Transit Access and Population Change: The Demographic Profiles of Rail-Accessible Neighborhoods in the Washington, DC Area

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INTRODUCTION

Community resources such as local transportation systems influence the spatial distribution of people as well as the relative utility of neighborhoods across metropolitan areas. This research explores the extent to which the population profile of workers living near rail transit differs from those of other workers within the Washington, DC region. To assess demographic changes in rail-accessible neighborhoods over time, this project uses two multi-year American Community Survey (ACS) three-year datasets for comparison, 2006-2008 and 2011-2013. Each dataset is treated as a point estimate spanning three years. The analysis includes the six counties or county equivalents in the Washington, DC region with at least one Metro Rail stop during the study period: Washington, DC; Arlington County, VA; Alexandria city, VA; Fairfax County, VA; Montgomery County, MD; and Prince Georges County, MD. [1] To assess differences across urban and suburban environments, the demographic profiles of rail-accessible neighborhoods in Washington, DC are compared to those of the five counties that surround it.

This project treats 'access' as a matter of geographic proximity to a rail stop, which serves as a proxy for one's ability to access a rail stop by walking.[2] Using Geographic Information System (GIS) software, distance to the nearest rail stop is calculated and assigned to individual workers' residence blocks. Workers with rail access are defined as those living in a block whose centroid lies within a half-mile of a rail stop. In this paper, the term *neighborhood* refers to the aggregation of all blocks within that half-mile buffer. Information on rail accessibility is then linked to demographic characteristics of individual workers. Results are presented as distributions of workers along several socio-demographic characteristics such as age, race and Hispanic origin, earnings, household composition, mobility status, and commuting mode.

Findings suggest that, for several population characteristics, rail-accessible neighborhoods differ from those without rail access. For example, in Washington, DC and the surrounding counties, some population subgroups such as young and highly educated workers disproportionately reside in neighborhoods near rail stops. The prevalence of certain groups has also increased at a comparatively high rate in rail-accessible neighborhoods, relative to other neighborhoods. For some population characteristics, the composition of rail-accessible neighborhoods in Washington, DC is notably similar to those of surrounding counties, suggesting that the presence of a rail stop may influence neighborhood characteristics in ways that transcend municipal lines or traditional notions of cities and suburbs.

RESEARCH ON PROXIMITY TO RAIL TRANSIT

A majority of the nation's workers, about 86 percent, commutes by automobile.[3] Rail transit is concentrated within a relatively small number of places, but the number of cities with some form

[1] The newest line in the Washington, DC Metro system is the Silver Line, which began service in 2014 and is not included in this analysis.
[2] Several rail transit stops include parking lots for automobiles and/or bicycle sharing docks, which expand the transit-shed area beyond walking distance.
[3] U.S. Census Bureau. American FactFinder. ACS 2013 1-Year. Table S0801.

of rail transit has increased in recent years.[4] A growing body of research focuses on the demographic and economic characteristics of the people and institutions that surround rail stops. Transportation systems are among the many forces that shape geographic dimensions of neighborhoods and influence their socio-demographic makeup, but there is a great deal to learn about how these processes unfold across different community contexts.

Transportation systems shape not only how people get around, but also the feasibility and attractiveness of living in certain locations. Over the historical arch of transportation developments, increased mobility has influenced the potential for physical separation of land uses as well as spatial clustering of subsets of populations. Transportation may influence the type and cost of housing in a given neighborhood, which influences spatial differentiation of populations along socio-economic lines. For example, the compact urban form that characterized early twentieth century walking-oriented cities imposed physical and temporal limits on the distance of routine travel to the city center for the entire working population. The expansion of streetcar lines during the early twentieth century increased the geographic range of development possibilities along the urban periphery, allowing people who could afford the regular commute downtown and the housing associated with newer streetcar-oriented communities to live outside of the congested city center.[5] The automobile and expanded road and highway systems further increased the potential for residential dispersion and geographic fragmentation along socio-economic lines.[6]

Several unanswered questions remain about how rail stops shape neighborhood boundaries and identities. Some communities have taken deliberate steps to increase residential and commercial densities near rail stations, encourage mixed-used development, and facilitate multiple transportation options. Such rail-accessible development is often referred to as transit-oriented development (TOD). Much of the existing research on TOD is concerned with changes in real estate values near rail stations. A growing body of research suggests that rail stations have some influence on the type or value of residential properties that surround them. This effect is generally positive, although its magnitude varies considerably across community contexts and according to type of rail.[7, 8] One study found that, across several large metropolitan areas, changes in property values near transit outpaced their counterparts in other neighborhoods, and the strongest effect was associated with high-frequency service transit.[9] A half-mile is commonly

[4] American Public Transportation Association. 2014. "2014 Public Transportation Fact Book." www.apta.com/resources/statistics/Documents/FactBook/2014-APTA-Fact-Book-Appendix-A.pdf.
[5] Warner Jr., Sam Bas. 1978. *Streetcar Suburbs: The Process of Growth in Boston, 1870-1900*. Harvard University Press, Cambridge.
[6] Jackson, Kenneth. 1985. *Crabgrass Frontier: The Suburbanization of the United States*. New York: Oxford University Press.
[7] Zuk, Miriam, Ariel H. Bierbaum, Karen Chapple, Karolina Gorska, Anastasia Loukaitou-Sideris, Paul Ong, Trevor Thomas. 2015. "Gentrification, Displacement and the Role of Public Investment: A Literature Review." Working Paper. Community Development Investment Center. San Francisco. www.frbsf.org/community-development/.
[8] Wardrip, Keith. 2011. "Public Transit's Impact on Housing Costs: A Review of the Literature." Center for Housing Policy. www.reconnectingamerica.org/resource-center.
[9] American Public Transportation Association. 2013. "The New Real Estate Mantra: Location near Public Transportation." www.apta.com/resources/statistics/Documents/NewRealEstateMantra.pdf.

used to represent the geographic extent of a rail stop's effect on nearby blocks.[10] Still, there is little consensus about how far a rail stop's effect on neighborhood characteristics such as real estate prices extends, as this varies across community contexts.[11]

Transit-rich neighborhoods represent a small portion of the nation's metro areas, but they have captured a disproportionate amount of metropolitan growth over the last decade.[12] Few studies have explored the relationship between rail stops and the population profiles of those who live near them. The perceived value and utility of rail or any other components of transportation networks varies across communities and households. Workers who find the most utility in transit may take extra steps or make financial trade-offs to gain access to it, influencing the demographic makeup of transit-oriented neighborhoods through self-selection. For some households, proximity to transit may reduce transportation expenditures by providing more transportation options. [13] An analysis of the combined housing and transportation cost across neighborhoods in the Washington, DC area found a great deal of variation between Washington, DC and its suburbs, and among neighborhoods within Washington, DC. The lowest average transportation costs were generally associated with high-density neighborhoods with a high level of transit connectivity.[14]

Increasingly, social science research has included transportation among the set of factors with potential to influence socio-economic outcomes or reflect differences in access to opportunity. Much of the research concerned with transit stops and the characteristics of the populations that surround them examines transit's role in connecting people to employment opportunities or improving access to goods and services such as grocery stores. [15, 16, 17, 18, 19] This project is motivated by such work, but it does not seek to measure the effect of rail access on any socio-economic outcome. Rather, its aim is limited to describing differences between workers in rail-accessible neighborhoods and workers in other areas within the same community.

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[10] Petheram, S.J., Nelson, A.C., Miller, M., & Ewing, R. 2013. "Use of the Real Estate Market to Establish Light Rail Station Catchment Areas. Case Study of Attached Residential Property Values in Salt Lake County, Utah, by Light Rail Station Distance." *Transportation Research Record* 2357: 95-99.

[11] Guerra, Erick, Robert Cervero, and Daniel Tischler. 2012. "The Half-Mile Circle: Does it Best Represent Transit Station Catchments?" *Transportation Research Record* 2276: 101–109.

[12] Federal Transit Administration. 2014. "Trends in Transit-Oriented Development 2000–2010." Washington, DC. www.fta.dot.gov.

[13] Kilpatrick, John A., Ronald L. Throupe, John I. Carruthers, and Andrew Krause. 2007. "The Impact of Transit Corridors on Residential Property Values." *Journal of Real Estate Research* 29: 303–20.

[14] Center for Neighborhood Technology. 2011. "Housing + Transportation Affordability in Washington, DC." www.reconnectingamerica.org/resource-center/browse-research/2011/.

[15] Tomer, Adie and Robert Puentes. 2011. "Transit Access and Zero-Vehicle Households," Brookings Institution, Washington, DC.

[16] Holzer, Harry and John Quigley. 2003. "Public Transit and the Spatial Distribution of Minority Employment: Evidence from a Natural Experiment" *Journal of Policy Analysis and Management* 22: 415-442.

[17] Ong, Paul, and Douglas Houston. 2002. "Transit, Employment, and Women on Welfare." *Urban Geography* 23: 344-364.

[18] Sanchez, Thomas W., Qing Shen, and Zhong-Ren Peng. 2004. "Transit Mobility, Jobs Access and Low-Income Labor Market Participation in U.S. Metropolitan Areas." *Urban Studies* 41: 1313-1331.

[19] Neckerman, K.M., Bader, M., Purciel, M. and Yousefzadeh, P. 2009. "Measuring food access in urban areas." Presented at: Understanding the Economic Concepts and Characteristics of Food Access, Washington, DC.

Several studies find that residents of neighborhoods near rail transit have higher average incomes relative to those without rail access.[20, 21, 22] Prompted by such patterns, a growing body of research examines displacement of low-income residents from transit-rich neighborhoods. One study examined the relationship between affordable housing and TOD, finding that barriers such as the high cost of land near rail stops present considerable challenges to developing and maintaining affordable housing within transit-rich neighborhoods.[23] Another Washington, DC-based study found that the transportation-related savings associated with the most transit-rich neighborhoods are unlikely to offset the high cost of housing in these areas for low-income workers.[24] Still, other studies found that transit-rich neighborhoods across several metro areas had lower average household incomes than their respective regions as a whole.[25] These mixed results speak to the diverse role that transit systems play across varied community contexts.

Real estate values and income have played a prominent role in research related to transit-oriented neighborhoods, but less is known about other characteristics of the rail-accessible population. One study found that average household size has declined in transit-oriented neighborhoods in recent years, which may reflect both changes in demographics and the type of housing surrounding transit.[26] This finding is consistent with recent attitudinal surveys suggesting that young adults increasingly prefer to live in the type of dense, mixed-use communities associated with much of the nation's most transit-rich areas.[27] The small body of research on the racial and ethnic makeup of neighborhoods surrounding transit yields a mixed set of results, reinforcing the context-specific nature of demographic patterns of transit-oriented neighborhoods.[28, 29]

Research on transit-accessible neighborhoods also contributes to how we conceptualize urban form and population distribution patterns. Urban scholarship commonly discusses the metropolitan landscape and its residential patterns within the context of neighborhood typologies such as "urban" or "suburban." Prevailing depictions of urban space often include a relatively low-income and densely populated city center surrounded by more affluent low-density suburbs. However, recent economic and demographic shifts, along with increased diversity in patterns of

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[20] Pollack, Stephanie, Barry Bluestone, and Chase Billingham. 2010. Maintaining Diversity in America's Transit-Rich Neighborhoods: Tools for Equitable Neighborhood Change. Dukakis Center for Urban and Regional Policy.
[21] Barton, Michael and Joseph Gibbons. 2015. "A Stop Too Far: How Does Public Transportation Concentration Influence Neighbourhood Median Household Income?" *Urban Studies* 52 (9): 1-17.
[22] Florida, Richard, Zara Matheson, Patrick Adler, Taylor Brydges. 2015. "The Divided City and the Shape of the New Metropolis." Martin Prosperity Institute. www.martinprosperity.org/content/insight-divided-city/.
[23] Zuk, Miriam & Ian Carlton. 2015. "Equitable Transit Oriented Development: Examining the Progress and Continued Challenges of Developing Affordable Housing in Opportunity- and Transit-Rich Neighborhoods." PRRAC.
[24] Ross, Martha and Nicole Prchal Svajlenka. 2012. "Connecting to Opportunity: Access to Jobs via Transit in the Washington, DC Region." Brookings Institution, Washington, DC.
[25] Center for Transit Oriented Development, Trends in Transit-Oriented Development 2000–2010. 2014. Federal Transit Administration. Washington, DC.
[26] Center for Transit Oriented Development, Trends in Transit-Oriented Development 2000–2010. 2014. Federal Transit Administration. Washington, DC.
[27] Nielsen. 2014. Millennials: Breaking the Myths. www.nielsen.com/us/en/insights/reports/2014/millennials-breaking-the-myths.html.
[28] McKenzie, Brian. 2013. "Neighborhood Access to Transit by Race, Ethnicity, and Poverty in Portland, OR." City and Community 12 (2), 134-155.
[29] Pollack, Stephanie, Barry Bluestone, and Chase Billingham. 2010. "Maintaining Diversity in America's Transit-Rich Neighborhoods: Tools for Equitable Neighborhood Change." Dukakis Center for Urban and Regional Policy.

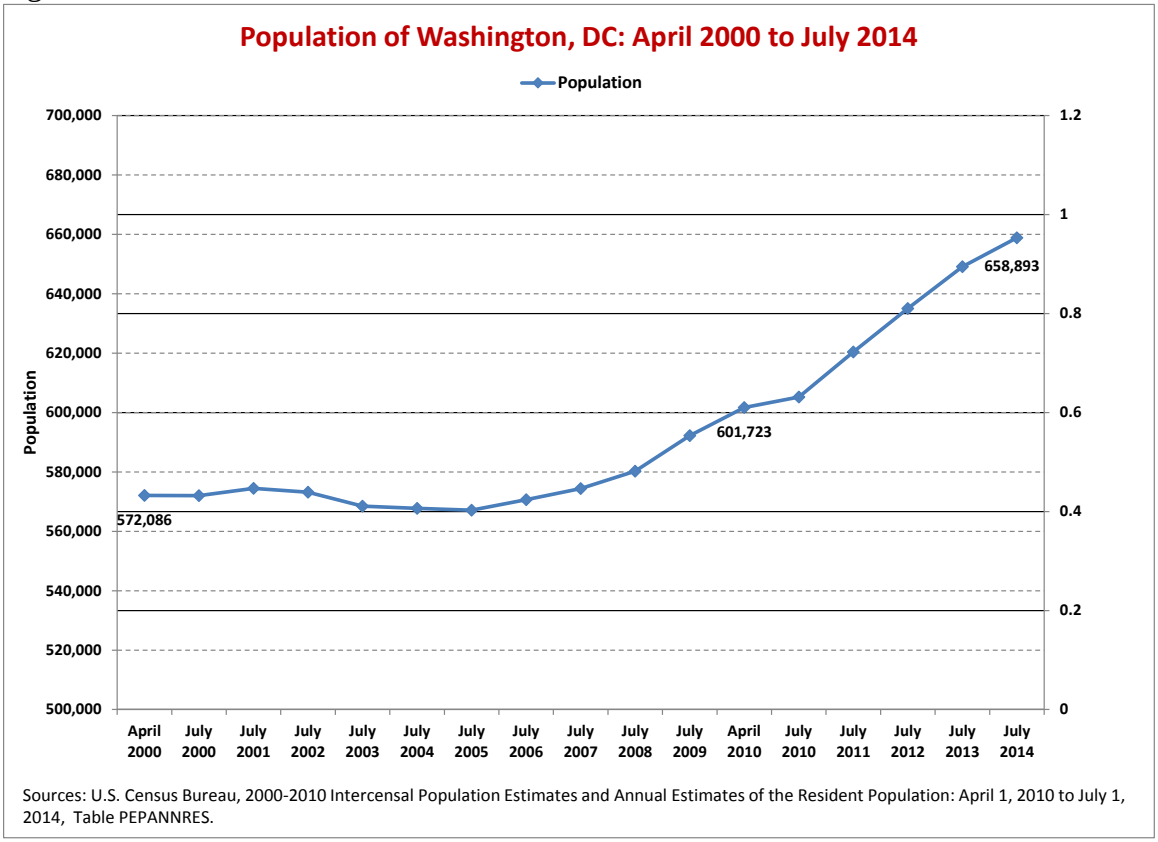
development across metro areas have blurred such familiar notions of a rigid urban/suburban divide. Suburbs have become more racially and economically diverse in recent decades.[30] In many metro areas, suburban poverty has increased, while central cities have experienced economic investment and population growth.[31] Many suburbs have embraced TOD, fostering neighborhoods with relatively high population and retail densities. While no single model of urban development provides a perfect representation of the nation's diverse set of metropolitan landscapes, a closer look at the distinct population patterns surrounding rail stops may contribute to our understanding of evolving neighborhood typologies.

THE DEMOGRAHPIC AND TRANSPORTATION PROFILES OF THE WASHINGTON, DC REGION

The extensive public transportation network and the pace at which recent demographic changes have taken place within the Washington, DC metro area make it a unique setting to explore the relationship between residential patterns and rail transit. Following a modest decline in population during the first part of the last decade, Washington, DC's population increased by about 90,000 people between 2006 and 2014 (Figure 1). Within the city, several neighborhoods that had experienced considerable disinvestment and population loss during the last few decades of the 20th century saw population gains in recent years. The percentage of Washington, DC's population aged 25 and older with a bachelor's degree or higher increased from 39.1 to 55.1 percent between 2000 and 2013.[32] Increased educational attainment during this period accompanied greater affluence, as median household income climbed from about $40,000 in 2000 to about $68,000 in 2013. [33, 34] An influx of relatively young workers to Washington, DC has contributed to a decline in the median age from 34.6 years in 2000 to 33.8 years in 2013.[35]

[30] Frey, William. 2011. "Melting Pot Cities and Suburbs: Racial and Ethnic Change in Metro America in the 2000s." Washington, DC: Brookings Institution.
[31] Kneebone, Elizabeth, & Berube, Alan. 2013. "Confronting suburban poverty in America." Washington, DC: Brookings Institution Press.
[32] Sources: U.S. Census Bureau. Census 2000, Table SF3_DP2; ACS 2013, 1 Year, Table S1501.
[33] Median incomes not adjusted for inflation.
[34] Sources: U.S. Census Bureau, Census 2000, Table DP03. ACS 2013 1 Year, Table S2503.
[35] Sources: U.S. Census Bureau, Census 2000, Table DP1. ACS 2013 1 Year, Table B01002.

Figure 1.



Sources: U.S. Census Bureau, 2000-2010 Intercensal Population Estimates and Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2014, Table PEPANNRES.

Notable shifts in Washington, DC's racial and ethnic composition also occurred between 2000 and 2013, as the city's Black population declined from 60.0 to 48.8 percent, while its White population increased from 30.8 to 40.9 percent.[36] The 2000s also saw an increase in the proportion of the region's Black and Latino populations living in the suburbs. For example, among the Black population living within the metro area in 2000, about 27 percent lived in the District of Columbia, compared with about 21 percent in 2013.[37] These changes within Washington, DC occurred within a context of larger regional population shifts, although the nature of population change varied considerably across the region's counties and neighborhoods.

The region's multi-modal transportation system reaches a large share of urban and suburban neighborhoods in Washington, DC, Virginia, and Maryland. The metro area's integrated transportation network includes several transit types and providers. The Washington Metropolitan Area Transit Authority (WMATA) is the largest transit operator in the region. WMATA operates the region's "Metrorail" and "Metrobus" systems, which include an extensive network of bus routes integrated with rail lines. Smaller transit providers such as county-level bus service, commuter rail, paratransit, and one of the nation's largest bicycle sharing systems also serve the region. While these services play an important role in the overall mix of public transportation, assessing every stop of every transit provider in the region is beyond the scope of

[36] Source: Census 2000, Table DP-1; 2013 ACS, Table DP05.
[37] Source: Census 2000, Table DP-1; 2013 ACS, Table DP05.

this project. Instead, the analysis focuses on Metrorail access, which forms the core of the region's transportation network and determines the most transit-rich neighborhoods.

Between 2000 and 2013, the share of Washington, DC workers who commuted by public transportation increased from about 33 percent to about 39 percent, part of a more general increase in the region's share of workers who commute by travel modes other than private automobile.[38] In 2013, walking and bicycle commuting accounted for about 14 percent and about 5 percent of Washington DC workers, respectively.[39] Metrobus and Metrorail stops serve a diverse set of communities, including outlying areas characterized by the relatively high population density that is often associated with more urban areas. Several of these communities, such as Clarendon, VA and Bethesda and Silver Spring, MD, are suburban commercial centers where TOD has fostered a dense street network and mixed-use (commercial and residential) development within walking distance of Metrorail stations. Within the Washington, DC region and other large metro areas, recent shifts in demographic makeup of urban populations and the spatial distribution of household resources raise several unanswered questions about emerging spatial patterns of access to community resources. This research sheds light on differences in transit access across population subgroups and how this has changed in recent years.

DATA AND METHODOLOGY

This project uses ACS microdata from two different 3-year data periods, 2006-2008 and 2011-2013. The analysis is restricted to workers aged 16 years and older captured in the ACS sample. The study area is limited to the counties to which the Washington, DC Metro rail system extends, including the following: Washington, DC; Arlington County, VA, Alexandria city, VA; Fairfax County, VA; Montgomery County, MD; and Prince Georges County, MD, referred to in this report as the "five county area." Although a more local-level aggregation such as differentiating among individual surrounding counties would be informative, the sample size of the 3-year ACS does not lend itself to such small scales for this analysis.

To measure distance between rail stops and households, the centroid (geographic center) of each worker's block of residence is used as the origin unit from which distance to public transportation is measured. The ability to assess the distance to transit stops from the center of individual blocks rather than entire neighborhoods provides a level of geographic granularity not available from standard ACS estimates. To protect the confidentiality of individual respondents, estimates in this paper are aggregated to larger geographic areas, including the District of Columbia and the combined 5-county region that encompasses the Metrorail system. Researchers interested in exploring the effects of proximity to transit often encounter barriers related to data availability and geographic detail. Data limitations make such a measure difficult to standardize across communities. Studies often use publicly available population data aggregated to geographies such as Census block groups or Census tracts. With aggregated data, every household in a neighborhood is typically assigned the same distance to a transit stop, complicating the ability to differentiate levels of transit access across households within the same neighborhood. Beyond this challenge, linking transit access indicators to specific individuals and

[38] Sources: U.S. Census Bureau, Census 2000, Table P030 and ACS 2013 1-Year, Table S0801.
[39] Source: ACS 2013 1-Year, Table S0801.

households is not possible at small geographies using public ACS data. Instead, transit access is often linked to aggregated neighborhood characteristics.[40, 41] Census blocks are the smallest unit for which aggregated Census data are publicly available, but publicly available block data provide only the most basic population characteristics.

Transit access research often employs GIS technology, including spatial data layers that represent local transportation networks.[42] The availability and quality of spatial data improved considerably over the 2000s, and an increasing number of planning authorities have invested in developing spatial data related to infrastructure. Existing measures of access to transit and other amenities take on several forms with varying levels of detail. Some studies employ a street network approach to capturing distance between two points.[43] A network approach has the benefit of capturing real-world geometry of the built environment, but is resource-intensive and requires detailed transportation network data that are sometimes not available. Alternatively, studies interested in distance to amenities such as transit commonly use Euclidean distance, which generally yields shorter distances than network distance analyses because turns and curvatures are not accounted for.[44, 45, 46, 47, 48]

This project uses several GIS layers to capture distance to rail stops. Block boundary files were obtained from the U.S. Census Bureau's Tigerline shapefiles website, and GIS files for Metro transit infrastructure were obtained from the Washington, DC government information and services website.[49] The distance between block centroids and rail stops was measured for all blocks. If a worker's block centroid fell within a half mile from a rail stop, that worker is coded as having rail access. This project affords a unique opportunity to overcome many of the measurement barriers associated with geographic specificity by using ACS microdata for the underlying distance measure, then linking it to several demographic characteristics for individual workers rather than aggregated characteristics for all workers within a neighborhood.

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[40] Barton, Michael and Joseph Gibbons. 2015. "A Stop Too Far: How Does Public Transportation Concentration Influence Neighbourhood Median Household Income?" *Urban Studies* 52 (9): 1-17.

[41] McKenzie, Brian. 2014. "Access to supermarkets among poorer neighborhoods: A comparison of time and distance measures." *Urban Geography* 35: 133–151.

[42] Bader, MD., M. Purciel, P. Yousefzadeh, KM. Neckerman. 2010. "Disparities in Neighborhood Food Environments: Implications of Measurement Strategies." *Economic Geography*. 86 (4): 409-30.

[43] See Raja, Samina, Changxing Ma, and Padan Yadav. 2008. "Beyond Food Deserts: Measuring and Mapping Racial Disparities in Neighborhood Food Environments." *Journal of Planning Education and Research* 27: 469-482; Sparks, Andrea, Neil Bania, and Laura Leete. 2011. "Comparative Approaches to Measuring Food Access in Urban Areas: The Case of Portland, Oregon." *Urban Studies* 48: 1715-37.

[44] Zenk, Shannon, Amy J. Schulz, Barbara A. Israel, Sherman A. James, Shuming Bao, and Mark L. Wilson. 2005. "Neighborhood Racial Composition, Neighborhood Poverty, and the Spatial Accessibility of Supermarkets in Metropolitan Detroit." *American Journal of Public Health* 95: 660-667.

[45] Debrezion, Ghebreegziabiher, Eric Pels, and Piet Rietveld. 2011. "The Impact of Rail Transport on Real Estate Prices: An Empirical Analysis of the Dutch Housing Market." *Urban Studies* 48: 997.

[46] Grengs, Joe. 2003. "Does Public Transit Counteract the Segregation of Carless Households? Measuring Spatial Patterns of Accessibility." *Transportation Research Record*. Paper 01: 3534.

[47] Sanchez, Thomas W., Qing Shen, and Zhong-Ren Peng. 2004. "Transit Mobility, Jobs Access and Low-Income Labor Market Participation in U.S. Metropolitan Areas." *Urban Studies* 41: 1313-1331.

[48] Tomer, Adie; Elizabeth Kneebone; Robert Puentes, and Alan Berube. 2011. "Missed Opportunity: Transit and Jobs in Metropolitan America." Brookings Institution, Washington, DC.

[49] See www.census.gov/geo/maps-data/data/tiger-line.htmland and www.dc.gov, respectively.

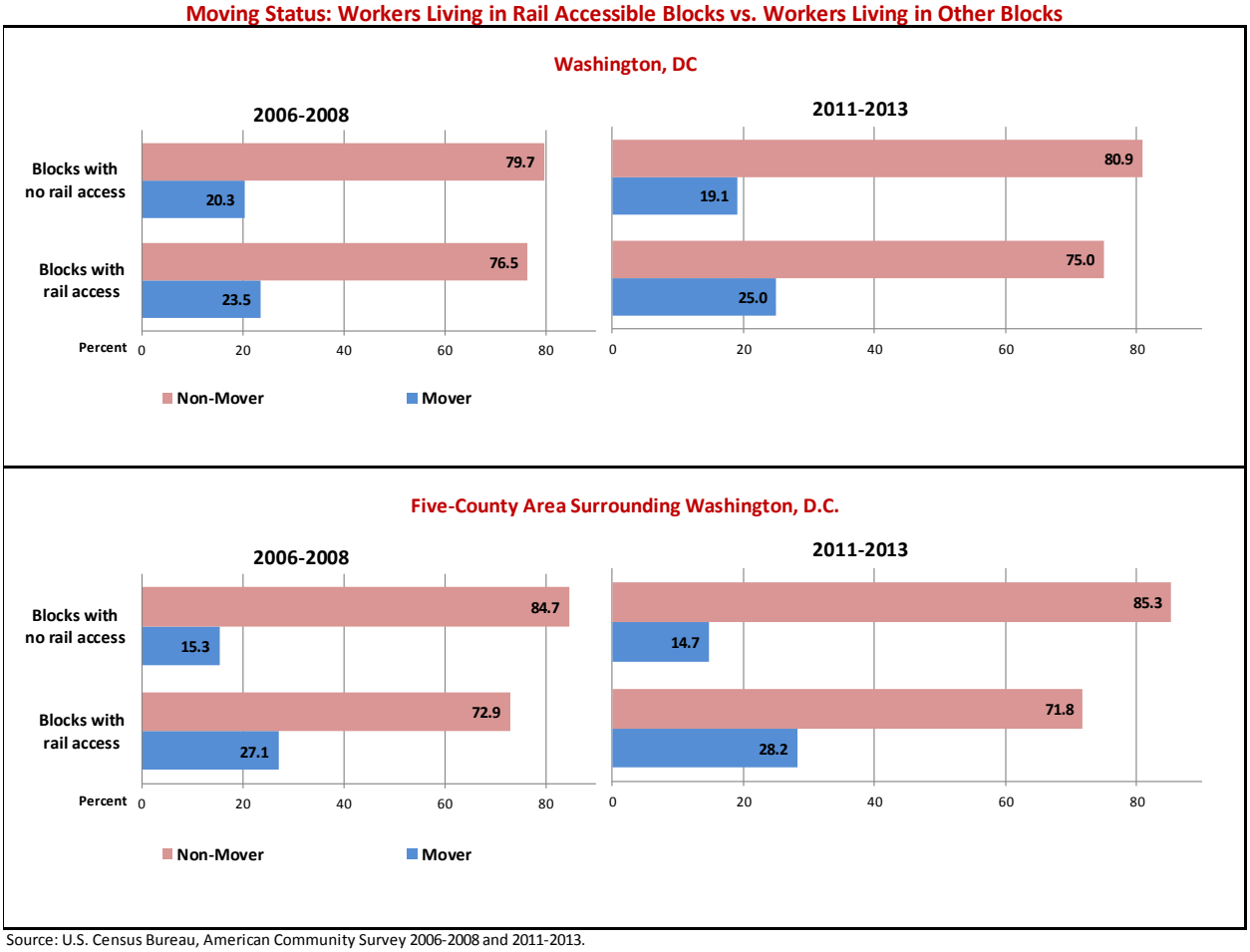
FINDINGS

This section highlights several characteristics of workers that serve as important social and economic indicators of neighborhood change, including the rate of recent movers, the presence of children, age structure, educational attainment and income, the racial and ethnic distribution of workers, and the travel mode used for commuting. The greater Washington, DC region has experienced dramatic demographic change over the last decade, but for several population characteristic, the rate of change near rail stops has outpaced that of the larger area. The analysis also reveals several similarities in the worker profiles of rail-accessible neighborhoods, regardless of whether or not they are located in Washington, DC or the surrounding counties. Outside of rail-accessible neighborhoods, starker demographic differences emerge between Washington, DC and surrounding counties. This suggests that the effect of rail stops on neighborhood demographic profiles transcends the central city.

Rail-Accessible Neighborhoods Have Higher Rates of Recent Movers

The thousands of workers that move to the Washington, DC metro area each year have dramatically altered the demographic composition of the region. Newcomers have had a particularly strong effect on the demographic profiles of neighborhoods immediately surrounding rail stops. The ACS question that asks respondents if they have lived in a different household within the previous year provides the information necessary to explore the relationship between moving status and rail access. In 2011-2013, 28.2 percent of all workers with rail access within the five-county area were recent movers, compared with 14.7 percent of workers for households without rail access (Figure 2). Washington, DC also showed a greater prevalence of recent movers within rail-accessible neighborhoods, at 25 percent of all workers in 2011-2013.

Figure 2.



Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.
Universe: Workers 16 years and over.
A block is considered to be rail-accessible if its center is within one half-mile from a rail stop.
The five counties with at least one rail stop during the study period include Arlington County, Va.; Alexandria city, Va.; Fairfax County, Va.; Montgomery County, Md.; and Prince Georges County, Md.

Table 1 shows how the location of a workers' previous residence relates to proximity to rail for their current residence. Among recent movers living in Washington DC, workers who previously resided outside of the Washington, DC Metro Area were more prevalent near rail stops than their counterparts who previously resided within the Washington, DC Metro Area. Among recent movers who currently live in Washington, DC and previously lived outside of the Washington, DC Metro Area, about 63 percent live in a rail-accessible neighborhood.

Table 1.

Rail access among workers living in Washington, DC who recently moved: 2011-2013

Previous residence location of recent movers	Rail accessibility	Number of workers	Percent of workers	Margin of error
All workers who recently moved	No Rail Access	28,925	40.4	2.1
	Rail Access	42,677	59.6	2.1
Previously lived outside of Washington, DC Metro Area	No Rail Access	8,988	36.9	3.2
	Rail Access	15,352	63.1	3.2
Previously lived within Washington, DC Metro Area, but outside of Washington, DC	No Rail Access	4,890	44.1	4.6
	Rail Access	6,203	55.9	4.6
Lived within Washington, DC	No Rail Access	15,047	41.6	3.0
	Rail Access	21,122	58.4	3.0

Source: U.S. Census Bureau, American Community Survey 2011-2013.

Universe: Workers 16 years and over who lived in Washington, DC and moved to a different residence during reference year.

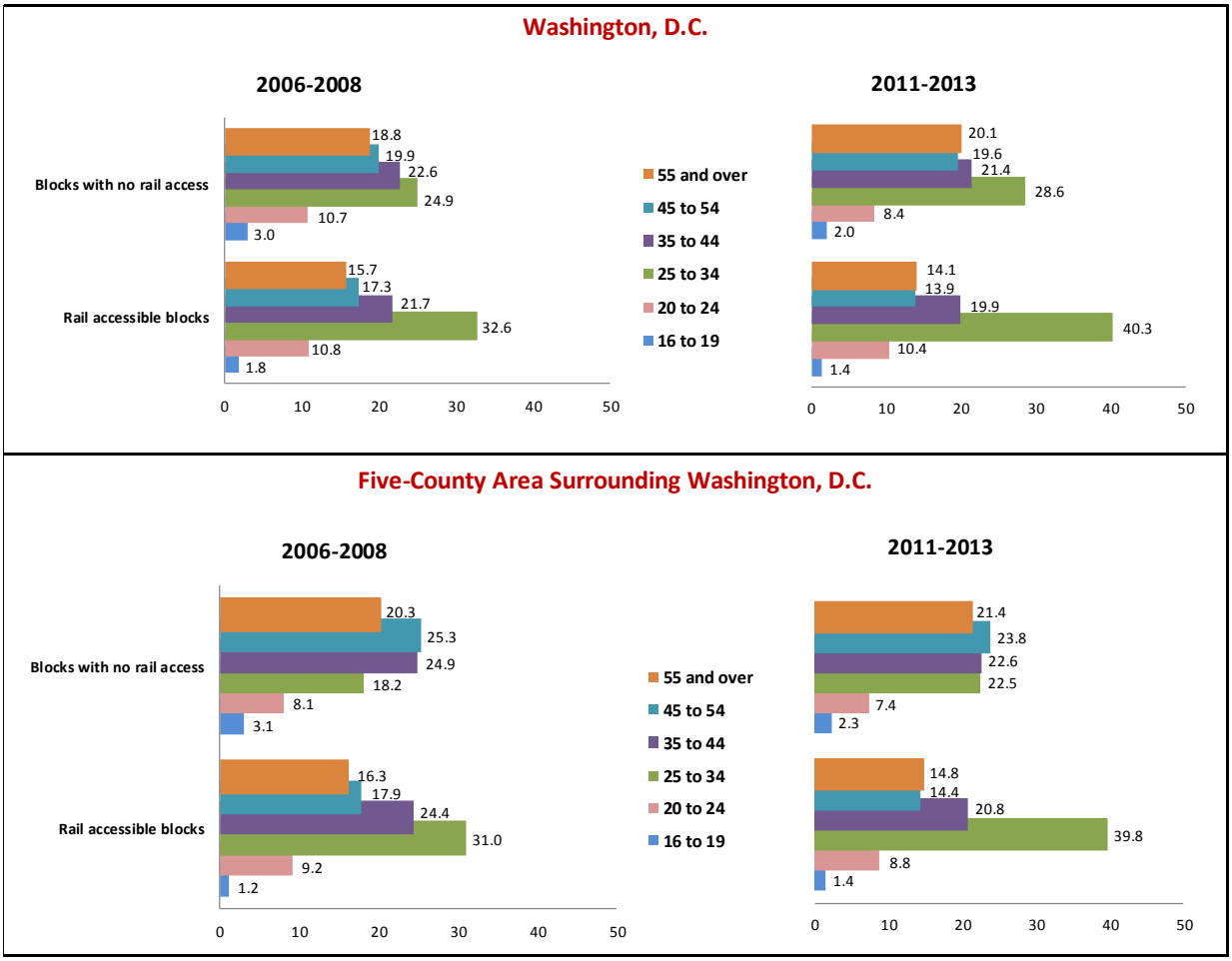
Rail-Accessible Neighborhoods have a Higher Proportion of Younger Workers

The influx of younger workers into the region may exacerbate competition associated with living near a rail stop, sharpening differences in population profiles between rail-accessible neighborhoods and other neighborhoods. Younger workers disproportionately reside near rail stops, both within Washington, DC and within the five-county area. Within both geographies, about 40 percent of workers living in a rail-accessible neighborhood were between ages 25 and 34 during the 2011-2013 period (Figure 3). Between 2006-2008 and 2011-2013, the proportion of workers in this age group increased at similar rates for Washington, DC and the surrounding counties, at about 8 percentage points. Workers in neighborhoods without rail access were distributed more evenly across age groups, particularly within the five-county area.

In Washington, DC and the surrounding counties, older workers, those that fall within each of the three oldest age categories, are more prevalent outside of rail-accessible neighborhoods. For example, within the five-county area in 2011-2013, the share of workers between ages 45 and 54 in neighborhoods without rail access was about 10 percentage points higher than their rail-accessible counterparts. Outside of rail-accessible neighborhoods, the similarities in age structure between rail-accessible Washington, DC neighborhoods and rail-accessible five-county area neighborhoods are less apparent. This suggests that, with respect to workers' age profile, the effect of transit-oriented development in the Washington, DC region transcends municipal boundaries. The presence of a rail stop, perhaps just as much as a jurisdictional boundary or major institution or physical element, may play an important role in defining the characteristics of a neighborhood.

Figure 3.

Age of Workers: Rail-Accessible Neighborhoods vs. Other Neighborhoods



Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.

Universe: Workers 16 and over.

A block is considered to be rail-accessible if its center is within one half-mile from a rail stop.

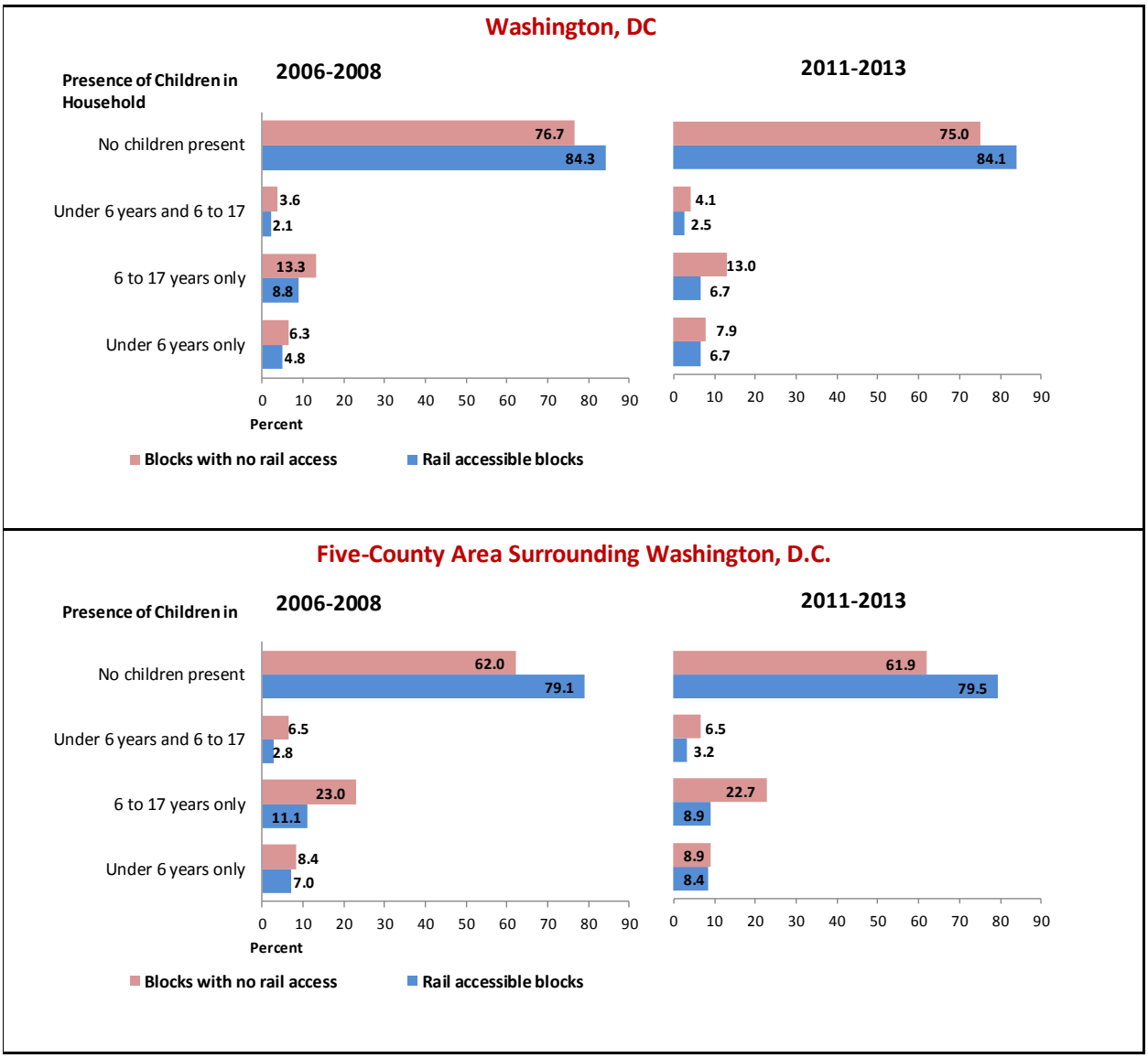
The five counties with at least one rail stop during the study period include Arlington County, Va.; Alexandria city, Va.; Fairfax County, Va.; Montgomery County, Md.; and Prince Georges County, Md.

Households without Children are More Prevalent in Rail-Accessible Neighborhoods

Beyond financial constraints, lifestyle characteristics such as the presence of children may influence a household's decision to live near transit. Residence near transit may also be unintentional or incidental for many households who have made location decisions based on other neighborhood characteristics such as schools or the availability of certain types of housing. Compared with workers without rail access, workers living in rail-accessible households were less likely to live in households with children (Figure 4), both within the five-county area and Washington, DC.

Figure 4.

Presence of Children in Households: Rail Accessible Blocks vs. Other Blocks



Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.
Universe: Workers 16 years and over.
A block is considered to be rail-accessible if its center is within one half-mile from a rail stop.
The five counties with at least one rail stop during the study period include Arlington County, Va.; Alexandria city, Va.; Fairfax County, Va.; Montgomery County, Md.; and Prince Georges County, Md.

Within the five-county area during 2011-2013, about 80 percent of workers in rail-accessible neighborhoods live in households without children, and 62 percent of households without rail access have no children. Differences in the prevalence of children between geographies is especially apparent for workers in households with children between ages 6 and 17 only. Among workers without rail access within the five-county area, about 23 percent lived in households with children ages 6 to 17, compared with only about 9 percent for workers in households with rail access. One might expect this considering that rail-accessible households are typically in more densely populated neighborhoods where space is more limited or more expensive.

The Proportion of Black Workers Declined in Rail-Accessible Neighborhoods

The racial and ethnic makeup of the Washington, DC region has changed notably over the last decade, but shifts in the racial and ethnic composition of neighborhoods are disproportionately reflected within rail-accessible areas. Within Washington, DC, between 2006-2008 and 2011-2013, the proportion of Black workers declined from 32.9 percent to 24.1 percent within rail-accessible blocks, whereas the proportion of all other groups either increased or did not experience a statistically significant change (Figure 5).[50] The proportion of workers in rail-accessible neighborhoods who are Black is about half that of workers with no rail access who are Black in 2011-2013, at 24.1 percent and 47.3 percent.

Between study periods, the proportion of White workers in rail-accessible neighborhoods in Washington, DC increased by about 6 percentage points, from 50.3 percent to 56.0 percent. This trend is consistent with findings from a recent study showing White population growth in large cities between 2010 and 2014, after decades of White population loss.[51] When comparing Washington, DC to the five-county area that surrounds it, rail-accessible neighborhoods show more racial and ethnic similarities than do neighborhoods without rail access.

A rich body of literature has documented residential settlement patterns in American cities, showing that race is among the most persistent socio-economic characteristics upon which neighborhood patterns fall. A discussion of the complex set of factors that have influenced residential patterns by race, ethnicity, income and other key demographic characteristics is beyond the scope of this paper, but transit access serves as an increasingly relevant geographic dimension by which to assess residential patterns.[52] As classical urban/suburban racial and income divides erode, and cities and suburbs become increasingly diverse, residential patterns may become more complex and context-specific, calling for new frameworks for understanding emerging spatial patterns.

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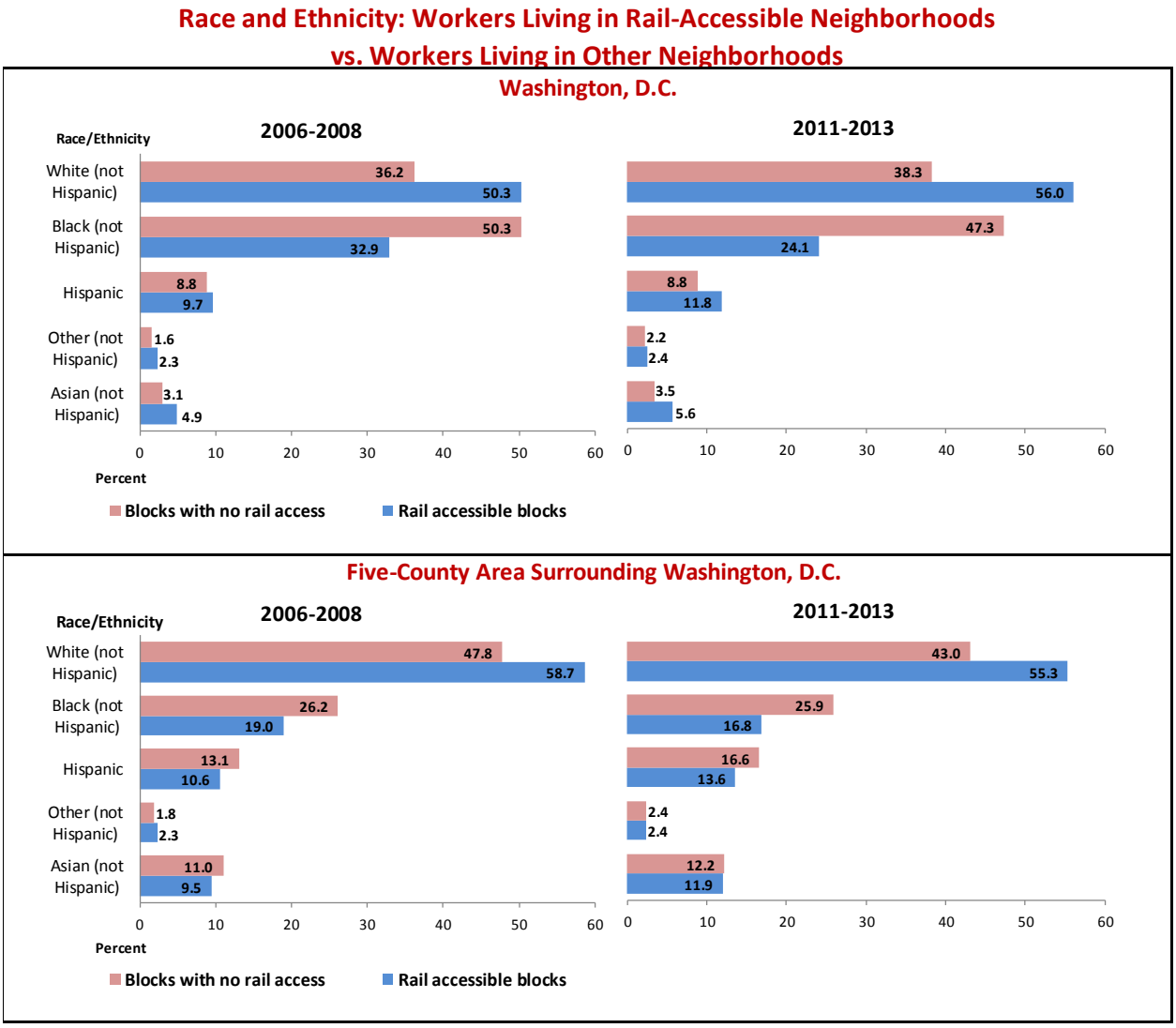
[50] Federal surveys now give respondents the option of reporting more than one race. Therefore, two basic ways of defining a race group are possible. A group such as Asian may be defined as those who reported Asian and no other race or as those who reported Asian regardless of whether they also reported another race. This report shows data using the first approach (race alone). For further information, see the report "Overview of Race and Hispanic Origin: 2010 (C2010BR-02)" at <www.census.gov/library/publications/2011/dec/c2010br-02.html>. Each group outside of the "Hispanic" category includes only workers who identified as "non-Hispanic."

[51] Frey, William H. 2015. "More Big Cities are Gaining White Population, Census Data Show." Metropolitan Policy Program, Brookings Institution, Washington, DC.

[52] For an overview of historic residential segregation patterns by race, see Massey, Douglas S., and Nancy A. Denton. 1993. *American Apartheid: Segregation and the Making of the Underclass*. Cambridge: Harvard.

Figure 5.



Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.
Universe: Workers 16 and over.
A block is considered to be rail-accessible if its center is within one half-mile from a rail stop.
The five counties with at least one rail stop during the study period include Arlington County, Va.; Alexandria city, Va.; Fairfax County, Va.; Montgomery County, Md.; and Prince Georges County, Md.

Rail-Accessible Neighborhoods have a Higher Proportion of High Earning and College Educated Workers

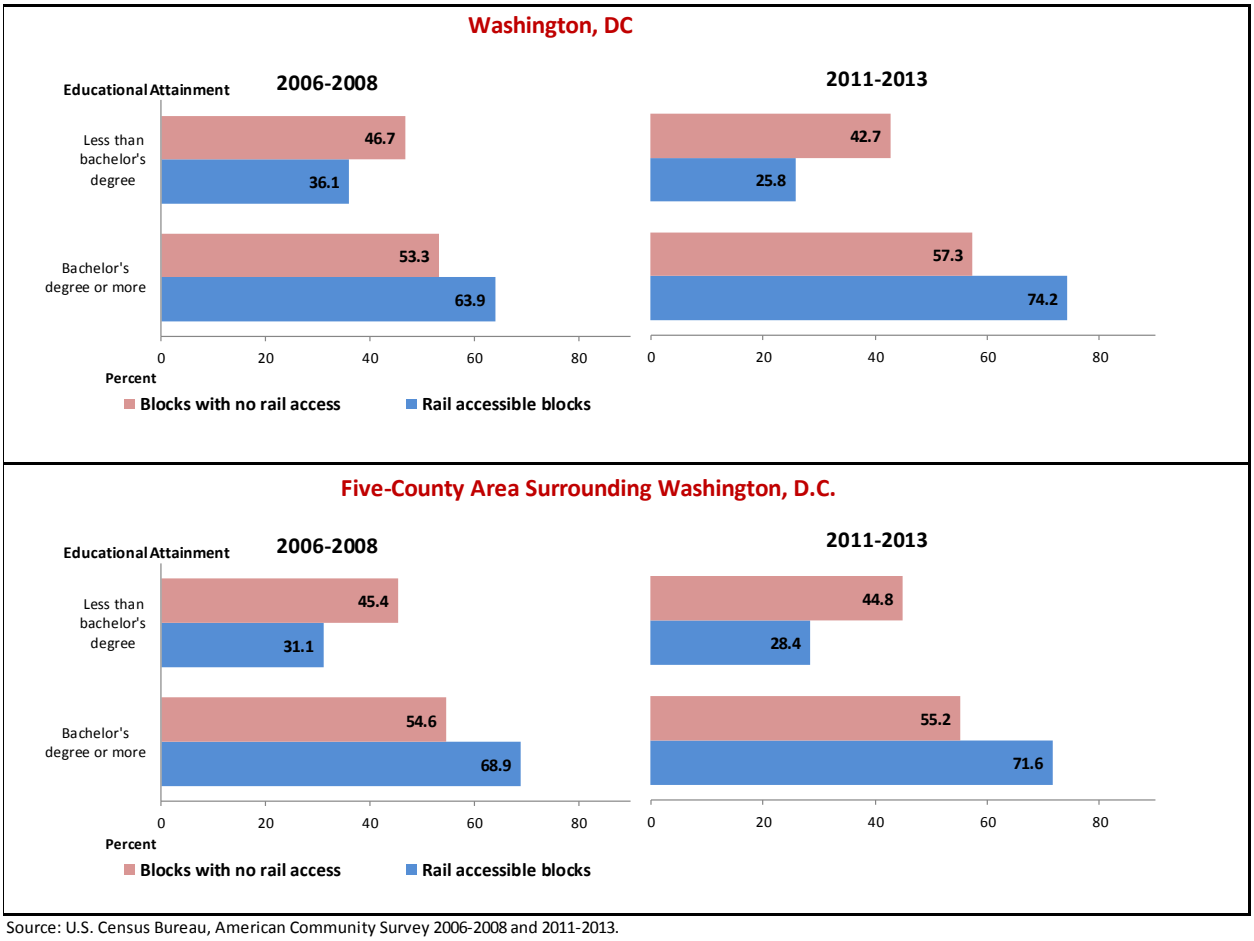
The large inflow of highly educated workers to the Washington, DC region in recent years has increased average educational attainment for the region as a whole, but rail-accessible neighborhoods have disproportionately attracted educated newcomers. Figure 6 shows that rail-accessible neighborhoods have higher rates of more educated workers than other neighborhoods in Washington, DC and the five-county area. Notably, Washington, DC experienced about a ten-percentage point increase in the percent of highly educated workers living near rail stops between 2006-2008 and 2011-2013, from 63.9 percent to 74.2 percent, respectively. In

Washington, DC about three-quarters of workers living near rail stops had a bachelor's degree or higher in 2011-2013, compared with about 57 percent of workers not living near rail.

In Washington, DC, workers in higher earnings categories became more prevalent in rail-accessible neighborhoods between the two study periods, whereas the share of workers in the lowest earning categories declined (Figure 7).[53] In 2011-2013 within the five-county area, almost a quarter of all workers (23.5 percent) in rail-accessible neighborhoods earned at least $100,000 per year. This is up from 21.3 percent in 2006-2008. Washington, DC experienced about a 5-percentage point increase in workers who earn at least $100,000 per year living within rail-accessible neighborhoods over the study period, from 17.9 percent to 23.2 percent. In Washington, DC, the percentage of workers earning between $25,000 and $49,999 who lived near rail declined from about 29 percent to 22 percent between 2006-2008 and 2011-2013. To the extent that educational attainment corresponds with earnings, this pattern is unsurprising.

Figure 6.

Educational Attainment: Workers Living in Rail Accessible Blocks vs. Workers Living in Other Blocks

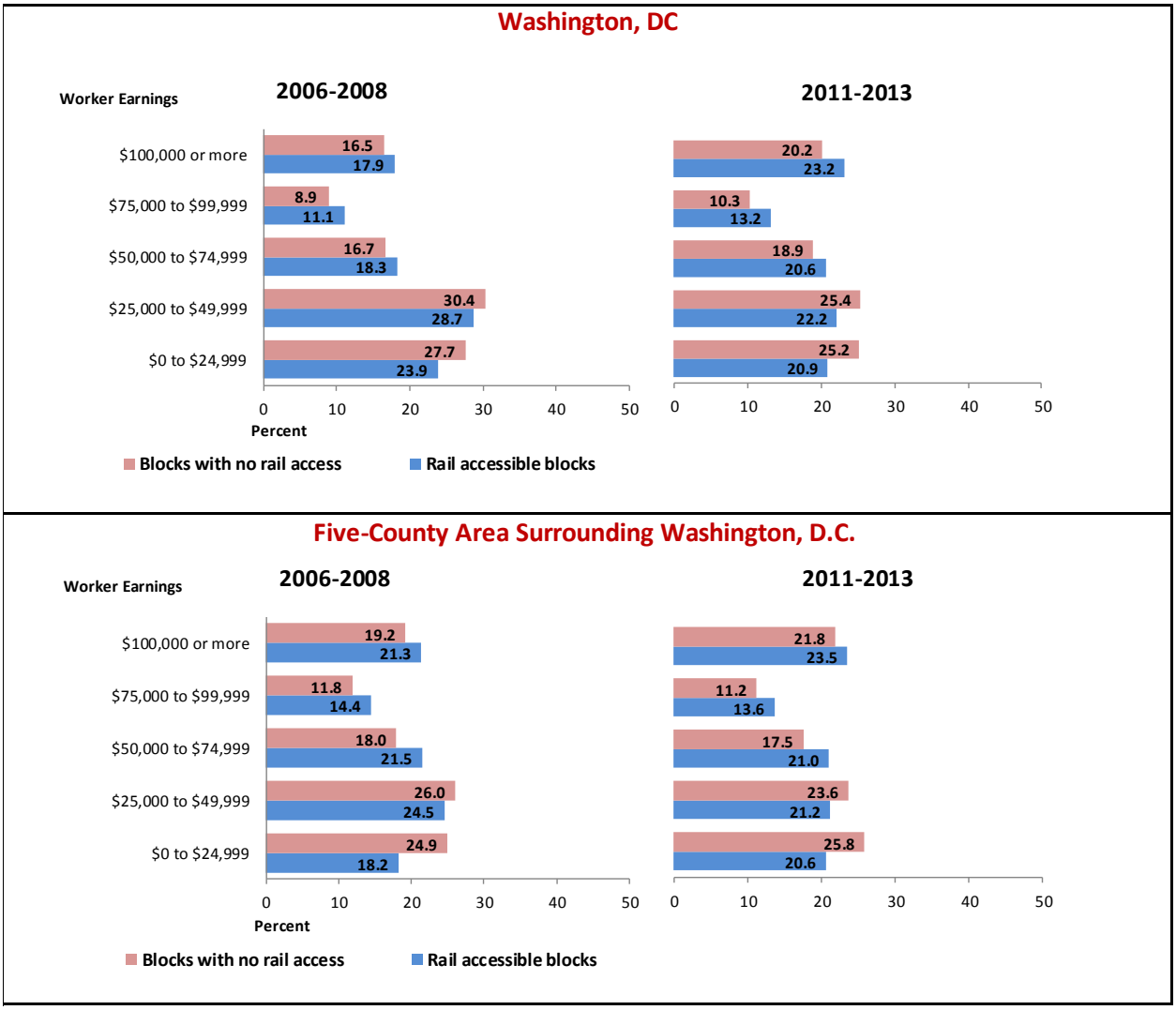


Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.
Universe: Workers ages 25 and over.
A block is considered to be rail-accessible if its center is within one half-mile from a rail stop.
The five counties with at least one rail stop during the study period include Arlington County, Va.; Alexandria city, Va.; Fairfax County, Va.; Montgomery County, Md.; and Prince Georges County, Md.

[53] Earnings not adjusted for inflation.

Figure 7.

Worker Earnings: Workers Living in Rail Accessible Blocks vs. Workers Living in Other



Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.
Universe: Workers 16 years and over.
A block is considered to be rail-accessible if its center is within one half-mile from a rail stop.
The five counties with at least one rail stop during the study period include Arlington County, Va.; Alexandria city, Va.; Fairfax County, Va.; Montgomery County, Md.; and Prince Georges County, Md.

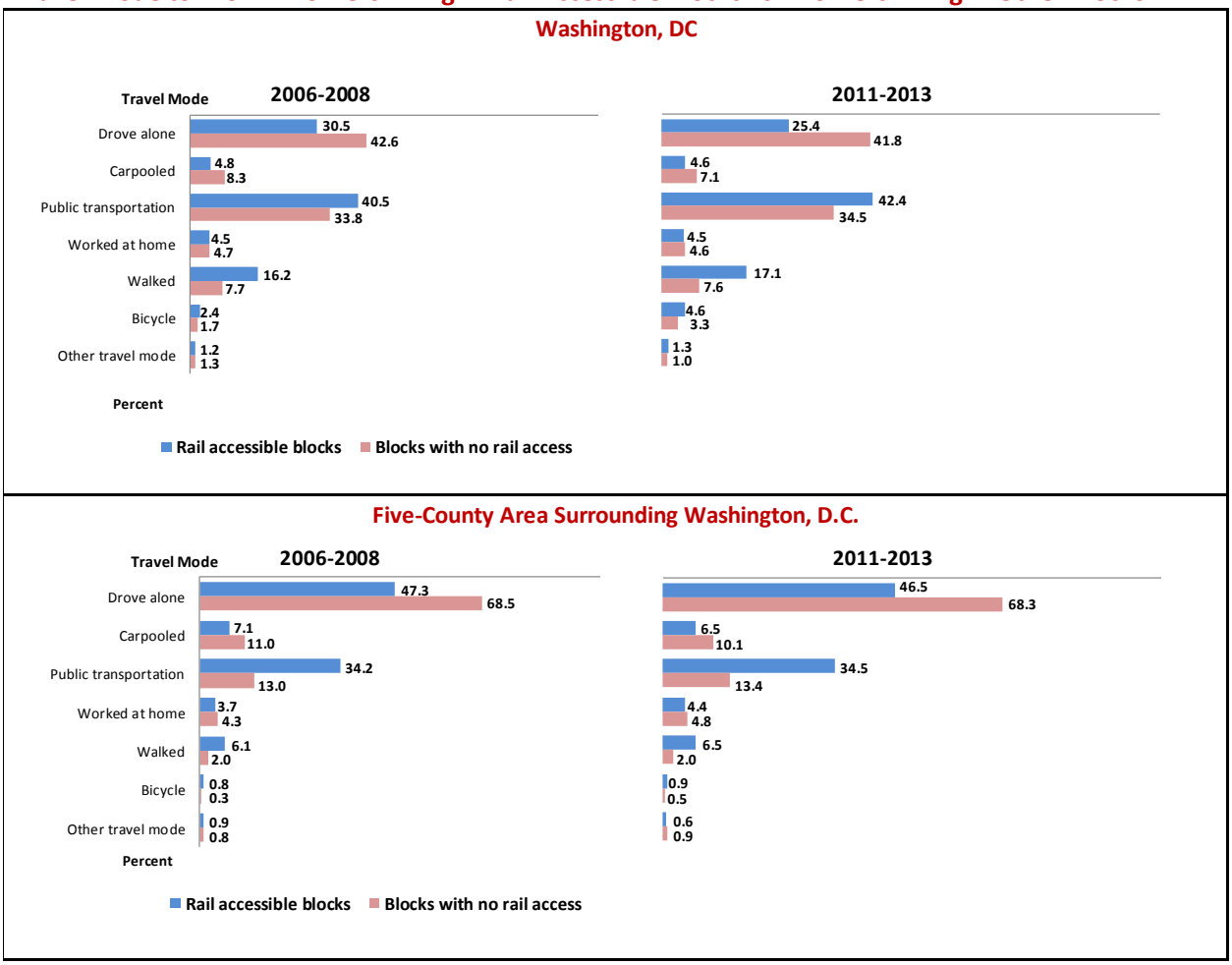
Workers in Rail-Accessible Neighborhoods are More Likely to Commute by Transit

Rail-accessible neighborhoods in Washington, DC have a higher rate of commuting by public transportation than their counterparts in the five-county area, just as Washington, DC neighborhoods without rail access have a higher rate of public transportation commuting than their counterparts in the five-county area (Figure 8). As expected, rail-accessible neighborhoods have a higher concentration of workers who commute by transit than their non-accessible counterparts within Washington, DC and the five-county area. This difference was largest in the five-county surrounding area, where 34.5 percent of workers near rail commuted by transit,

compared with only 13.4 percent of workers with no rail access. The rail-accessible working population within the five-county area more closely resembles that of Washington, DC than the population without rail access between the two areas. Among workers in Washington, DC who lived near rail, the rate of driving alone declined by about five percentage points, from 30.5 percent to 25.4 percent between 2006-2008 and 2011-2013. Bicycling increased notably for workers living near rail stops in Washington, DC, almost doubling from 2.4 to 4.6 percent. This may be related to the region's expanding bike sharing system, which includes a growing number of bicycle docks near rail stations.

Figure 8.

Travel Mode to Work: Workers Living in Rail Accessible Blocks vs. Workers Living in Other Blocks



Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.
Universe: Workers 16 years and over.
A block is considered to be rail-accessible if its center is within one half-mile from a rail stop.
The five counties with at least one rail stop during the study period include Arlington County, Va.; Alexandria city, Va.; Fairfax County, Va.; Montgomery County, Md.; and Prince Georges County, Md.

CONCLUSION

The social sciences have produced a rich body of literature illuminating how the spatial distribution of goods, services, and amenities relates to subsets of populations at the neighborhood level. To analyze such granular spatial population patterns, researchers increasingly take advantage of ever-improving spatial analysis tools and a growing pile of infrastructure-related data. This analysis contributes to the small, but growing body of research specifically interested in the link between residential patterns and transportation infrastructure, particularly rail transit stops. Findings reveal several population characteristics that are more prevalent in neighborhoods near rail transit, relative to other neighborhoods within the same county.

In Washington, DC and the five surrounding counties with at least one Metrorail stop, young adults, recent movers, White workers, highly educated workers, and workers with high earnings all disproportionately live near rail stops. Workers living near rail also have considerably higher rates of commuting by public transportation, walking, and bicycling. Perhaps the most surprising finding is that, along several socio-economic indicators, the rail-accessible population in Washington, DC is similar to the rail-accessible population of the counties that surround it. For example, the distribution of age and educational attainment are similar for rail-accessible neighborhoods in Washington, DC and the surrounding five-county area. In both cases, young and highly educated workers disproportionately reside near rail.

The Washington, DC metro area experienced considerable population growth and economic development during the study period. Such growth has spurred a great deal of discussion about topics such as housing affordability, displacement of low-income populations, and strain on transportation systems. Demographic shifts, changes in the spatial distribution of wealth, and changes in the built environment have blurred familiar notions of a rigid "urban" and "suburban" divide in the Washington, DC region and others. In increasingly complex and diverse metropolitan landscapes, information about how rail stops shape neighborhood identities and boundaries contributes to our understanding of emerging socio-spatial patterns. No single model perfectly captures rapidly changing patterns of urban form and the spatial distribution of populations. Still, subsets of metro areas with common characteristics such as extensive rail systems may exhibit some directional similarities. An improved understanding of such patterns requires examining communities through multiple lenses, including transportation infrastructure.

SOURCE AND ACCURACTY OF ESTIMATES

The American Community Survey (ACS) is a nationwide survey designed to provide communities with reliable and timely demographic, social, economic, and housing data for congressional districts, counties, places, and other localities every year. It has an annual sample size of about 3.5 million addresses across the United States and Puerto Rico and includes both housing units and group quarters. Beginning in 2006, ACS data for 2005 were released for geographic areas with populations of 65,000 and greater. For information on the ACS sample design and other topics, visit <www.census.gov/acs/www>.

The estimates presented in this report are based on the ACS sample interviewed during two periods, 2006-2008 and 2011-2013. The estimates based on this sample approximate the actual values and represent the entire U.S. resident household and group quarters populations. Sampling error is the difference between an estimate based on a sample and the corresponding value that would be obtained if the estimate were based on the entire population. All comparative statements in this report have undergone statistical testing, and comparisons are significant at the 90 percent level, unless otherwise noted. In addition to sampling error, non-sampling error may be introduced during any of the operations used to collect and process survey data such as editing, reviewing, or keying data from questionnaires.

Suggested Citation:

Brian McKenzie. 2015. "Transit Access and Population Change: The Demographic Profiles of Rail-Accessible Neighborhoods in the Washington, DC Area." SEHSD Working Paper No. 2015-023. U.S. Census Bureau. Washington, DC.

Appendix Table 1. Moving Status: Workers Living in Rail Accessible Blocks vs. Workers Living in Other Blocks: 2006-2008 and 2011-2013

Rail accessibility	Moving status	Total number of workers	Percent of all workers	Margin of error	Total number of workers	Percent of all workers	Margin of error
		2006-2008			2011-2013		
Workers in Washington, DC		**293,251**	–	–	**321,604**	–	–
No Rail Access	Mover	31,183	20.3	1.2	28,925	19.1	1.1
No Rail Access	Non-Mover	122,330	79.7	1.2	122,185	80.9	1.1
Rail Access	Mover	32,856	23.5	1.6	42,677	25.0	1.2
Rail Access	Non-Mover	106,882	76.5	1.6	127,817	75.0	1.2
Workers in five-county study area		**1,680,046**	–	–	**1,804,607**	–	–
No Rail Access	Mover	238,547	15.3	0.4	242,429	14.7	0.3
No Rail Access	Non-Mover	1,315,603	84.7	0.4	1,405,627	85.3	0.3
Rail Access	Mover	34,058	27.1	1.7	44,107	28.2	1.4
Rail Access	Non-Mover	91,838	72.9	1.7	112,444	71.8	1.4

Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.

Universe: Workers 16 years and over.

For information on confidentiality protection, sampling error, and definitions, see www.census.gov/programs-surveys/acs.

Appendix Table 2. **Age: Workers Living in Rail Accessible Blocks vs. Workers Living in Other Blocks: 2006-2008 and 2011-2013**

Rail accessibility	Age of worker	Total number of workers	Percent of all workers	Margin of error	Total number of workers	Percent of all workers	Margin of error
		2006-2008			2011-2013		
Workers in Washington, DC		**293,251**	**–**	**–**	**321,604**	**–**	**–**
No Rail Access	All workers with no rail access	153,513	–	–	151,110	–	–
No Rail Access	16 to 19 years	4,537	3.0	0.4	2,981	2.0	0.4
No Rail Access	20 to 24 years	16,487	10.7	1.0	12,739	8.4	0.7
No Rail Access	25 to 34 years	38,270	24.9	1.1	43,161	28.6	1.1
No Rail Access	35 to 44 years	34,746	22.6	0.8	32,337	21.4	0.8
No Rail Access	45 to 54 years	30,605	19.9	0.9	29,562	19.6	0.9
No Rail Access	55 years and over	28,868	18.8	0.7	30,330	20.1	0.9
Rail Access	All workers with rail access	139,738	–	–	170,494	–	–
Rail Access	16 to 19 years	2,571	1.8	0.4	2,413	1.4	0.3
Rail Access	20 to 24 years	15,080	10.8	0.9	17,717	10.4	0.7
Rail Access	25 to 34 years	45,613	32.6	1.2	68,761	40.3	0.9
Rail Access	35 to 44 years	30,323	21.7	0.8	33,944	19.9	0.7
Rail Access	45 to 54 years	24,219	17.3	0.9	23,654	13.9	0.6
Rail Access	55 years and over	21,932	15.7	0.8	24,005	14.1	0.8
Workers in five-county study area		**1,680,046**	**–**	**–**	**1,804,607**	**–**	**–**
No Rail Access	All workers with no rail access	1,554,150	–	–	1,648,056	–	–
No Rail Access	16 to 19 years	47,467	3.1	0.1	38,553	2.3	0.1
No Rail Access	20 to 24 years	126,525	8.1	0.1	121,464	7.4	0.1
No Rail Access	25 to 34 years	282,993	18.2	0.2	370,613	22.5	0.2
No Rail Access	35 to 44 years	387,550	24.9	0.2	372,213	22.6	0.2
No Rail Access	45 to 54 years	393,371	25.3	0.2	391,960	23.8	0.2
No Rail Access	55 years and over	316,244	20.3	0.2	353,253	21.4	0.2
Rail Access	All workers with rail access	125,896	–	–	156,551	–	–
Rail Access	16 to 19 years	1,497	1.2	0.3	2,189	1.4	0.3
Rail Access	20 to 24 years	11,614	9.2	0.9	13,809	8.8	0.8
Rail Access	25 to 34 years	38,992	31.0	1.5	62,268	39.8	1.1
Rail Access	35 to 44 years	30,732	24.4	1.4	32,544	20.8	1.0
Rail Access	45 to 54 years	22,535	17.9	1.1	22,544	14.4	1.0
Rail Access	55 years and over	20,526	16.3	1.2	23,197	14.8	0.8

Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.

Universe: Workers 16 years and over.

For information on confidentiality protection, sampling error, and definitions, see www.census.gov/programs-surveys/acs.

Appendix Table 3. Presence and Age of Children within Household: Workers Living in Rail Accessible Blocks vs. Workers Living in Other Blocks: 2006-2008 and 2011-2013

Rail accessibility	Worker earnings	Total number of workers	Percent of all workers	Margin of error	Total number of workers	Percent of all workers	Margin of error
		2006-2008			2011-2013		
Workers in Washington, DC		**282,070**	–	–	**311,984**	–	–
No Rail Access	Under 6 years only	9,355	6.3	0.7	11,631	7.9	0.8
No Rail Access	6 to 17 years only	19,659	13.3	1.1	19,079	13.0	1.1
No Rail Access	Under 6 years and 6 to 17	5,312	3.6	0.6	6,052	4.1	0.6
No Rail Access	No children present	113,251	76.7	1.4	110,200	75.0	1.4
Rail Access	Under 6 years only	6,475	4.8	0.7	11,114	6.7	0.7
Rail Access	6 to 17 years only	11,889	8.8	1.0	11,025	6.7	0.8
Rail Access	Under 6 years and 6 to 17	2,800	2.1	0.6	4,144	2.5	0.6
Rail Access	No children present	113,329	84.3	1.5	138,739	84.1	1.1
Workers in Five-county study area		**1,670,881**	–	–	**1,795,025**	–	–
No Rail Access	Under 6 years only	130,035	8.4	0.3	146,172	8.9	0.3
No Rail Access	6 to 17 years only	356,098	23.0	0.4	372,178	22.7	0.5
No Rail Access	Under 6 years and 6 to 17	100,644	6.5	0.3	106,834	6.5	0.3
No Rail Access	No children present	958,981	62.0	0.4	1,014,276	61.9	0.5
Rail Access	Under 6 years only	8,744	7.0	0.8	13,129	8.4	0.9
Rail Access	6 to 17 years only	13,851	11.1	1.6	13,859	8.9	0.8
Rail Access	Under 6 years and 6 to 17	3,510	2.8	0.6	4,972	3.2	0.5
Rail Access	No children present	99,018	79.1	1.7	123,605	79.5	1.1

Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.

Universe: Workers 16 years and over in households.

For information on confidentiality protection, sampling error, and definitions, see www.census.gov/programs-surveys/acs.

Appendix Table 4. Race and Ethnicity: Workers Living in Rail Accessible Blocks vs. Workers Living in Other Blocks: 2006-2008 and 2011-2013

Rail Accessibility	Race or Ethnicity of Worker	Total number of workers	Percent of all workers	Margin of error	Total number of workers	Percent of all workers	Margin of error
		2006-2008			2011-2013		
Workers in Washington, DC		**293,251**	–	–	**321,604**	–	–
No Rail Access	Asian alone	4,691	3.1	0.4	5,237	3.5	0.4
No Rail Access	Black alone	77,244	50.3	1.3	71,485	47.3	1.2
No Rail Access	Hispanic	13,552	8.8	0.8	13,292	8.8	0.8
No Rail Access	Some other Race or Two or More Races	2,503	1.6	0.3	3,263	2.2	0.3
No Rail Access	White alone	55,523	36.2	1.2	57,833	38.3	1.1
Rail Access	Asian alone	6,777	4.9	0.5	9,611	5.6	0.4
Rail Access	Black alone	45,906	32.9	1.5	41,006	24.1	0.9
Rail Access	Hispanic	13,505	9.7	0.9	20,161	11.8	0.7
Rail Access	Some other Race or Two or More Races	3,279	2.3	0.5	4,172	2.4	0.4
Rail Access	White alone	70,271	50.3	1.4	95,544	56.0	0.9
Workers in five-county study area		**1,680,046**	–	–	**1,804,607**	–	–
No Rail Access	Asian alone	170,995	11.0	0.1	200,842	12.2	0.2
No Rail Access	Black alone	406,930	26.2	0.2	426,196	25.9	0.2
No Rail Access	Hispanic	204,359	13.1	0.2	272,748	16.6	0.2
No Rail Access	Some other Race or Two or More Races	28,697	1.8	0.1	39,079	2.4	0.1
No Rail Access	White alone	743,169	47.8	0.2	709,191	43.0	0.2
Rail Access	Asian alone	11,905	9.5	0.8	18,689	11.9	1.1
Rail Access	Black alone	23,904	19.0	1.5	26,358	16.8	1.2
Rail Access	Hispanic	13,341	10.6	1.3	21,257	13.6	1.4
Rail Access	Some other Race or Two or More Races	2,902	2.3	0.5	3,706	2.4	0.4
Rail Access	White alone	73,844	58.7	1.8	86,541	55.3	1.5

Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.

Universe: Workers 16 years and over.

For information on confidentiality protection, sampling error, and definitions, see www.census.gov/programs-surveys/acs.

Appendix Table 5. Educational Attainment: Workers Living in Rail Accessible Blocks vs. Workers Living in Other Blocks: 2006-2008 and 2011-2013

Rail accessibility	Worker earnings	Total number of workers	Percent of all workers	Margin of error	Total number of workers	Percent of all workers	Margin of error
		2006-2008			2011-2013		
Workers in Washington, DC		**254,576**	**–**	**–**	**285,754**	**–**	**–**
No Rail Access	Bachelors degree or higher	70,605	53.3	1.6	77,640	57.3	1.3
No Rail Access	Other	61,884	46.7	1.6	57,750	42.7	1.3
Rail Access	Bachelors degree or higher	78,063	63.9	1.7	111,593	74.2	1.2
Rail Access	Other	44,024	36.1	1.7	38,771	25.8	1.2
Workers in five-county study area		**1,492,943**	**–**	**–**	**1,628,592**	**–**	**–**
No Rail Access	Bachelors degree or higher	753,317	54.6	0.5	820,791	55.2	0.4
No Rail Access	Other	626,841	45.4	0.5	667,248	44.8	0.4
Rail Access	Bachelors degree or higher	77,702	68.9	1.6	100,624	71.6	1.4
Rail Access	Other	35,083	31.1	1.6	39,929	28.4	1.4

Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.

Universe: Workers 25 years and over.

For information on confidentiality protection, sampling error, and definitions, see www.census.gov/programs-surveys/acs.

Appendix Table 6. Worker Earnings: Workers Living in Rail Accessible Blocks vs. Workers Living in Other Blocks: 2006-2008 and 2011-2013

Rail accessibility	Worker earnings	Total number of workers	Percent of all workers	Margin of error	Total number of workers	Percent of all workers	Margin of error
		2006-2008			2011-2013		
Workers in Washington, DC		**293,251**	–	–	**321,604**	–	–
No Rail Access	$0 to $24,999	42,493	27.7	1.1	38,095	25.2	1.1
No Rail Access	$25,000 to $49,999	46,594	30.4	1.1	38,359	25.4	1.0
No Rail Access	$50,000 to $74,999	25,564	16.7	0.9	28,541	18.9	1.0
No Rail Access	$75,000 to $99,999	13,594	8.9	0.8	15,603	10.3	0.7
No Rail Access	$100,000 or more	25,268	16.5	0.9	30,512	20.2	0.8
Rail Access	$0 to $24,999	33,388	23.9	1.8	35,629	20.9	1.0
Rail Access	$25,000 to $49,999	40,132	28.7	1.4	37,778	22.2	1.0
Rail Access	$50,000 to $74,999	25,630	18.3	1.0	35,147	20.6	0.9
Rail Access	$75,000 to $99,999	15,508	11.1	0.8	22,432	13.2	0.8
Rail Access	$100,000 or more	25,080	17.9	1.0	39,508	23.2	1.1
Workers in five-county study area		**1,680,046**	–	–	**1,804,607**	–	–
No Rail Access	$0 to $24,999	387,343	24.9	0.4	425,768	25.8	0.3
No Rail Access	$25,000 to $49,999	404,780	26.0	0.4	389,165	23.6	0.3
No Rail Access	$50,000 to $74,999	279,247	18.0	0.3	288,697	17.5	0.3
No Rail Access	$75,000 to $99,999	183,887	11.8	0.2	184,567	11.2	0.2
No Rail Access	$100,000 or more	298,893	19.2	0.3	359,859	21.8	0.3
Rail Access	$0 to $24,999	22,966	18.2	1.4	32,244	20.6	1.2
Rail Access	$25,000 to $49,999	30,889	24.5	1.3	33,233	21.2	1.2
Rail Access	$50,000 to $74,999	27,044	21.5	1.2	32,922	21.0	1.1
Rail Access	$75,000 to $99,999	18,126	14.4	1.2	21,317	13.6	0.9
Rail Access	$100,000 or more	26,871	21.3	1.3	36,835	23.5	1.2

Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.

Universe: Workers 16 years and over.

For information on confidentiality protection, sampling error, and definitions, see www.census.gov/programs-surveys/acs.

Appendix Table 7. Means of Transportation: Workers Living in Rail Accessible Blocks vs. Workers Living in Other Blocks: 2006-2008 and 2011-2013

Rail accessibility	Travel mode	Total number of workers	Percent of all workers	Margin of error	Total number of workers	Percent of all workers	Margin of error
		2006-2008			2011-2013		
Workers in Washington, DC		**293,251**	–	–	**321,604**	–	–
No Rail Access	Drove alone	65,340	42.6	1.4	63,208	41.8	1.3
No Rail Access	Carpooled	12,676	8.3	0.9	10,738	7.1	0.8
No Rail Access	Public transportation	51,918	33.8	1.1	52,152	34.5	1.2
No Rail Access	Worked at home	7,178	4.7	0.8	6,945	4.6	0.6
No Rail Access	Walked	11,865	7.7	1.1	11,510	7.6	0.8
No Rail Access	Bicycle	2,561	1.7	0.3	5,056	3.3	0.5
No Rail Access	Other Mode	1,975	1.3	0.3	1,501	1.0	0.2
Rail Access	Drove alone	42,661	30.5	1.1	43,387	25.4	1.1
Rail Access	Carpooled	6,650	4.8	0.7	7,845	4.6	0.5
Rail Access	Public transportation	56,575	40.5	1.3	72,371	42.4	1.3
Rail Access	Worked at home	6,275	4.5	0.7	7,632	4.5	0.4
Rail Access	Walked	22,648	16.2	0.8	29,158	17.1	1.0
Rail Access	Bicycle	3,288	2.4	0.4	7,897	4.6	0.5
Rail Access	Other Mode	1,641	1.2	0.3	2,204	1.3	0.3
Workers in five-county study area		**1,680,046**	–	–	**1,804,607**	–	–
No Rail Access	Drove alone	1,064,063	68.5	0.4	1,125,605	68.3	0.4
No Rail Access	Carpooled	170,977	11.0	0.3	166,608	10.1	0.3
No Rail Access	Public transportation	202,780	13.0	0.3	221,447	13.4	0.3
No Rail Access	Worked at home	67,503	4.3	0.2	79,170	4.8	0.1
No Rail Access	Walked	31,068	2.0	0.1	32,649	2.0	0.1
No Rail Access	Bicycle	4,793	0.3	0.0	7,676	0.5	0.1
No Rail Access	Other Mode	12,966	0.8	0.1	14,901	0.9	0.1
Rail Access	Drove alone	59,557	47.3	1.5	72,831	46.5	1.3
Rail Access	Carpooled	8,882	7.1	0.9	10,147	6.5	0.7
Rail Access	Public transportation	42,993	34.2	1.3	54,073	34.5	1.3
Rail Access	Worked at home	4,678	3.7	0.6	6,843	4.4	0.5
Rail Access	Walked	7,626	6.1	0.7	10,168	6.5	0.8
Rail Access	Bicycle	1,042	0.8	0.3	1,473	0.9	0.2
Rail Access	Other Mode	1,118	0.9	0.3	1,016	0.6	0.2

Source: U.S. Census Bureau, American Community Survey 2006-2008 and 2011-2013.

Universe: Workers 16 years and over.

For information on confidentiality protection, sampling error, and definitions, see www.census.gov/programs-surveys/acs.