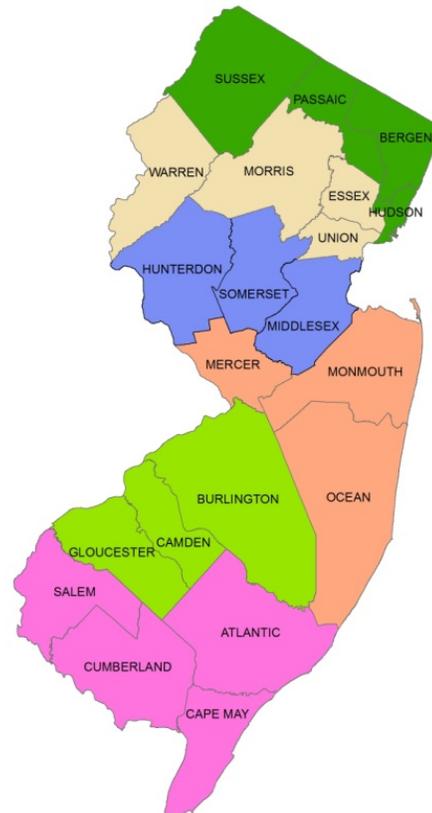
¹ New Jersey Future created tract-based station-area neighborhoods around each of the state’s commuter ferry terminals, in a process parallel to that used by NJ Transit and revised by New Jersey Future for rail transit stations.

Appendix B: Using Census Bureau Income Data To Approximate HUD-Style Income Ranges Defined Relative to Regional Median

For purposes of describing income distributions in transit station neighborhoods, we sought to compare individual station areas to regional benchmarks, namely the six housing regions defined by the Council on Affordable Housing (COAH) (see **Figure B.1**).

Figure B.1. Housing Regions Defined by the Council on Affordable Housing (COAH)

Northeast: Bergen, Hudson, Passaic, Sussex
 Northwest: Essex, Morris, Union, Warren
 West Central: Hunterdon, Middlesex, Somerset
 East Central: Mercer, Monmouth, Ocean
 Southwest: Burlington, Camden, Gloucester
 South/Southwest: Atlantic, Cape May, Cumberland, Salem



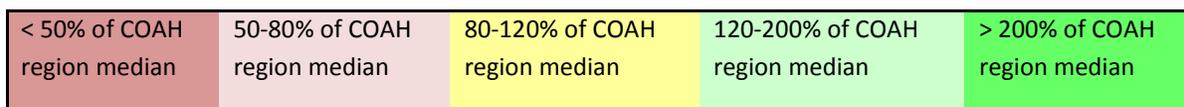
We also wanted to describe these income distributions – both for individual station areas and for COAH regions in total – in relative terms, with income ranges defined in terms of percentages of the regional median household income, using cutoffs similar to those employed in HUD-administered housing programs. Specifically, we wanted to identify, for each COAH region:

- a regional median household income

and thence the following data points defined relative to that median:

- 50 percent of (estimated) regional median
- 80 percent of regional median
- 120 percent of regional median
- 200 percent of regional median

These four cutoff points then define five income ranges relative to the regional median, as represented by the following diagram:



We will refer to these ranges as “HUD ranges,” since they are defined relative to a regional median, as is done in HUD assistance programs. Our goal is to estimate the percentage of households that fall into each of these ranges for each COAH region and for each transit station neighborhood within each of the regions.

We used data on median household income from the 2008-2012 five-year American Community Survey as the raw material for creating income distributions using these HUD ranges. We began by approximating a region-wide median for each COAH region by taking a weighted-average of the median household incomes of all municipalities in the region, where each municipality’s median was weighted by the number of households in the municipality. This is akin to creating a data set with one observation for each household in the COAH region, only with each household’s actual income (the individual values of which are not known from the tabular data anyway) replaced with the median household income for that household’s municipality of residence, and then taking the median over all the observations in the data set.

Estimating a region-wide median household income is thus relatively straightforward. And the HUD income range cutoffs are then easily computed in terms of the COAH region median. **Table B.1** shows the estimated median household income for each COAH region, along with the HUD income range cutoff points that derive from the median.

COAH region	total households	estimated median HH income	50% of median	80% of median	120% of median	200% of median
northeast	794,927	72,473	36,237	57,978	86,968	144,946
northwest	683,523	75,496	37,748	60,397	90,595	150,992
west central	442,695	89,038	44,519	71,230	106,846	178,076
east central	586,887	75,068	37,534	60,054	90,082	150,136
southwest	458,572	72,097	36,049	57,678	86,516	144,194
south/southwest	220,215	56,774	28,387	45,419	68,129	113,548

The difficulty arises in trying to determine how many households then fall into each of the five HUD ranges defined by these cutoff points. The percentages of households falling into each HUD range cannot be computed precisely using Census Bureau tabular data because the Census Bureau reports household income using a standard set of income ranges/categories (see **Figure B.2**) with endpoints given in round dollar amounts. The endpoints of these ranges are unlikely to coincide with (and would do so only by chance) any of the HUD range cutoff points, since the HUD ranges are defined relative to regional medians, and these medians (and hence the endpoints of the data ranges) vary from one region to another and are also unlikely to assume round dollar-amount values in any case. Household counts for the HUD ranges must therefore be approximated by assigning each census data range – and all of the households falling within it – to one and only one of the HUD ranges. The number of households in the

HUD range is then estimated as the total number of households in all census income categories that have been assigned to that HUD range. Some consistent method must therefore be devised for mapping the Census Bureau income ranges onto the desired HUD ranges.

Let us use the Southwest COAH region (consisting of Burlington, Camden, and Gloucester counties) as an example of how to map the census income ranges onto the HUD ranges. In **Table B.2**, we show the numbers of households in the Southwest region that fall into each of the standard census household income categories. (These counts are computed by summing the county-level counts of households in each income category over the three counties in the COAH region.) We also display a histogram of this data (see **Figure B.3**), with the *total area* of each bar proportional to the number of households falling into the income range represented by that bar.¹

Figure B.2. Standard Data Ranges Used by the Census Bureau for Reporting Household Income

- Less than \$10,000
- \$10,000 to \$14,999
- \$15,000 to \$24,999
- \$25,000 to \$34,999
- \$35,000 to \$49,999
- \$50,000 to \$74,999
- \$75,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 to \$199,999
- \$200,000 or more

total households	southwest COAH region -- number of households having income:									
	< \$10K	\$10K - \$14,999	\$15K - \$24,999	\$25K - \$34,999	\$35K - \$49,999	\$50K - \$74,999	\$75K - \$99,999	\$100K - \$149,999	\$150K - \$199,999	\$200K+
458,572	22,171	16,832	34,294	36,438	51,265	80,938	66,381	85,480	36,406	28,367

¹ An accurate visual representation of the income distribution requires the heights of the bars to be adjusted downward in some cases, because not all of the standard income ranges are of the same width. For example, the narrowest of the standard census income ranges is “\$10K - \$14,999,” which has a width of only \$5,000, while the range “\$35K - \$49,999” has a width of \$15,000, or three times as wide. On a histogram using \$5,000 as the unit interval, the bar for “\$10K - \$14,999” can be drawn with a height proportional to the actual number of households in that range – 16,832 – since the bar is only one unit interval wide. But for the “\$35K - \$49,999” range, the bar is three unit intervals wide (which we could label \$35K - \$39,999, \$40K - \$44,999, and \$45K - \$49,999), so the bar must be drawn at a height only one-third the number of households in that range – 51,265 / 3 = 17,088. Conceptually, think of dividing the “\$35K - \$49,999” range into three subintervals, each of width \$5,000. If there are 51,265 households in the whole range, then on average there are one-third this amount, or 17,088, in each of the subintervals, hence the appropriate height of the whole bar is 17,088.

Figure B.3. Histogram of Household Income Distribution in Southwest COAH Region, Using Census Bureau Income Ranges

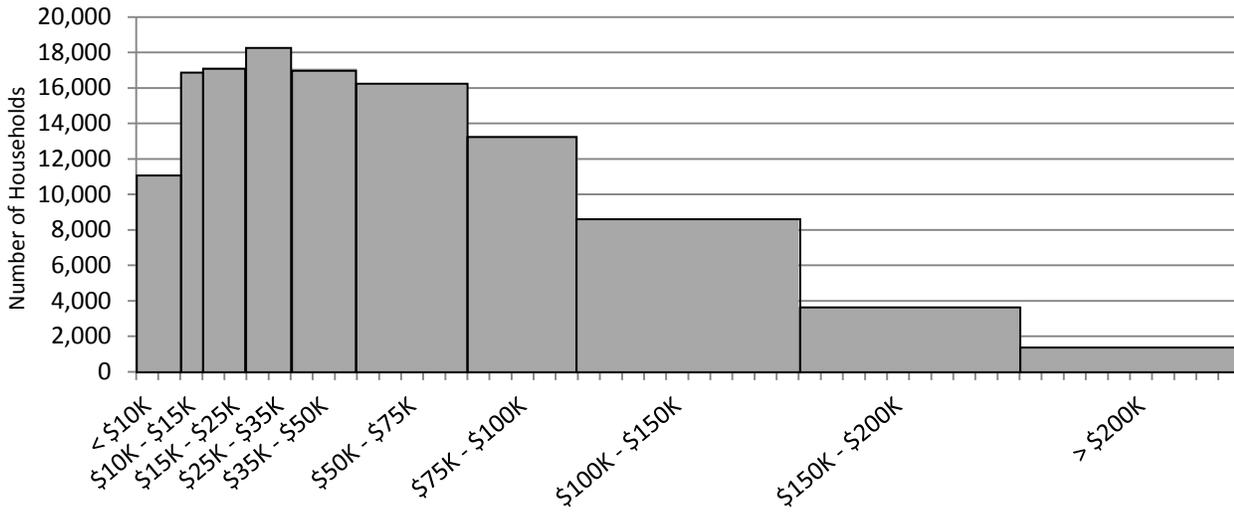
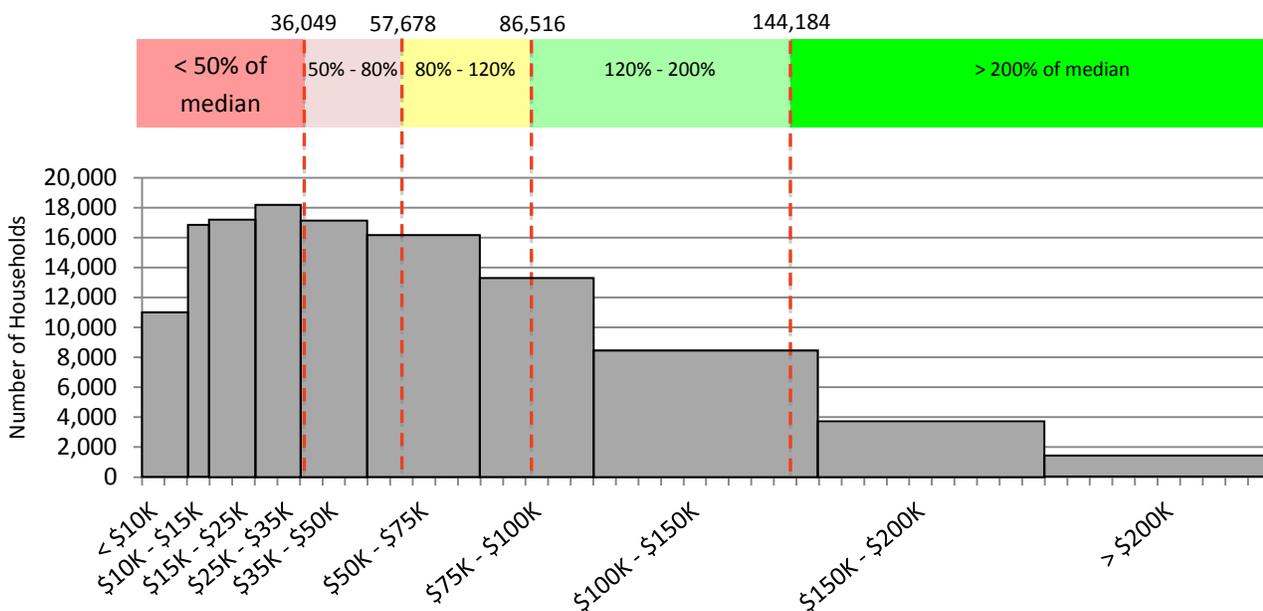


Figure B.4 shows the same histogram of household income for the Southwest region but with the HUD range cutoff points for the region (from Table B.1) indicated. Note that none of the cutoff points neatly coincides with any of the endpoints of the census income ranges.

Figure B.4. Histogram of Household Income Distribution in Southwest COAH Region, With HUD Income Range Cutoff Points Indicated



The individual HUD-range cutoff points that are defined relative to the regional median will generally fall somewhere in the middle of one of the published census ranges rather than right at an endpoint. So in each case, a decision needs to be made as to whether the published income range that includes a particular cutoff point should be considered to be above or below that cutoff point. We have adopted a rule that this will depend the end of the published range to which the cutoff point is closest. For example, in the Southwest region, the “80 percent of regional median” cutoff point of \$57,678 falls in the census range of “\$50,000 to \$75,000” but is closer to the lower endpoint of that published range, so all the households in that range will be tallied as being above 80 percent of the regional median (since more of the \$50,000 to \$75,000 range lies above \$57,678 than below it – see **Figure B.5**).

Figure B.5 once again shows the histogram of household income for the Southwest region and shows how each HUD range cutoff point is rounded to the nearest census income range endpoint, in order to determine which census income range(s) should be included in which HUD income category. Each bar of the histogram (i.e. each census income range) is now colored based the HUD range to which that bar gets assigned.

Figure B.5. Histogram of Household Income Distribution in Southwest COAH Region, With HUD Income Range Cutoff Points Mapped to Nearest Census Bureau Income Range Endpoint

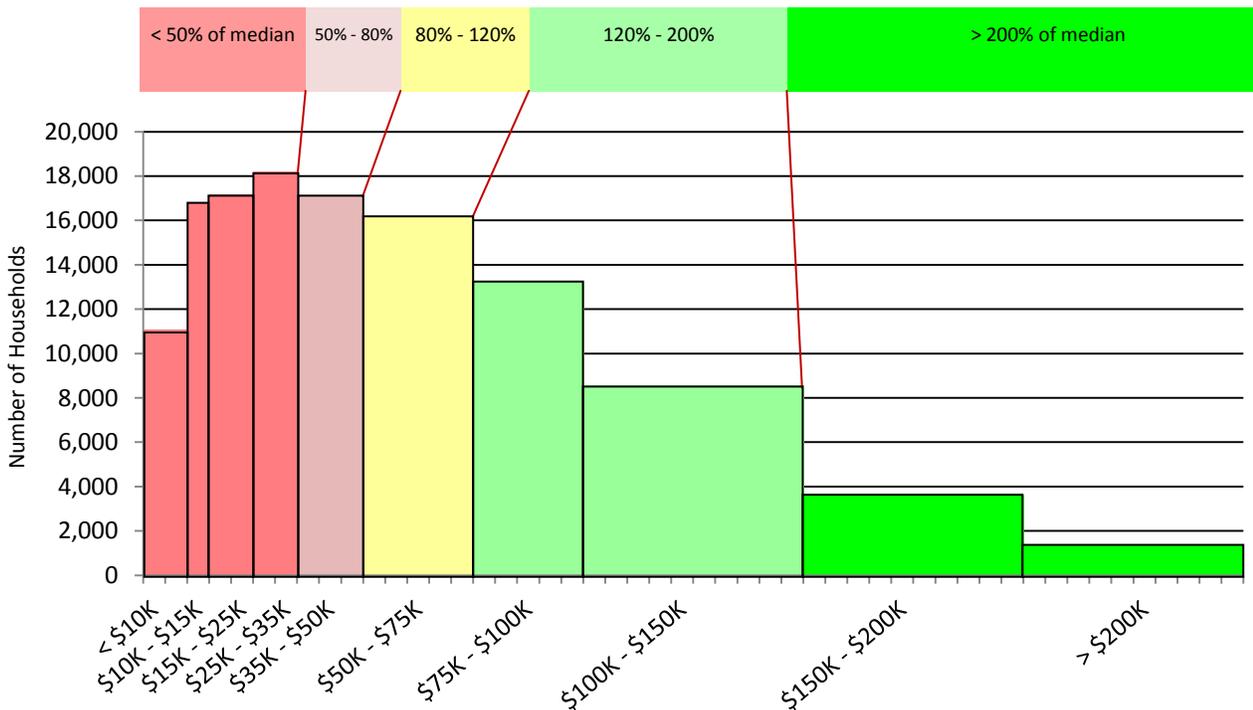


Figure B.6 summarizes the process of mapping Census Bureau income categories onto HUD income ranges for the Southwest COAH region. The top table in the graphic is simply a reproduction of Table B.2, only with each standard Census Bureau income range now color-coded to indicate the HUD range to which that census income range has been assigned. The bottom table aggregates household totals from the Census income ranges to create approximate numbers of households in each of the HUD income ranges.

Figure B.6. Mapping Census Bureau Household Income Categories Onto HUD-Type Ranges Defined Relative to Regional Median

southwest COAH region -- number of households having income:										
Census income range	< \$10K	\$10K - \$14,999	\$15K - \$24,999	\$25K - \$34,999	\$35K - \$49,999	\$50K - \$74,999	\$75K - \$99,999	\$100K - \$149,999	\$150K - \$199,999	\$200K+
# of households	22,171	16,832	34,294	36,438	51,265	80,938	66,381	85,480	36,406	28,367
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
HUD income range	< 50% of COAH region median				50% to 80% of median	80% to 120% of median	120% to 200% of median		> 200% of median	
# of households	109,735				51,265	80,938	151,861		64,773	

For each of the six COAH-defined housing regions, we used the above procedure to determine which of the Census Bureau’s published income ranges should be mapped into each of the following HUD ranges:

- Less than 50 percent of regional median
- Between 50 percent and 80 percent of regional median
- Between 80 percent and 120 percent of regional median
- Between 120 percent and 200 percent of regional median
- More than 200 percent of regional median

Table B.3 illustrates the result of this process – and illustrates how the result differs by region – by showing the original census income distribution for each COAH range (Table B.2 is essentially just the “Southwest” row of this table) and shading each census income range according to the HUD range to which it gets assigned.

Table B.3. Results By COAH Region of Mapping Census Bureau Income Data Onto HUD Ranges

COAH region	total households	median HH income	number of households having income:									
			< \$10K	\$10K - \$14,999	\$15K - \$24,999	\$25K - \$34,999	\$35K - \$49,999	\$50K - \$74,999	\$75K - \$99,999	\$100K - \$149,999	\$150K - \$199,999	\$200K+
northeast	794,927	72,473	48,144	33,528	65,702	63,091	82,155	126,900	98,469	135,435	67,332	74,171
northwest	683,546	75,496	41,841	27,456	54,576	54,703	73,259	107,207	84,184	110,819	55,818	73,683
west central	442,695	89,038	14,632	11,469	26,874	28,456	40,658	70,146	60,722	90,212	47,688	51,838
east central	586,923	75,068	26,208	21,711	48,356	48,190	63,243	95,714	76,649	103,041	49,835	53,976
southwest	458,572	72,097	22,171	16,832	34,294	36,438	51,265	80,938	66,381	85,480	36,406	28,367
south/southwest	220,215	56,774	15,158	10,633	22,380	22,353	30,370	40,040	29,812	31,253	10,573	7,643

Table cells are color-coded for each COAH region, based on which HUD income range (defined relative to regional median) each Census Bureau income range gets assigned to in that region. Household counts in the table cells are aggregated across same-colored cells to produce HUD-range totals for each region.

Note that the mapping of the census ranges onto the HUD ranges differs by region because household incomes differ from one region to another. Consider the West Central COAH region, where incomes are highest (the West Central region has an approximate median household income of \$89,038). In the West Central region, the median household income is so high that even the Census Bureau’s \$35,000-to-\$49,999 income category falls mostly below 50 percent of the regional median. In contrast, median household income in the South/Southwest COAH region is low enough (\$56,774) that only the three lowest Census Bureau income categories fall below 50 percent of the median, while the three highest all fall mostly above 200 percent of the median.

After determining by region which census income categories should be included in each HUD range, we then estimated the percent of all households in the region that fall into each of these five HUD ranges by summing the household counts from the appropriate census income ranges that are mapped to each HUD range. **Table B.4** shows the tallies of households by estimated HUD income range for each COAH region.

Table B.4. Approximate Number and Percent of All Households Falling in Each HUD-Type Income Range (Defined Relative to Regional Median), by COAH Region.

COAH region	total households	number and percent of households having income:									
		< 50% of COAH region median		50% to 80% of median		80% to 120% of median		120% to 200% of median		> 200% of median	
		number	%	number	%	number	%	number	%	number	%
northeast	794,927	210,465	26.5%	82,155	10.3%	126,900	16.0%	233,904	29.4%	141,503	17.8%
northwest	683,546	178,576	26.1%	73,259	10.7%	191,391	28.0%	110,819	16.2%	129,501	18.9%
west central	442,695	122,089	27.6%	70,146	15.8%	60,722	13.7%	137,900	31.2%	51,838	11.7%
east central	586,923	144,465	24.6%	63,243	10.8%	172,363	29.4%	103,041	17.6%	103,811	17.7%
southwest	458,572	109,735	23.9%	51,265	11.2%	80,938	17.7%	151,861	33.1%	64,773	14.1%
south/southwest	220,215	48,171	21.9%	52,723	23.9%	40,040	18.2%	29,812	13.5%	49,469	22.5%

And because the Census Bureau uses the same standard set of income ranges/categories for all geographic levels for reporting household income, we can also construct a HUD-type income distribution for each transit-station area within a given region, by taking the Census Bureau income data for each station-area census tract and combining the categories in the same way as was done for the station’s host region. (Note that this process also produces income distributions at the individual tract level as a by-product.) For every tract and every transit-station neighborhood within a COAH region, the same set of standard Census Bureau income ranges are mapped to the same HUD range, since the mapping is determined at the COAH region level.