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Missed Opportunity:
Transit and Jobs in Metropolitan America

Adie Tomer, Elizabeth Kneebone, Robert Puentes, and Alan Berube

"As states and regions strive to put Americans back to work, policymakers should be careful not to sever the transportation lifelines between workers and jobs."

Findings

An analysis of data from 371 transit providers in the nation's 100 largest metropolitan areas reveals that:

- **Nearly 70 percent of large metropolitan residents live in neighborhoods with access to transit service of some kind.** Transit coverage is highest in Western metro areas such as Honolulu and Los Angeles, and lowest in Southern metro areas such as Chattanooga and Greenville. Regardless of region, residents of cities and lower-income neighborhoods have better access to transit than residents of suburbs and middle/higher-income neighborhoods.
- **In neighborhoods covered by transit, morning rush hour service occurs about once every 10 minutes for the typical metropolitan commuter.** In less than one quarter of large metro areas (23), however, is this typical service frequency, or "headway," under 10 minutes. These include very large metro areas such as New York, Los Angeles, Houston, and Washington. Transit services city residents on average almost twice as frequently as suburban residents.
- **The typical metropolitan resident can reach about 30 percent of jobs in their metropolitan area via transit in 90 minutes.** Job access differs considerably across metro areas, from 60 percent in Honolulu to just 7 percent in Palm Bay, reflecting variable transit coverage levels and service frequencies, and variable levels of employment and population decentralization. Among very large metro areas, the share of jobs accessible via transit ranges from 37 percent in Washington and New York to 16 percent in Miami.
- **About one-quarter of jobs in low- and middle-skill industries are accessible via transit within 90 minutes for the typical metropolitan commuter, compared to one-third of jobs in high-skill industries.** This reflects the higher concentration of high-skill jobs in cities, which are uniformly better served by transit. It also points to potentially large accessibility problems for workers in growing low-income suburban communities, who on average can access only about 22 percent of metropolitan jobs in low- and middle-skill industries for which they may be most qualified.
- **Fifteen of the 20 metro areas that rank highest on a combined score of transit coverage and job access are in the West.** Top performers include metro areas with noted transit systems such as New York, Portland, San Francisco, and Washington, but also Salt Lake City, Tucson, Fresno, and Las Vegas. Conversely, 15 of the 20 metro areas that rank lowest are in the South.

These trends have three broad implications for leaders at the local, regional, state, and national levels. Transportation leaders should make access to jobs an explicit priority in their spending and service decisions, especially given the budget pressures they face. Metro leaders should coordinate strategies regarding land use, economic development, and housing with transit decisions in order to ensure that transit reaches more people and more jobs efficiently. And federal officials should collect and disseminate standardized transit data to enable public, private, and non-profit actors to make more informed decisions and ultimately maximize the benefits of transit for labor markets.

Introduction

Public transit is a critical part of the economic and social fabric of metropolitan areas. Nearly 30 million trips are made every day using public transit. Almost all of these trips occur in the nation's 100 largest metro areas, which account for over 95 percent of all transit passenger miles traveled. People take transit for any number of reasons, but one of the most common is to get to work. Seven percent of workers in these metropolitan areas, or 6.5 million overall, rely on some form of public transit for their commutes. For lower-income residents the share is even higher, 11 percent.[1]

But when it comes to the question of how effectively transit connects people and jobs within and across these metropolitan areas, strikingly little is known. There is no comprehensive national database of the spatial geography of transit service. While some have made efforts to identify gaps in metropolitan transit networks, the absence of detailed information has made it difficult to do so broadly.[2] As a result, few federal and state programs related to transportation use factors like job accessibility via transit to drive investment decisions. With governments at all levels considering deep budget cuts, it is increasingly important to understand not just the location and frequency of transit service, but ultimately how well transit aligns with where people work and live. This kind of information would ensure that limited funds are targeted in smart and effective ways to improve and maintain transit options for metropolitan residents, particularly those who depend most on public transportation.

To better understand these issues, the Brookings Metropolitan Policy Program developed a detailed database of schedule and geospatial data for all transit systems in the nation's 100 largest metropolitan areas, including each major transit mode (primarily bus and rail). This comprehensive database provides the first comparable, detailed look at transit coverage and connectivity across and within the nation's major metro areas. It combines transportation data with neighborhood-level information on income and employment to characterize access to jobs via transit.

The results reveal considerable variation in transit coverage and service levels across the country, and in how effectively systems connect workers to jobs, including the jobs they may be most likely to hold. Within metro areas, the analysis illustrates how well and how often transit serves each neighborhood, and how many and what kind of jobs can be accessed via transit within a reasonable travel time. It also underscores that transit on its own does not dictate access; a host of other factors—from land use patterns to where people choose to live and where jobs locate—matter greatly for how well transit ultimately functions. Understanding these dynamics can help national and state policy makers identify which metropolitan areas offer the strongest transit options, and help local and regional decision makers understand how well transit serves different parts of their metropolitan areas by location and income.

This report begins by providing background on factors that influence the reach and efficiency of transit in metropolitan areas. After describing the data and methods used to profile transit in the 100 largest U.S. metropolitan areas, the report presents a series of measures that characterize transit access across and within these metro areas. Along the way, it assesses the regional and local factors that relate to how well transit serves metropolitan populations and connects them to employment. The report concludes with a range of implications for policymakers, employers, and workers at all levels.

Background

The journey to work literally defines U.S. metropolitan areas. Because metropolitan areas are intended to represent regional labor markets, the federal government uses data on county-to-county commuting flows to construct metro area definitions. The metropolitan transportation network that connects different jurisdictions within the same region is critical for improving the efficient functioning of labor markets, increasing labor market flexibility, and providing access to employment. It is cliché to say that transportation is a means to an end, but it is absolutely true. In this analysis, the "end" is a job.

More immediately, transportation matters for establishing a broad-based economic recovery. Improving transportation connections to jobs enhances the efficiency of labor markets for both workers and employers.[3] Years of study, research, and practice have tried to address the vexing logistical problems stemming from lack of access to transportation in major metropolitan areas.[4] Today, transportation analysts increasingly consider *accessibility* to be a better measure of system performance than traditional *mobility*.[5] It is at least as important for metropolitan residents to be able to access a range of activities, such as jobs, via the transportation system, than it is for systems to simply move vehicles faster and reduce travel times.[6]

One important way workers get to work is via public transit. While three out of four commutes occur alone in a car, recent statistics show that the share of Americans commuting to work via public transit grew during the 2000s for the first time in decades.[7] Each of the nation's 100 largest metropolitan areas offers some form of public transit service. Many of the places with the largest recent increases in transit usage, such as New York and Washington, offer extensive rail networks. Other metro areas that recently opened light rail lines such as Charlotte and Phoenix also saw upticks, as did others that rely almost exclusively on buses for transit commuting, such as Colorado Springs and Albuquerque.

A high quality public transit network can allow employers to benefit from the clustering and agglomeration of people and businesses, and thereby raise productivity in metro areas. One recent analysis recommends using access to jobs and labor as a measure of the economic benefit of transportation to metropolitan areas.[8] Transit also supplies travel choices for workers, and is thus especially important to populations who depend on such service because they are too old or poor, or otherwise choose not to own a car. Metro areas with a high number of transit commuters, such as Los Angeles, Honolulu, and Philadelphia, also stand out for having small per capita carbon emissions due to transportation compared with more car-dependent areas such as Nashville and Oklahoma City.[9] In some metropolitan areas, transit can help workers avoid severe rush hour traffic congestion, and reduce the costs of their commutes relative to driving a car. Moreover, as gasoline prices continue to rise, transit use is predicted to increase as well.[10]

Of course, the success of a transit network in reaching workers and helping them to access jobs rises and falls on much more than the transit system itself. Transportation networks interact with the location of employment and housing in complex ways that influence the metrics analyzed in this report:

- ***Metro growth and expansion.*** In the 2000s, America's central cities continued their growth trend from the 1990s. In fact, from 2006 to 2009, their growth accelerated at the same time that suburban population growth slowed, largely due to the housing crisis and deepening recession. Nevertheless, much of the decade saw low-density exurban parts of metropolitan America grow at rates several times those of cities and high-density suburban counties. Today, about 40 percent of the metropolitan population lives in these spread-out areas.[11] Several metro areas are experiencing dual trends of growth in the urban core as well as outward expansion.
- ***Employment decentralization.*** Suburbs are no longer just bedroom communities for workers commuting to traditional downtowns. Rather, many are strong employment centers serving a variety of functions in their regional economies. An investigation into the location of jobs in the nation's largest metropolitan areas finds that nearly half are located more than 10 miles outside of downtowns.[12] Only about one in five metropolitan jobs is located near the urban core, within 3 miles of downtown. Some suburban job growth is undoubtedly occurring in city-like settings, yet a significant share continues to take shape in low density, "edgeless" forms.[13]
- ***Suburbanization of poverty.*** Poverty, once overwhelmingly concentrated in cities, has likewise drifted into the suburbs. By 2008, large metropolitan suburbs were home to a larger share—about one-third—of America's poor than big cities, small metropolitan areas, or rural areas. During the 2000s, poverty in suburbs grew five times faster than in cities.[14] While poor suburban families are not yet geographically concentrated in the extreme degrees traditionally seen in some central cities, there are alarming trends in this direction.[15] Furthermore, poor suburban residents tend to reside in less jobs-rich communities than their non-poor counterparts.[16]

These trends have enormous implications for how workers access a range of activities and opportunities in metropolitan America: education, shopping, health care, and recreation. Most importantly, these challenges bring a new sense of urgency to metropolitan job access, particularly for the working poor. However, many cities and older communities have inherited a road and rail infrastructure geared more to the commuting and travel patterns of prior decades. Several problems emerge:

- ***Old hubs and spokes.*** Although nearly half of work commutes still originate from, or terminate in, central cities, 39 percent of work trips are entirely suburban.[17] Some older rail transit systems—which still move millions of daily commuters—capture little of this market because they were laid out when the dominant travel pattern was still into and out of cities, before business and commercial development began rapid decentralization. These hub-and-spoke patterns provide dense metropolitan cores with large supplies of suburban workers, but may not serve other parts of metropolitan areas well.[18]
- ***Serving low-density areas.*** As metropolitan areas decentralize in low-density forms of development—where residential and commercial uses are kept separate—it becomes increasingly difficult to connect people to jobs with public transit in a cost-effective manner. From 2002 to 2007, the amount of developed land in the United States increased by 8.4 percent, nearly twice the rate of population growth (4.5 percent).[19] Indeed, an estimated 55 percent of large metropolitan residents live under traditional or exclusionary zoning regimes that separate uses and/or emphasize low-density development.[20]
- ***Spatial mismatch and the costs of transportation.*** As economies and opportunity decentralize, a "spatial mismatch" has arisen between jobs and people in metropolitan America.[21] In some metro areas, inner-city workers are cut off from suburban labor market opportunities. In others, low- and moderate-income suburban residents spend large shares of their incomes owning and operating cars.[22] While owning a car improves chances of employment, a growing body of work quantifies the large combined impact of housing and transportation costs on households' economic bottom lines.[23]

Faced with these trends and attendant challenges, policymakers have promoted many strategies to enhance job accessibility. Transportation-related responses aim to provide more or better transit so workers can get to more locations more often. Urban reinvestment strategies seek to bring jobs closer to inner-city workers. Housing mobility programs strive to expand opportunities for lower-income residents to live close to jobs, often in suburbs. Other recent efforts to increase spatial efficiency at the metropolitan, local, and neighborhood levels have included interventions such as place-based affordable housing, transit-oriented development, reverse commuting, and "livability" programs.

Numerous federal rules and regulations also aim to improve geographic employment accessibility, especially for lower-income workers. For example, the Federal Transit Administration's (FTA) Job Access and Reverse Commute Program includes employment accessibility in its metrics for project evaluations.[24] Newer federal discretionary grant programs and activities—such as the National Infrastructure Investments and the multi-agency Partnership for Sustainable Communities—explicitly aim to improve access to employment opportunities.[25] Those approaches seek to link up often disparate policy areas such as transportation, housing, and economic development.

The effectiveness of these programs is still to be determined. Part of the challenge is that no comprehensive information exists that describes the relationship between transit and employment access.[26] One detailed assessment finds that only "a handful of areas" have developed sophisticated measures regarding the availability of transit services.[27]

This research aims to fill that void by providing a national framework for the discussion. Using previously disaggregated or nonexistent data alongside complex modeling technology, this report presents accessibility metrics for the country's most populous metropolitan areas, where nearly all transit ridership occurs. Beyond contributing to the research literature, the goal of this analysis is to establish a foundation for public policy and planning applications through comparative metrics useful for planning and economic development strategies. As policymakers, business and local leaders, and the general public grapple with 21st century challenges of achieving economic growth and prosperity, understanding how well workers can access jobs by transit is critically important.

Methodology

This study combines detailed data on transit systems, household income, and employment to determine the accessibility of jobs via transit within and across the country's 100 largest metropolitan areas—as defined by the U.S. Office of Management and Budget in 2008 and based on Census Bureau population estimates for that year. (For a detailed description of methods used, see Appendix 1.)

For this analysis, an extensive original database was constructed to house information on routes, stops, and schedules for 371 transit providers that operate on a fixed schedule within the nation's 100 largest metro areas. Route, stop, and schedule information was collected and standardized into a comparable format (General Transit Feed Specification, or GTFS). Data were compiled and analyzed for all modes of transit, including buses, rail, and ferries.[28]

A specialized GIS extension called Traffic Analyst was used to create a model that analyzes travel time via transit between each census block group (origin) and every census tract (destination) within each of the 100 largest metro areas. The model uses population-weighted mean centroids (developed using Census 2000 block population data) as the origin point for each trip, and standard geographic centroids for the tract destinations. Note that the origin points are limited to only those neighborhoods that have a transit stop within a 3/4 mile radius of their population-weighted centroid.[29]

The model analyzes the morning commute—between 6 AM and 9 AM—on a Monday morning, when transit is typically much more frequent than on weekend days.[30] It assumes a traveler departs from the origin every five minutes (using random times within each interval), and combines the results of these 36 trips to create an average travel time to each destination. The model accounts for walking times and speeds (from the origin to the transit stop, between transit stops when transferring, and between the final transit stop and the destination centroid) as well as in-vehicle time. All transit systems within a metro area are treated as one network, allowing seamless switching between systems.[31]

Data on the working-age population (18 to 64 years old) and on neighborhood income come from the Nielsen Pop-Facts 2010 Database. Block groups are assigned to one of three categories based on median household income: low income (less than 80 percent of the metropolitan area's median income), middle income (80 to 120 percent of the metro median income), or high income (above 120 percent of the metro median income).

Data on total census tract employment and employment by Standard Industry Classification (SIC) code come from the Nielsen Business-Facts Database and are current as of the second quarter of 2010. The analysis categorizes jobs into low-, middle-, and high-skill categories based on the industry's 2-digit SIC code and its ratio of workers without bachelor's degrees to those with bachelor's degrees in 2000.

Combining the results of the transit model with demographic and employment data, the analysis constructs three primary metrics:

Coverage: the share of working-age residents living in block groups that are considered "served" by transit (i.e., block groups with access to at least one transit stop within 3/4 mile of their population-weighted centroid).

Service Frequency: the median "headway," or wait time, for morning rush hour transit service in a block group. The overall service frequency for each metropolitan area is calculated as the median of the typical headways in all covered block groups, weighted by their working-age populations.

Job Access: the share of metropolitan jobs the typical working-age resident can reach via transit. (Note: this measure is only calculated for neighborhoods that can reach at least one other destination within 90 minutes.) Metro-wide job access is calculated as the average share of jobs reachable within 90 minutes across all block groups with transit coverage, weighted by block group working-age population.

In addition to calculating the share of total jobs accessible via transit within 90 minutes, the analysis also considers the share of low-, middle-, and high-skill jobs accessible via transit.

Each metric is also calculated by neighborhood income group, and separately for cities and suburbs. "Cities" are designated as the first city listed in the official metropolitan statistical area name, as well as any other city that appears in the name and has a population over 100,000. According to these

Box 1. Exporting Workers

This report measures intra-metropolitan job accessibility—that is, workers commuting within the metropolitan areas in which they live–to jobs via public transportation. Due to complexities inherent in the model, that definition does not include residents who use transit to commute to destinations outside their home metro area. This pattern is more common in parts of the country with contiguous metropolitan areas along relatively dense corridors.

To determine the prevalence of these inter-metro area commuters, data from the Census Transportation Planning Products was examined. The CTPP uses data from the Census Bureau to create a special set of tabulations for transportation professionals by combining information on commuting modes, household location, and place of work.[32]

Among the 264 counties in the 100 largest metro areas with more than 500 daily transit commuters, only 26 see at least one-quarter of their transit riders commute to jobs outside their home metropolitan area. Many of those 26 counties rely on commuter rail and bus systems designed to move workers long distances. Five send many of their workers into the New York metro area via New Jersey Transit or MetroNorth (Fairfield County in metro Bridgeport; Orange and Dutchess Counties in metro Poughkeepsie; and Burlington and Bucks Counties in metro Philadelphia). Other "exporting" counties outside of greater New York include Anne Arundel and Howard, MD (into Washington, D.C.); Bristol and Providence, RI and Worcester, MA (into Boston); and Riverside, CA (into Los Angeles).

For the metro areas in which these workers originate, the within-metro measures reflected here may somewhat understate the number of jobs workers can access due to transit links to adjacent metro areas. Nevertheless, these "exporting" counties represent less than 5 percent of the 100 metro areas' total counties and are limited to only a few locations. Future analyses will examine these commuter rail systems in greater detail to paint a broader portrait of inter-metropolitan job access via transit.

criteria, there are 137 primary cities in the 100 largest metro areas. "Suburbs" make up the balance of these metropolitan areas, outside of their primary cities.

In summary, this report provides a view of the "supply side" of transit in metropolitan areas as an indication of transit's potential effectiveness in serving workers and employers. Many other questions on transit and transportation in the metropolitan context also deserve analysis, possibly as an extension of this effort. These include: how transit relates to broader metropolitan economic health; the state of access to important services beyond jobs via transit; how transit compares to automobiles in providing access to jobs; and transit's monetary costs to riders, among others. Box 4 later in this report offers a list of possible future research projects that Brookings or other organizations could undertake that build on the database and analysis constructed for this initial report.

Findings

A. Nearly 70 percent of large metropolitan residents live in neighborhoods with access to transit service of some kind.

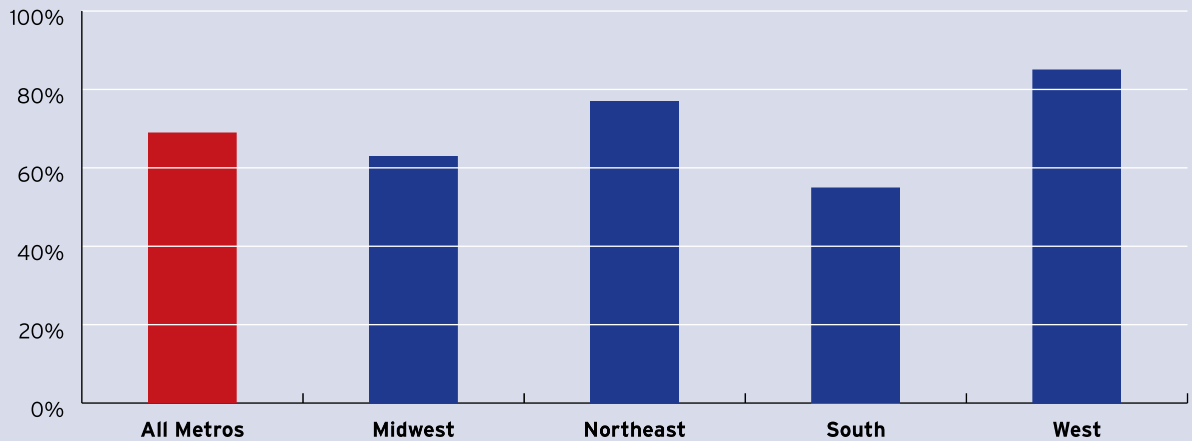
The measure of a transit system's effectiveness starts with its reach.[33] This section examines metropolitan transit coverage, or the share of a metro area's working-age population living in communities served by transit.

Across the nation's 100 largest metropolitan areas, nearly 70 percent of working-age people live in neighborhoods that receive transit service of some kind. With almost 128 million working-age people living in these metro areas, this implies that 39 million lack transit access in their communities.

U.S. regions are marked by significant differences in metropolitan transit coverage (Figure 1). Western metro areas boast the highest geographic coverage rates, with a combined 85 percent of their working-age populations receiving transit service. This outpaces metro coverage in the next closest region, the Northeast, by almost eight percentage points. Coverage rates fall off significantly in Midwestern metro areas (63 percent), and especially in Southern metro areas, where just 55 percent of working-age residents live in communities served by transit.

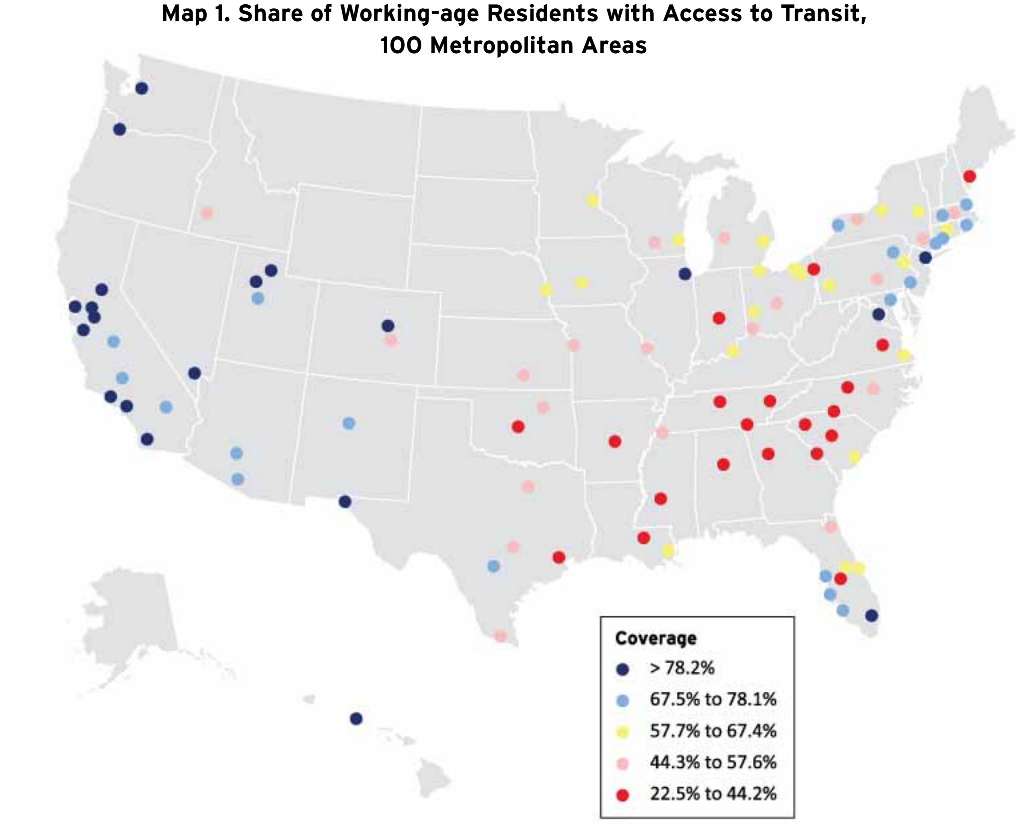
Differences in metropolitan age, urban form, and public polices among U.S. regions help account for some of these discrepancies in transit coverage. Many Western metro areas are characterized

Figure 1. Share of Working-Age Residents with Access to Transit, by Region, 100 Metropolitan Areas



Source: Brookings Institution analysis of transit agency and Nielsen Pop-Facts 2010 data

Map 1. Share of Working-age Residents with Access to Transit, 100 Metropolitan Areas



Source: Brookings Institution Analysis of transit agency data and Nielsen Pop-Facts 2010 data

by denser development patterns due to geographic barriers such as mountains, ocean, and desert.[34] Western metro areas are also much more likely than others to engage in comprehensive planning with growth containment policies, employ infrastructure regulations such as impact fees, and administer programs designed to boost the supply of affordable housing. As a result, they have, by far, higher densities than metropolitan areas in other regions.[35] Their more urbanized form puts transit within reach of larger shares of their populations. In the Northeast and Midwest, many older metro areas developed decades before the masses owned personal automobiles, leaving legacies of neighborhoods well-served by transit.

Yet these regional aggregate statistics mask considerable variation in transit coverage among individual metropolitan areas (Map 1 and Table 1). As the region-wide statistics suggest, most Western metropolitan areas rank among those with the highest coverage rates. Fully 97 percent of Honolulu's working-age residents live in transit-covered areas, as do 96 percent of those in Los Angeles and San Jose. Altogether, seven of the top 10, and 15 of the top 20 metro areas for transit coverage are in the West. Within the region, only Colorado Springs and Boise exhibit below-average transit coverage.

Metro areas in the Northeast and Midwest run the gamut on coverage rates. Metro areas such as New York (90 percent) and Chicago (79 percent) with extensive transit systems rank relatively high (7th and 20th, respectively). Other Northeastern metro areas such as Buffalo, Philadelphia, New Haven, and Bridgeport offer transit coverage to at least 75 percent of residents. Several other metro areas in these regions cluster around the national average of 69 percent, such as Boston, Milwaukee, Minneapolis, and Pittsburgh. But many more exhibit below-average coverage, with nine registering coverage rates below 50 percent. The Indianapolis (42 percent), Youngstown (36 percent), and Portland, ME (33 percent) metro areas all rank among the bottom 20 on this indicator.

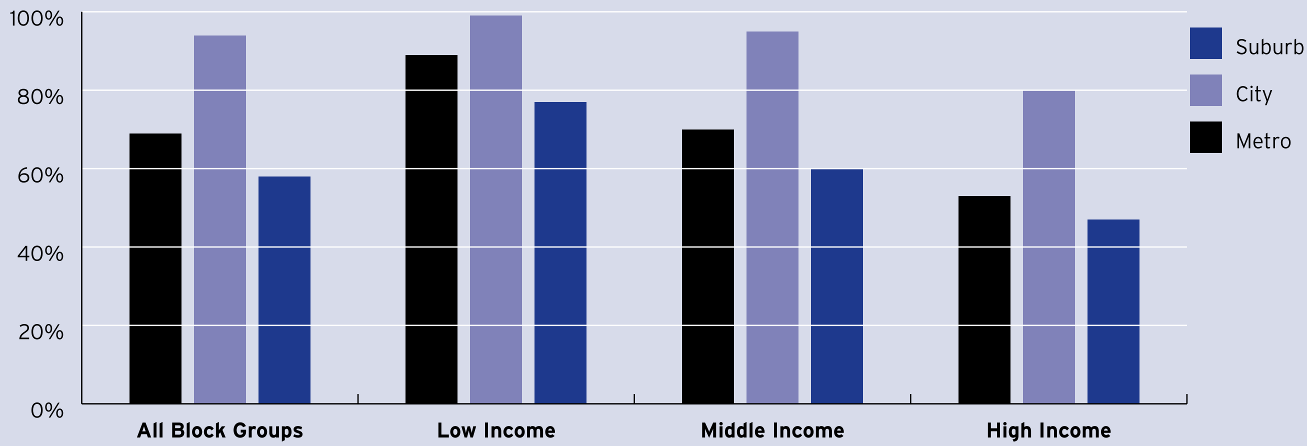
Finally, metro areas in the South represent a mirror image of their Western counterparts. Nine of the 10 metro areas with the lowest transit coverage rates are in the South, and 27 of the 38 Southern metro areas rank among the bottom 50. In only four of the South's 38 large metro areas (El Paso, Miami, Washington, D.C., and Cape Coral) do above-average shares of the working-age population live in communities served by transit. Chattanooga registers the lowest metropolitan coverage rate among the 100 largest metro areas, at 23 percent. More than 254,000 of its 329,000 working-age residents

Table 1. Top and Bottom Metropolitan Areas for Share of Working-Age Residents with Access to Transit

Rank	Metropolitan Area	Coverage (%)
1	Honolulu, HI	97.0
2	Los Angeles-Long Beach-Santa Ana, CA	96.0
3	San Jose-Sunnyvale-Santa Clara, CA	95.6
4	El Paso, TX	94.3
5	San Francisco-Oakland-Fremont, CA	91.7
6	Modesto, CA	90.4
7	New York-Northern New Jersey-Long Island, NY-NJ-PA	89.6
8	Salt Lake City, UT	89.0
9	Miami-Fort Lauderdale-Pompano Beach, FL	88.8
10	Las Vegas-Paradise, NV	85.5
91	Baton Rouge, LA	34.2
92	Portland-South Portland-Biddeford, ME	33.1
93	Nashville-Davidson--Murfreesboro--Franklin, TN	32.2
94	Birmingham-Hoover, AL	32.1
95	Richmond, VA	30.8
96	Augusta-Richmond County, GA-SC	30.2
97	Jackson, MS	30.0
98	Knoxville, TN	27.9
99	Greenville-Mauldin-Easley, SC	27.7
100	Chattanooga, TN-GA	22.5

Source: Brookings Institution analysis of transit agency and Nielsen Pop-Facts 2010 data

Figure 2. Share of City and Suburban Working-Age Residents with Access to Transit, by Income, 100 Metropolitan Areas



Source: Brookings Institution analysis of transit agency and Nielsen Pop-Facts 2010 data

lack transit service from their neighborhoods. The bulk of the nation's least covered metro areas cluster in the Southeast and Deep South, including larger regions such as Richmond (31 percent), Nashville (32 percent), Birmingham (32 percent), and Atlanta (38 percent).

Despite vast differences in transit coverage among the 100 largest metropolitan areas, coverage within these metro areas shares some common characteristics.

First, residents of low-income neighborhoods enjoy greater access to transit than those in other neighborhoods. Across all 100 metro areas, 89 percent of working-age residents of low-income neighborhoods have access to transit (Figure 2). This greatly exceeds the shares for middle- and high-income neighborhoods (70 percent and 53 percent, respectively). Transit agencies may place more effort into serving these communities given the fact that low-income people are less likely to own cars and depend more on transit than other groups.[36] Of the 100 largest metro areas nationwide, 98 exhibit higher rates of transit coverage in their low-income neighborhoods than in middle- or high-income neighborhoods.

Second, cities have better transit coverage than suburbs. Fully 94 percent of city residents in these 100 metropolitan areas live in neighborhoods served by transit, compared with just 58 percent of their suburban counterparts. This difference reflects the fact that several old, large rail transit systems were built before the era of mass suburbanization in metropolitan America, and thus better serve cities than suburbs.[37] It further reflects the hub-and-spoke design of many of these systems that feed suburban riders into the urban core, rather than from suburb to suburb. The convergence of multiple transit lines in the center gives much larger shares of city residents access to at least one route. For both rail and bus, it also signals the fact that the efficiency of transit increases with population density; it is much more cost-effective to serve city neighborhoods with many potential riders than more sparsely populated suburban locations.[38] In only one of the 100 largest metro areas (Cape Coral) are suburban residents better covered by transit than city dwellers. Moreover, in 87 of these metro areas, the share of city commuters covered by transit exceeds that for suburban commuters by at least 20 percentage points. All neighborhood income groups in the suburbs are less likely to be covered by transit than all neighborhood income groups in cities.

While these city/suburban coverage disparities have emerged over the decades for understandable reasons, they represent anachronisms now that suburbs contain more than two-thirds of working-age residents, as well as a majority of the poor. Indeed, a metro area's overall rate of transit coverage bears a much closer relationship to its rate of suburban, rather than city, coverage.[39] The future efficacy of metropolitan transit systems will thus rest squarely on their ability to reach the growing segment of suburban, especially low-income suburban, commuters.

B. In neighborhoods covered by transit, morning rush hour service occurs about once every 10 minutes for the typical metropolitan commuter.

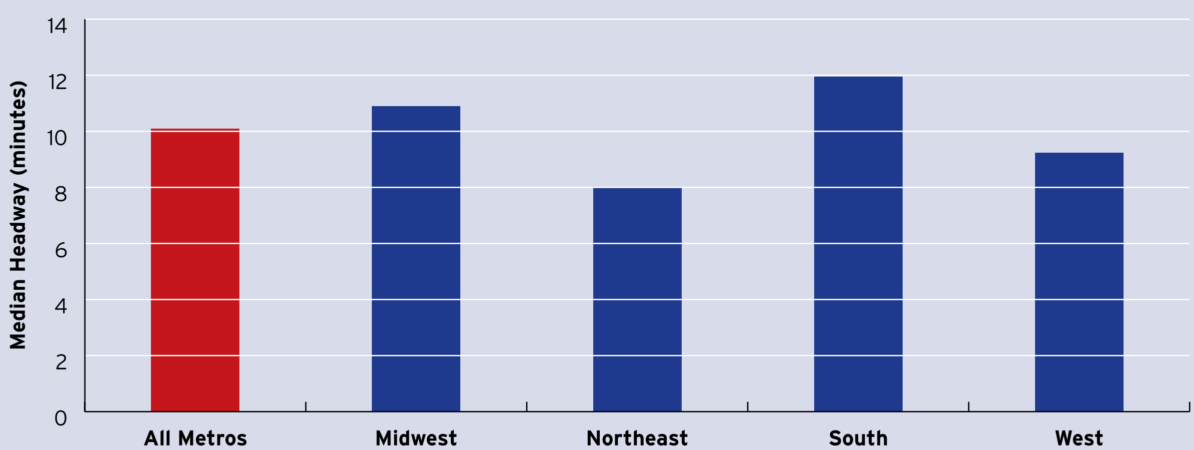
A transit system's effectiveness depends not only on its reach, but also the regularity of its service.[40] Higher service frequency translates into faster commute times and greater convenience for passengers. The primary expression of service frequency is "headway," the time between vehicles reaching a transit stop. Transit agencies attempt to balance user satisfaction and operational costs as they determine headways on each route.[41] This analysis measures headway for each neighborhood covered by transit, for all of the qualifying initial stops used by that neighborhood's residents.[42]

Across all neighborhoods in the 100 largest metropolitan areas that receive transit service, the median headway during the morning rush hour (or "peak") is 10.1 minutes.

As with coverage, however, service frequency varies a great deal across regions (Figure 3). In the Northeast, the typical resident living in a neighborhood covered by transit experiences only an 8.0 minute service gap. The New York metro area's performance drives this regional result, with the lowest median headway among the 100 metro areas (4.5 minutes). In fact, New York is the only metro area with a typical service frequency under 5 minutes. Western metro areas register the next shortest median headway at 9.2 minutes. Similar to the Northeast, two large Western metro areas in particular help drive these numbers—Los Angeles (6.2 minutes) and San Jose (6.9 minutes). Midwestern and Southern metro areas trail those in the other two regions considerably on this indicator, with median headways 3 and 4 minutes longer than those in the Northeast, respectively.

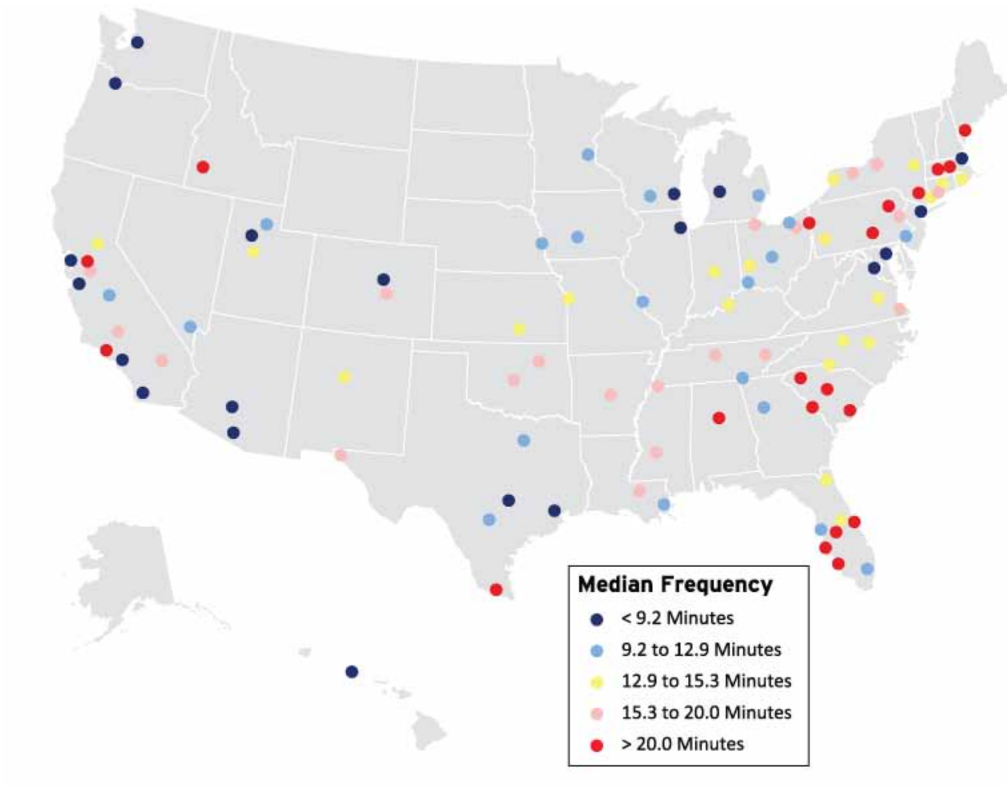
More so than with transit coverage, a handful of large metropolitan areas stand apart from others in providing frequent transit service. Fewer than one-quarter of the 100 largest metro areas maintain median headways below the 10.1 minute average, and only five—New York, Los Angeles, Milwaukee, Washington, and San Jose—see typical headways under 7 minutes. New York's and Washington's top rankings owe not only to their well-known city subway and bus systems, but also an extensive series of suburban rail and bus systems. Los Angeles and San Jose do not offer the same levels of rail service, but deliver high service frequencies via large bus networks. Los Angeles' 19 transit systems use well over 500 bus routes, and San Jose relies on about 100 routes. And while Milwaukee has no rail transit

Figure 3. Typical Transit Service Frequency, by Region, 100 Metropolitan Areas



Source: Brookings Institution analysis of transit agency and Nielsen Pop-Facts 2010 data

Map 2. Typical Transit Frequency, 100 Metropolitan Areas



Source: Brookings Institution Analysis of transit agency and Nielsen Pop-Facts 2010 data

at all, its median headway is below seven minutes.[43]

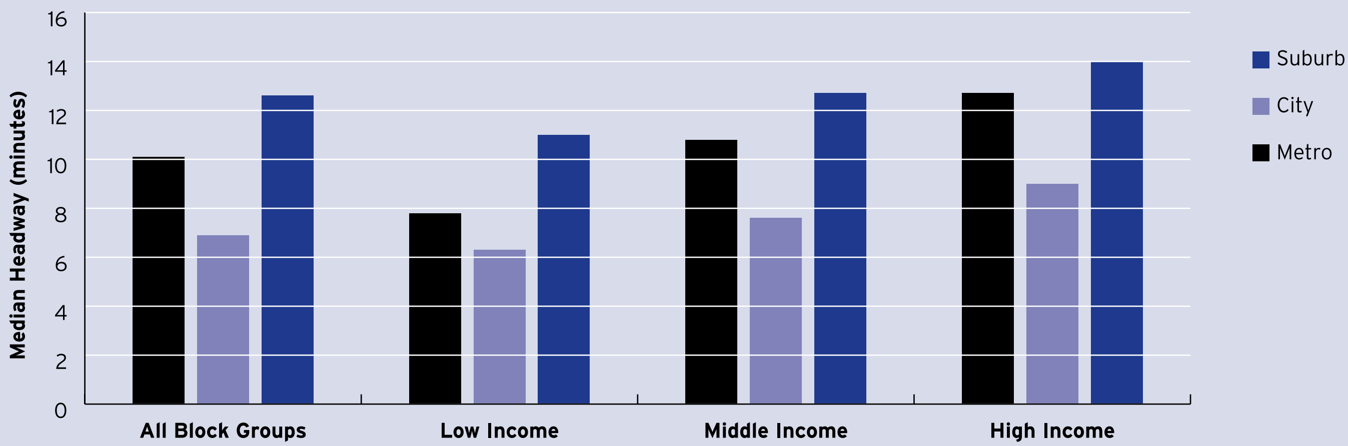
Only 18 other metropolitan areas' median headways are below 10 minutes (Map 2). Half of these are in the West, including Portland (7.4), Denver (8.1), Honolulu (9.0), and Tucson (9.2). Another three are in the South (Houston, Baltimore, and Austin), despite the region's poor overall performance on service frequency. Other metropolitan areas with shorter-than-average headways include those with both well-known rail systems and extensive bus systems, like Boston, Chicago, San Francisco, and Philadelphia.[44]

On the other hand, 41 of the 100 metro areas have median headways longer than 15 minutes. The longest is McAllen at 58.4 minutes, followed closely by Poughkeepsie (51.0 minutes), and then Palm Bay (38.4 minutes). Twenty metro areas' headways are at least 20 minutes, and half of those are in the South. Other metro areas with relatively long headways include older, auto-oriented, mid-sized regions of the Northeast and Midwest, such as Worcester, Springfield, Harrisburg, and Youngstown.

Good transit coverage does not always translate into high service frequency, and vice versa.[45] Some metro areas with relatively poor coverage manage to deliver short headways, suggesting they focus their service in a smaller area and deliver it more frequently. Houston, Austin, Grand Rapids, Atlanta, and Chattanooga all rank in the bottom 30 metro areas for coverage, but the top 30 for service frequency. Other metro areas with high transit coverage have much longer headways, suggesting they provide transit to more people at the expense of service regularity. Together with Cape Coral, four metro areas—Oxnard, Stockton, Modesto, and El Paso—rank in the top 30 for coverage, but the bottom 30 for service frequency.

Within metropolitan areas, city headways are consistently shorter than suburban headways. The typical time between transit service for city commuters is just 6.9 minutes, compared with 12.6 minutes for suburban commuters (Figure 4). Median service frequency ranges from 6.3 minutes in

Figure 4. Typical City and Suburban Transit Frequency, by Income, 100 Metropolitan Areas



Source: Brookings Institution analysis of transit agency and Nielsen Pop-Facts 2010 data

low-income neighborhoods to 9.0 minutes in high-income neighborhoods in cities, compared to 11.0 and 14.0 minutes for those suburban neighborhood income groups. Thus, transit is not only less likely to reach suburban locations, but where it does it provides much less frequent service, especially in higher-income areas. As with transit coverage, these patterns hold nearly universally. In 97 of the 100 largest metro areas, service is more frequent in cities than suburbs.[46] Shorter headways in cities make transit a more competitive commuting option there than in suburbs.

C. The typical metropolitan resident can reach about 30 percent of jobs in their metropolitan area via transit in 90 minutes.

Getting commuters to jobs is only one of the functions of a transit system, but it is arguably its most important. Commutes make up the largest share of transit trips nationwide.[47] Moreover, as those trips occur during the busiest travel periods of the day, they help reduce congestion on road networks in metropolitan areas.[48] Transit can compete with other modes of transportation if it connects workers with a significant number of jobs in what they regard to be a reasonable and reliable amount of time. Thus, the share of a metropolitan area's jobs that commuters can reach via transit represents a critical measure of transit quality and workers' access to labor market opportunity.

This section measures the share of metropolitan jobs accessible to the typical working-age resident within 90 minutes of travel time via transit from his/her neighborhood. This is longer than the typical commute by car or transit. As such, it represents an upper bound on the time and distance that one should travel in order to reach work, rather than the average commuter experience. The measure is designed to offer an inclusive portrait of job access via transit in metropolitan areas. (See Box 2 for a more detailed explanation of the 90-minute threshold and results under alternative thresholds.)

Across all neighborhoods served by some form of transit in the 100 largest metro areas, the typical working-age resident can reach about 30 percent of metropolitan jobs within 90 minutes of travel time.[49] Put differently, for this typical commuter, more than two-thirds of jobs in the nation's largest metro areas are inaccessible within an hour and a half by way of existing transit systems.

This result reflects more than just the size and reach of metropolitan transit networks. The location of jobs and population within metropolitan areas, and the extent to which transit systems align with both, play significant roles in determining access to jobs via transit. Over the past several decades, including the 2000s, jobs and people have moved farther outward in metropolitan areas.[50] By 2010, suburbs in the 100 largest metro areas housed almost 63 percent of metropolitan jobs and 69 percent of working-age people.[51] Yet the previous two findings underscore the extent to which transit in most metro areas still concentrates primarily in cities, and provides hub-and-spoke rail service misaligned with the suburbanization of employment and people.

Clear regional patterns emerge across and within the 100 largest metro areas, indicating differences not only in transit coverage and service frequency, but also in alignment (or lack thereof) between transit systems and the location of people and jobs (Figure 5). Metro areas in the West (33 percent) and Northeast (32 percent) demonstrate above-average median job accessibility rates. Midwestern metro areas (28 percent) lag the 100-metro average, while the typical resident of a Southern metro area can access only about one-quarter of metropolitan jobs within 90 minutes via transit (26 percent).

Box 2. Establishing a Commute-Time Threshold

Travel time thresholds are essential to model transportation accessibility. Without a temporal boundary, any destination within reach of transit could be considered accessible. Using the peak morning commuting period—6 to 9 AM—the model developed for this report allows workers to reach their intended destination within an allotted time. If they cannot, the model considers the destination unreachable.

Data from the 2008 American Community Survey were used to determine an appropriate travel time threshold for the model. Those data indicate that over half of all public transportation commutes within the country's 100 largest metropolitan areas take longer than 45 minutes.[52] Similar research from a 2001 national transportation survey confirms that larger metropolitan areas face longer overall transit travel times.[53] Adding the walking (not "in vehicle") time embedded in the model would push the typical commute time to more than 60 minutes.[54]

The final model therefore permits travelers a ceiling of up to 90 minutes to reach jobs within their metropolitan areas.[55] A 90-minute, one-way commute time certainly exceeds the vast majority of commute times in America. It also does not represent a preferred or desirable outcome for all metropolitan transit systems, which may have different goals or standards for commuting and job access. However, it establishes a comparable benchmark across all metropolitan areas, particularly one that recognizes the prevalence of longer commutes in larger metro areas where a majority of transit usage occurs.

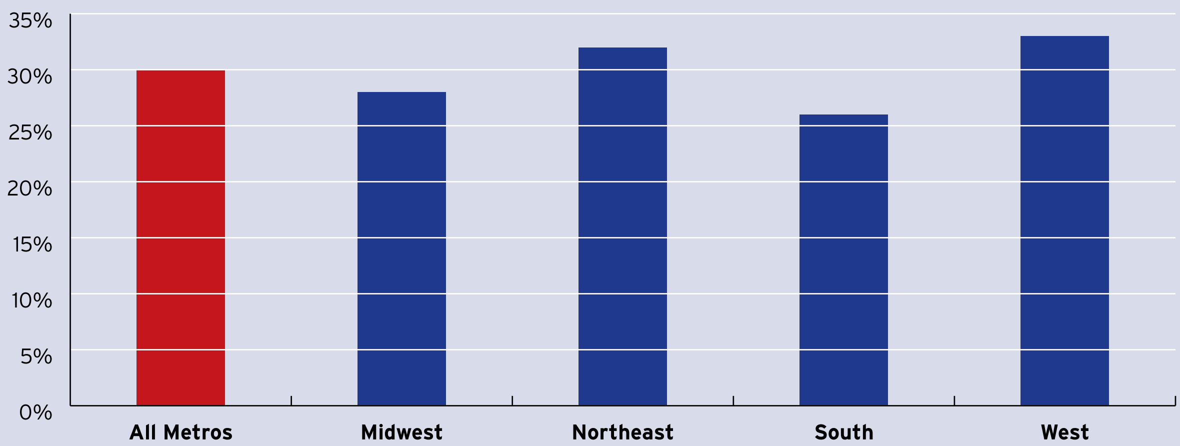
The result: across all metro areas, the typical worker can reach about 30 percent of total metropolitan jobs in 90 minutes. At a 60-minute commute threshold, only 13 percent of jobs are accessible for the typical worker. For a 45-minute commute, the share drops to 7 percent.

Naturally, job access levels are lower in each of the 100 largest metro areas under reduced time thresholds. In only a few cases, however, do the rankings among metro areas change significantly. Las Vegas experiences the biggest change, jumping from the 75th ranking under 45 minutes to 12th under 90 minutes. Pittsburgh shows the biggest drop, falling from 32nd under 45 minutes to 79th under 90 minutes. Overall, metro area rankings on job access do not change considerably under alternative travel time thresholds.[56] Appendix 5 presents metro-specific data under various travel time thresholds, and Box 4 explains how future research might use this model to explore metropolitan performance under different travel time assumptions.

These regional patterns are further reflected in how well individual metro areas do in promoting job access via transit (Map 3 and Table 2). The West accounts for eight of the 10 metro areas with the highest shares of jobs accessible via transit; the remaining two are both in Wisconsin. In these 10 metro areas, the typical working-age person in a neighborhood served by transit can reach from 48 to 60 percent of all metropolitan jobs within 90 minutes. (For detailed data on all 100 metro areas, see Appendices 2 through 4.) Honolulu, a region with long-standing urban containment policies, highly constrained geography, and a relatively centralized employment base, posts the highest share at 60 percent, nearly double the 100 metro-area average.[57]

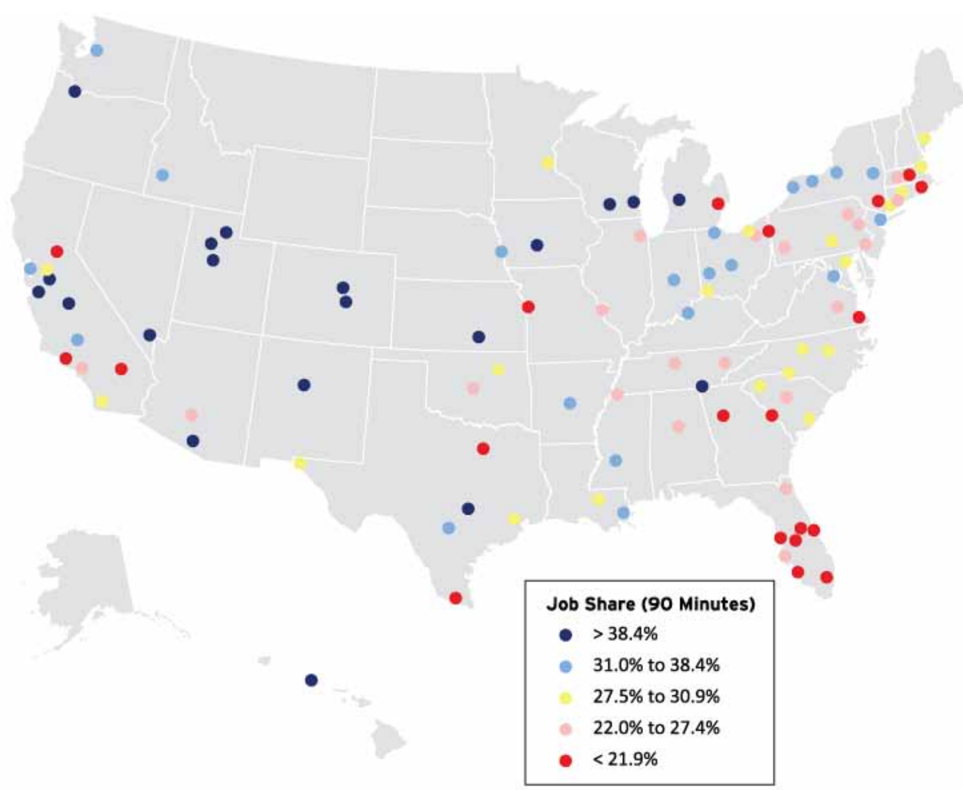
At the other end of the spectrum, the South accounts for seven of the 10 metro areas with the lowest shares of jobs accessible via transit; four are in Florida alone. Across all 10, the typical commuter in neighborhoods served by transit can reach only from 7 to 17 percent of metropolitan jobs within 90 minutes. Palm Bay, Riverside, and Poughkeepsie post much lower job access rates via transit than other metro areas.

Figure 5. Average Share of Jobs Accessible in 90 Minutes via Transit, by Region, 100 Metropolitan Areas



Source: Brookings Institution analysis of transit agency, Nielsen Pop-Facts 2010, and Nielsen Business-Facts data

Map 3. Share of Jobs Accessible on Average in 90 Minutes via Transit, 100 Metropolitan Areas



Source: Brookings Institution analysis of transit agency, Nielsen Pop-Facts 2010, and Nielsen Business-Facts data

Table 2. Top and Bottom Metropolitan Areas for Average Share of Jobs Accessible in 90 Minutes via Transit

Rank	Metropolitan Area	Share of Jobs Reachable in 90 Minutes (%)
1	Honolulu, HI	59.8
2	Salt Lake City, UT	58.9
3	San Jose-Sunnyvale-Santa Clara, CA	58.4
4	Madison, WI	58.2
5	Tucson, AZ	57.2
6	Fresno, CA	57.0
7	Albuquerque, NM	52.9
8	Milwaukee-Waukesha-West Allis, WI	48.6
9	Provo-Orem, UT	48.3
10	Denver-Aurora, CO	47.5
91	McAllen-Edinburg-Mission, TX	16.6
92	Augusta-Richmond County, GA-SC	16.4
93	Tampa-St. Petersburg-Clearwater, FL	16.3
94	Miami-Fort Lauderdale-Pompano Beach, FL	16.2
95	Orlando-Kissimmee, FL	15.8
96	Virginia Beach-Norfolk-Newport News, VA-NC	15.4
97	Youngstown-Warren-Boardman, OH-PA	14.2
98	Poughkeepsie-Newburgh-Middletown, NY	8.2
99	Riverside-San Bernardino-Ontario, CA	7.9
100	Palm Bay-Melbourne-Titusville, FL	7.4

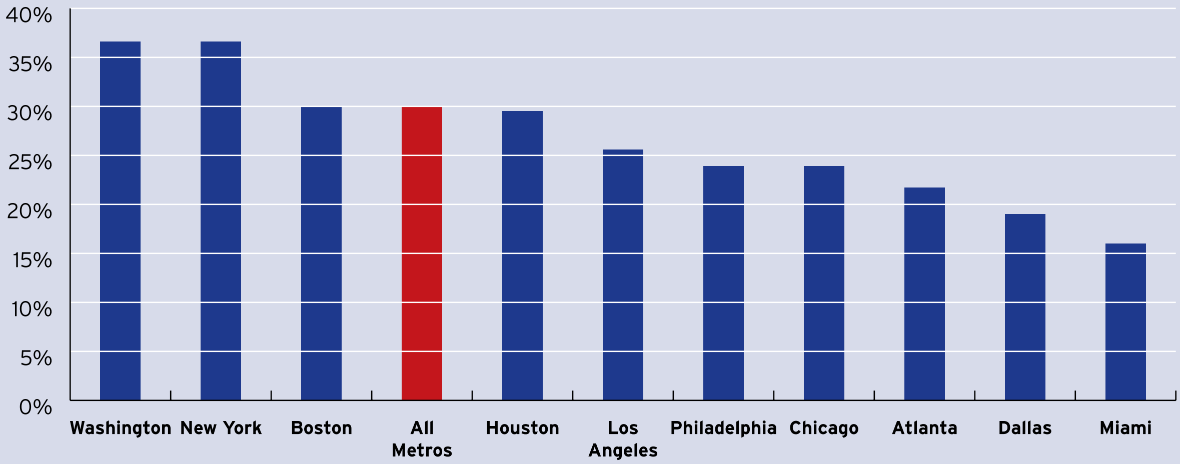
Source: Brookings Institution analysis of transit agency, Nielsen Pop-Facts 2010, and Nielsen Business-Facts data

As noted above, the jobs access measure more closely reflects where jobs lie within metro areas than the extent of transit coverage, particularly for metro areas ranking very high or low on those measures. Tucson and Fresno, for instance, rank 30th and 34th, respectively, among the 100 metro areas on the share of their working-age population in neighborhoods served by transit. But they post much higher rankings on job access (5th and 6th) largely by virtue of their more centralized employment; 66 percent of metropolitan jobs in Tucson, and 59 percent in Fresno, are located in central cities as opposed to suburbs (versus 37 percent in cities nationally). By contrast, Riverside and Palm Bay rank 23rd and 50th for transit coverage, but rate very poorly on job access (99th and 100th) because only 22 percent and 10 percent of their metropolitan jobs, respectively, are located in their cities.

Metropolitan size itself bears no relationship to transit job access rates.[58] Among the nation's 10 largest metro areas, the share of jobs accessible within 90 minutes range widely, from 16 percent to 37 percent (Figure 6). Miami, despite achieving the ninth-highest transit coverage of its working-age population, places very low on job access (94th) because just 17 percent of its jobs locate within its big cities. Notably, Chicago and Philadelphia—home to two of the oldest and best-known transit networks nationwide—rank lower on job access via transit than Houston and Los Angeles, both of which are known as auto-dominated metro areas. Yet Houston and Los Angeles actually display lower degrees of "job sprawl" than Chicago and Philadelphia.[59]

The job share measure analyzed here offers a way to compare metro areas of different sizes on the same basis. That noted, it does disguise the large number of jobs that the typical commuter can access via transit within 90 minutes in several of the largest metro areas. There are 16 metro areas in which that typical working-age resident can reach at least 500,000 jobs in that time (Table 3). They include several of the largest metro areas by employment (e.g., New York, Los Angeles, Chicago, and Washington), but also the somewhat smaller metro areas of Denver, Las Vegas, and San Jose, where transit does an above-average job of connecting working-age residents to jobs. Of course, the large

Figure 6. Average Share of Jobs Accessible in 90 Minutes via Transit, 10 Largest Metropolitan Areas



Source: Brookings Institution analysis of transit agency, Nielsen Pop-Facts 2010, and Nielsen Business-Facts data

Table 3. Metropolitan Areas with 500,000 or More Jobs Accessible in 90 Minutes via Transit

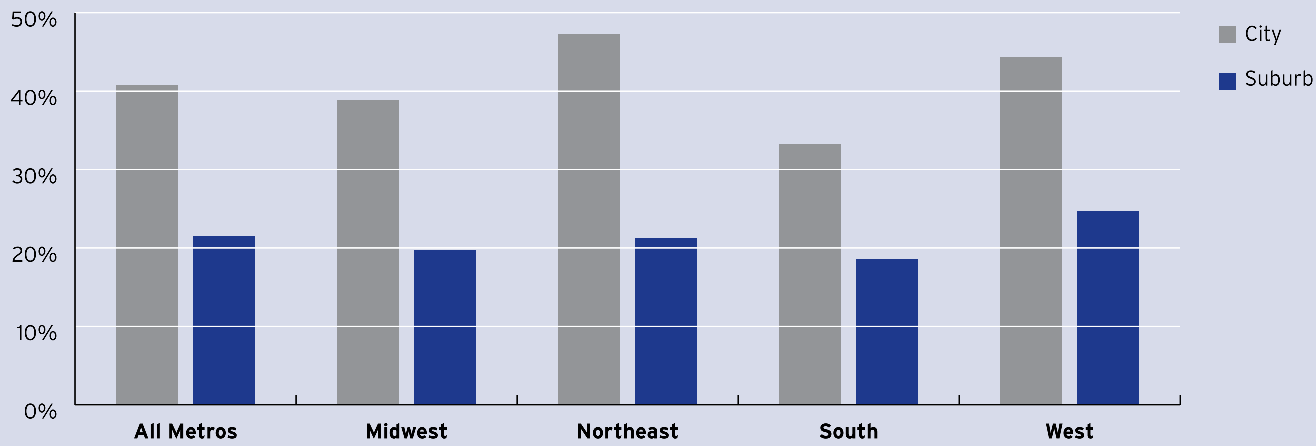
Metropolitan Area	Average Jobs Reachable in 90 Minutes	Share of Metropolitan Jobs (%)	Share Rank
New York-Northern New Jersey-Long Island, NY-NJ-PA	3,539,294	36.6	25
Los Angeles-Long Beach-Santa Ana, CA	1,544,990	25.6	69
Chicago-Naperville-Joliet, IL-IN-WI	1,194,812	23.9	76
Washington-Arlington-Alexandria, DC-VA-MD-WV	1,148,904	36.6	24
Boston-Cambridge-Quincy, MA-NH	832,215	30.2	43
Houston-Sugar Land-Baytown, TX	812,343	29.6	50
San Francisco-Oakland-Fremont, CA	798,327	34.8	30
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	747,972	24.0	75
Denver-Aurora, CO	617,584	47.5	10
Minneapolis-St. Paul-Bloomington, MN-WI	603,562	29.7	48
Dallas-Fort Worth-Arlington, TX	593,045	19.0	88
Seattle-Tacoma-Bellevue, WA	583,301	33.4	35
Atlanta-Sandy Springs-Marietta, GA	573,032	21.7	85
San Jose-Sunnyvale-Santa Clara, CA	553,213	58.4	3
Las Vegas-Paradise, NV	516,389	44.0	12
Phoenix-Mesa-Scottsdale, AZ	516,331	27.4	61

Source: Brookings Institution analysis of transit agency, Nielsen Pop-Facts 2010, and Nielsen Business-Facts data

labor supply in these metro areas increases the potential competition for these jobs, but the sheer scale of employment their workers can access via transit may afford some advantages over what is available in small metro areas that rate higher on transit job access.

As with transit coverage and frequency of service, great disparities in job connectivity via transit persist within metro areas as well (Figure 7). The typical working-age resident in city neighborhoods served by transit in the 100 largest metro areas can reach 41 percent of metropolitan jobs, compared

Figure 7. Average Share of Jobs Accessible in 90 Minutes via Transit for City and Suburban Residents, by Region, 100 Metropolitan Areas



Source: Brookings Institution analysis of transit agency, Nielsen Pop-Facts 2010, and Nielsen Business-Facts data

to 22 percent for the typical suburban commuter. This gap once again underscores the city-centric nature of many transit systems, and the relative lack of transit in most metro areas that supports suburb-to-suburb commuting.

City residents in all regions of the country enjoy greater job access via transit than suburban residents. Disparities are most stark in the Northeast, where 26 percentage points separate the shares of jobs accessible to typical city (47 percent) versus suburban (21 percent) residents. Yet that still exceeds rates in Midwestern and Southern suburbs that average below 20 percent. In the West, city residents reach a slightly lower share of jobs on average than their Northeastern counterparts, but suburban residents do better, typically accessing one-quarter of metropolitan jobs via transit.

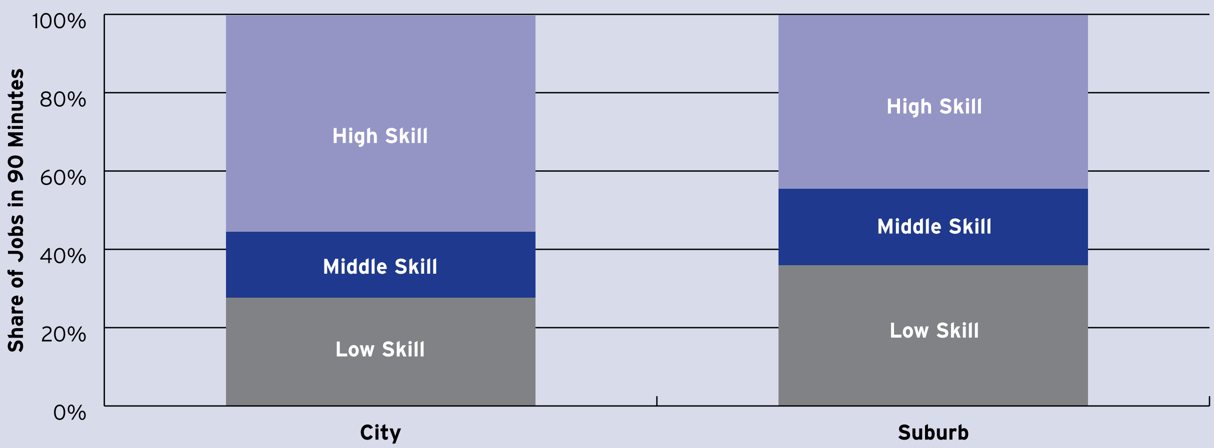
Neighborhood income also relates to job access via transit at the metro, city, and suburban levels. Residents of low-income neighborhoods can access higher shares of metropolitan jobs than those in higher-income communities (although the disparity among neighborhood income groups is narrower than for transit coverage and service frequency). In the 100 largest metro areas, the typical resident of a low-income neighborhood served by transit can reach 36 percent of metropolitan jobs within 90 minutes, compared to 28 percent and 23 percent for residents of middle-income and high-income neighborhoods, respectively.

These metrics indicate that metropolitan transit networks do a somewhat better job connecting residents of low-income communities—who are more likely to depend on transit—to employment than residents of higher-income communities. But what kinds of jobs are most accessible via transit? And are they appropriate for the workers who can reach them? The next section explores these questions in greater detail.

D. About one-quarter of jobs in low- and middle-skill industries are accessible via transit within 90 minutes for the typical metropolitan commuter, compared to one-third of jobs in high-skill industries.

Where jobs lie within a metropolitan area shapes how many of them are accessible via transit. Similarly, the spatial distribution of different types of industries within a region may affect the kinds of jobs residents can reach via transit. While almost every major industry decentralized within metropolitan areas over the last several years, some remain more concentrated in the urban core than others.[60] Consequently, the degree to which transit systems "match" workers and the jobs for which they are

Figure 8. Distribution of City and Suburban Jobs by Skill Type, 100 Metropolitan Areas



Source: Brookings Institution analysis 2010 Nielsen Business-Facts data

most qualified depends on a range of factors that vary significantly across metro areas.

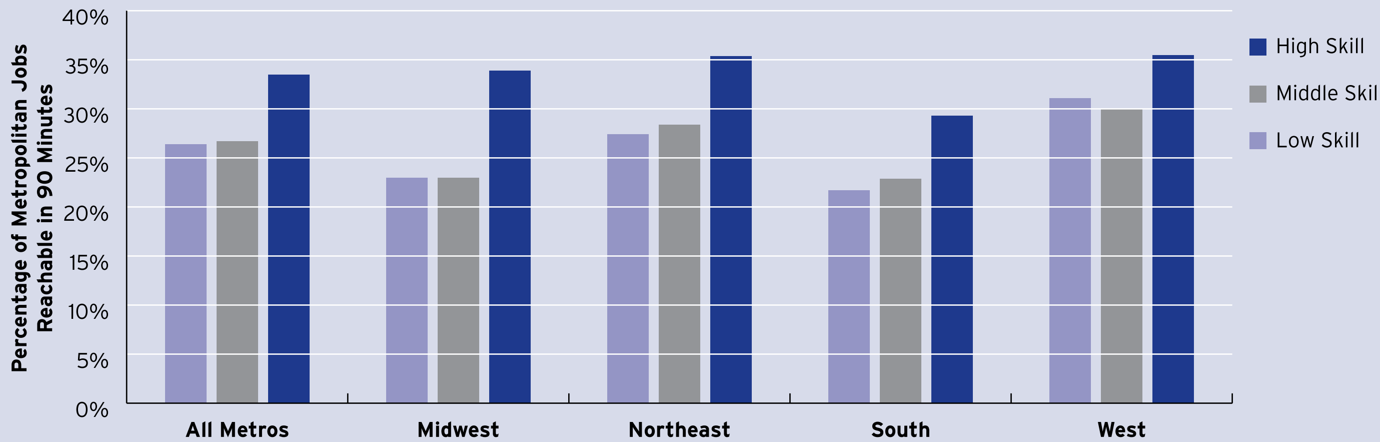
As described in the methodology, this report classifies major industries by the average educational attainment of their workers. In the 100 largest metro areas, almost half of total jobs are in industries defined as high-skill, such as finance, business and legal services, and public administration. The remaining jobs include those in middle-skill industries (19 percent) like wholesale trade and manufacturing, and low-skill sectors (33 percent) like construction, personal services, and hospitality. More than half of jobs in cities of the 100 largest metro areas are in high-skill industries, while more than half of suburban jobs are middle- or low-skill (Figure 8).[61] Stated another way, across these metro areas, 43 percent of metropolitan high-skill industry jobs are in cities, and 69 percent of low-skill industry jobs are in suburbs. This reflects the greater "demand for density" among high-skill sectors, and the larger physical footprint of middle- and low-skill sectors like manufacturing and retail.[62]

Because transit generally provides better access to employment in cities than suburbs, metropolitan commuters can reach relatively more high-skill industry jobs via transit than other jobs. Across the 100 largest metro areas, the typical working-age person in neighborhoods served by transit can reach one-third of metro area jobs in high-skill industries within 90 minutes of travel time, compared to just over one-quarter of metro area jobs in middle- or low-skill industries (Figure 9).

This pattern holds across metropolitan areas in all census regions, but some regions exhibit more pronounced disparities than others. In Western metro areas, the typical commuter can access 31 percent of low-skill industry jobs, and 35 percent of high-skill industry jobs, within 90 minutes via transit. In the Midwest, commuters can reach a similar share of high-skill industry jobs (34 percent), but only 23 percent of low- and middle-skill industry jobs. Disparities are also high, and access levels lower at every skill level, in the South, where the typical working-age person can reach only 29 percent of high-skill industry jobs and 22 percent of low-skill industry jobs via transit.

Among the 100 metro areas, 94 provide access to greater shares of their high-skill industry jobs via transit than their low- and middle-skill industry jobs. Las Vegas, McAllen, Colorado Springs, Virginia Beach, Palm Bay, and Tampa are the only exceptions, reflecting their above-average concentrations of low- and middle-skill jobs and the decentralization of those jobs across cities and suburbs. Metro areas in which transit and jobs are better aligned overall exhibit higher levels of job access across employment skill types. Metropolitan San Jose, Honolulu, Fresno, Salt Lake City, and Tucson, which rank among the top 10 metro areas for total share of metropolitan jobs accessible via transit, each place among the top 10 for job access at all three industry skill levels. In each of these metro areas,

Figure 9. Share of Jobs Accessible in 90 Minutes via Transit, by Region and Skill Type, 100 Metropolitan Areas



Source: Brookings Institution analysis of transit agency, Nielsen Pop-Facts 2010, and Nielsen Business-Facts data

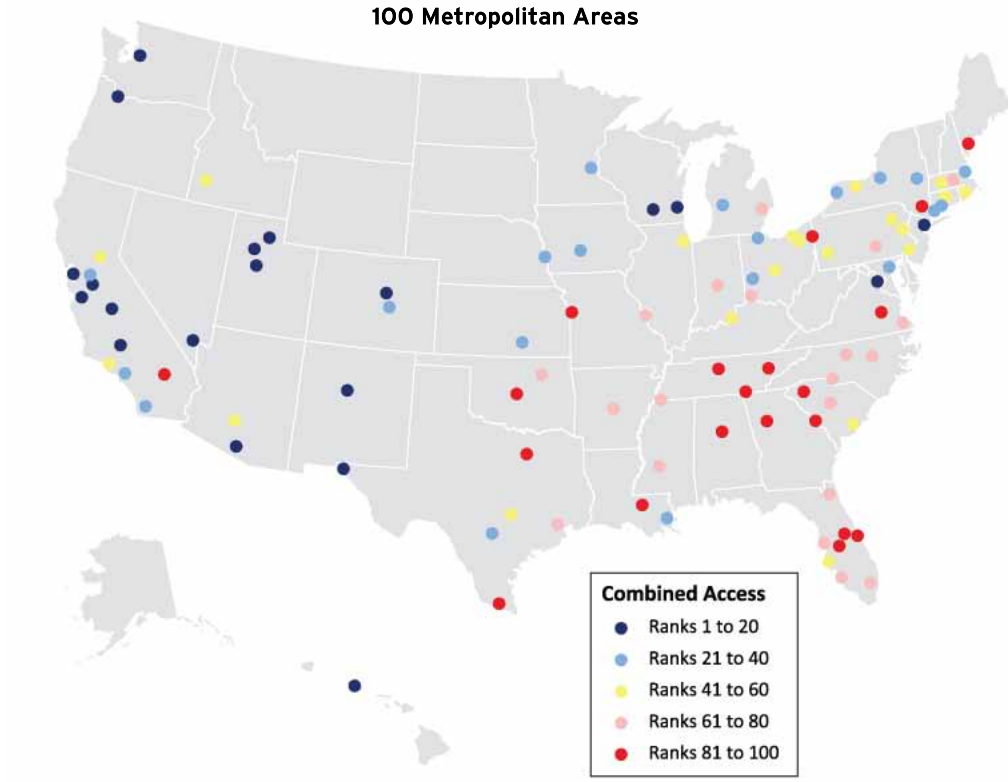
the typical working-age resident can reach roughly two-thirds of high-skill jobs, and more than half of low-skill jobs, in 90 minutes.

Residents of cities can access higher shares of jobs across all industry skill categories via transit than their suburban counterparts, another result of transit's traditional hub-and-spoke design. The typical city resident can reach 46 percent of high-skill metropolitan jobs within 90 minutes, compared to 36 percent of middle- and low-skill jobs. And while low- and middle-skill jobs make up the bulk of suburban employment, suburban residents still reach greater shares of metropolitan high-skill jobs via transit. The typical suburban resident can reach 24 percent of metro-wide high-skill industry jobs within 90 minutes, compared to just 19 percent of middle- and low-skill industry jobs.

Notably, this disparity between high- and low-skill industry job access via transit is most pronounced for residents of the low-income neighborhoods who depend most on the service. As revealed in the last section, these commuters generally enjoy greater levels of access to all metropolitan jobs than their counterparts in higher-income communities. The typical commuter from a low-income neighborhood in the 100 largest metro areas can reach over 40 percent of metropolitan high-skill industry employment, but only about 32 percent of low- and middle-skill industry jobs, 8 percentage points lower.

Taken together, the findings for low-income and suburban neighborhoods raise concerns about the ability of a suburbanizing poor population to connect to employment opportunities via transit. Residents of low-income suburban neighborhoods can reach just over one-in-five middle- or low-skill industry jobs in their metropolitan areas (23 and 22 percent, respectively)—the types of jobs for which they may be most likely to qualify. A metro area like Riverside, where 81 percent of low-income community residents are suburban, and residents of these neighborhoods can reach less than 7 percent of low- and middle-skill metropolitan jobs via transit, exemplifies the lack of viable options for this growing segment of the population. Although both low-income people and jobs have suburbanized over time, poor suburban residents are already less likely to live in a jobs-rich area than their higher-income counterparts, and as a result may have to commute farther to find work. This only serves to underscore the challenges facing these residents as they try to connect with employment opportunities throughout the wider metropolitan region.[63]

Map 4. Combined Ranking of Access to Transit and Employment, 100 Metropolitan Areas



Source: Brookings Institution analysis of transit agency, Nielsen Pop-Facts 2010, and Nielsen Business-Facts data

E. Fifteen of the 20 metro areas that rank highest on a combined score of transit coverage and job access are in the West.

The previous two findings examine how well metropolitan areas perform on getting residents of transit-served areas to jobs. While significant, those measures do not account for the experience of residents living in areas without transit service. This section introduces a final measure called "combined access" to simultaneously assess a metropolitan area's transit coverage and access to jobs via transit. It multiplies two key metrics from prior sections—the share of metropolitan working-age population living in neighborhoods served by transit, and the share of jobs that the typical working-age resident of those neighborhoods can access within 90 minutes via transit—to indicate the best and worst overall metropolitan performers.[64]

Metropolitan area rankings on combined access demonstrate clearly that the West is best. The top 12 metropolitan areas, as well as 15 of the top 20, are in the West (Map 4 and Table 4). Large metro areas such as San Jose, Denver, and Portland, as well as mid-sized areas such as Honolulu, Salt Lake City, and Tucson, posted among the highest scores thanks to strong rankings on both transit coverage and job access. Los Angeles, San Diego, and Colorado Springs post above-average rankings due to especially strong performance on one of the two indicators. The average combined access ranking among the 24 Western metro areas is 23 out of 100, reflecting both their high levels of transit coverage, and efficiency in getting transit commuters to jobs.

On average, Midwestern and Northeastern metro areas rank similarly on combined access (48 and 49 out of 100, respectively), much lower than their Western counterparts. New York, Madison, and Milwaukee rank among the top 20 performers. Another 13 metro areas, including large regions such as Boston and Minneapolis, and smaller regions such as Des Moines, Albany, and Wichita, rank among the next 20 metro areas on combined access. At the same time, four metro areas in the

Table 4. Top and Bottom Metropolitan Areas for Combined Ranking of Access to Transit and Employment

Rank	Metropolitan Area	Coverage (%)	Job Access (%)
1	Honolulu, HI	97.0	59.8
2	San Jose-Sunnyvale-Santa Clara, CA	95.6	58.4
3	Salt Lake City, UT	89.0	58.9
4	Tucson, AZ	73.1	57.2
5	Fresno, CA	71.5	57.0
6	Denver-Aurora, CO	83.7	47.5
7	Albuquerque, NM	73.1	52.9
8	Las Vegas-Paradise, NV	85.5	44.0
9	Provo-Orem, UT	73.1	48.3
10	Modesto, CA	90.4	38.4
91	Atlanta-Sandy Springs-Marietta, GA	37.8	21.7
92	Richmond, VA	30.8	26.5
93	Greenville-Mauldin-Easley, SC	27.7	29.4
94	Birmingham-Hoover, AL	32.1	23.3
95	Knoxville, TN	27.9	25.4
96	Riverside-San Bernardino-Ontario, CA	77.3	7.9
97	Youngstown-Warren-Boardman, OH-PA	36.3	14.2
98	Augusta-Richmond County, GA-SC	30.2	16.4
99	Palm Bay-Melbourne-Titusville, FL	64.1	7.4
100	Poughkeepsie-Newburgh-Middletown, NY	45.8	8.2

Source: Brookings Institution analysis of transit agency, Nielsen Pop-Facts 2010, and Nielsen Business-Facts data

Northeast and Midwest rank among the bottom 20 metro areas overall—Poughkeepsie, Youngstown, Kansas City, and Portland, ME.

Southern metro areas represent a mirror image of those in the West; the region registers 15 of the 20 bottom performers on combined access. These include many metro areas in the Southeast, stretching from Virginia, to Georgia, Tennessee, and central Florida. Even large Southern metro areas with major transit investments still perform below average on combined access, including Atlanta, Dallas, Houston, and Miami. Washington and El Paso are the only regional representatives among the top 20, and only three others in the region crack the top 40—San Antonio, New Orleans, and Baltimore. Many Southern metro areas that exhibit above-average rankings on job access via transit have much lower combined access scores. Chattanooga, Jackson, Little Rock, and Austin do well in getting residents of their transit-covered neighborhoods to metropolitan jobs, but transit covers relatively few of their residents to begin with.

In general, how metro areas rank on combined access for their total populations tracks closely with how they rank on the measure for residents of low-income neighborhoods.[65] A few exceptions do stand out, however. Rochester and Colorado Springs both score much higher for residents of low-income neighborhoods than overall. Bakersfield, meanwhile, ranks 20th among metro areas on combined access for its total population, but only 47th for residents of its low-income neighborhoods. It and other metro areas with poor marks for combined access for these populations (including McAllen, Virginia Beach, Tampa, and Orlando) could significantly improve overall system performance by providing better service to low-income communities.

Implications

In the post-recession economy, ensuring access to employment should be an explicit focus for policymakers. Private sector employers already make location decisions based on a number of factors including access to labor pools and proximity to consumers and suppliers. Along the way, they consider the role of the metropolitan highway and transit networks in connecting them to workers and markets.

Now, however, severe budget constraints and rapidly fluctuating energy prices and transportation costs complicate the route to broader economic recovery. In the short run, transit agencies face real threats of service cuts, delayed investments in both new capital projects and vehicles, and deferred maintenance. Revenue declines are widespread and many agencies are already planning fare increases and operating cuts to close yawning budget gaps. In some cases, these go along with numerous other cuts made in recent years. Only one of 64 transit agencies surveyed recently reported that it has not had to reduce service or increase fares in response to larger fiscal challenges.[66] Belt tightening at the state level further exacerbates these agency-level challenges.

In Wisconsin, for example, the state's two major metro areas, Milwaukee and Madison, rank 14th and 15th on our combined score of transit coverage and job accessibility. The average neighborhood in these metros can reach 49 and 58 percent of the metro areas' jobs, respectively, via transit. Both metro areas rank in the top 20 nationwide for the share of their commuters using public transportation.[67] Yet the program cuts proposed statewide are expected to lead to increased fares and the reduction or elimination of certain transit services in these places. One analysis shows that the funding reductions to the Milwaukee County system alone would make 25,000 currently served jobs "inaccessible by transit" and would be directly burdensome to low-income workers. This would be on top of the estimated 40,000 jobs made inaccessible in that metro due to transit cuts from 2001 to 2007.[68]

Similar debates are ongoing in metro areas across the country. Given the nation's economic turmoil, states, metro areas, and local governments will have to make hard choices about their budgets. In several cases, reductions in transit funding are probably inevitable, particularly as federal stimulus dollars run out. But these decisions must be made intelligently. Across-the-board cuts are politically appealing because they spread the pain, but they lack a strategic sense of which existing investments are most important for enhancing job access. As states and regions strive to put Americans back to work, policymakers should be careful not to sever the transportation lifelines between workers and jobs.

At the same time, transit agencies and commuters alike are struggling with the budgetary impacts of higher gasoline prices. While most rail service is electrically powered (99 percent of total consumption), America's bus fleet still largely depends on diesel fuel for its operations (71 percent).[69] When gasoline prices spike, as they did in 2008, the effect on transit's bottom line is significant. In that year, fuel and power made up, on average, about 11 percent of transit agencies' operating budgets—up from just 6 percent in 2004.[70] The U.S. Energy Information Administration predicts average retail gasoline prices of nearly $4 per gallon for summer 2011, further squeezing transit budgets.[71]

These pressures might be coupled with a surge in demand if higher gasoline prices drive commuters to transit as they seek to reduce their travel costs. Brookings' analysis of federal data shows drops in driving when gasoline prices spike.[72] These declines probably owe to a combination of rising transportation costs, economic instability, housing relocation, and increasing unemployment. Although research on the relationship between gas prices and commuting behavior is limited, a 2008 Congressional Budget Office (CBO) examination of driving trends in a dozen metropolitan highway locations in California found that rising gas prices reduce driving on metropolitan highways adjacent to rail systems, but have little impact in those places without. Further, they found that the increase in ridership on those transit systems is just about the same as the decline in the number of vehicles on the roadways, suggesting that commuters will switch to transit if service is available that is convenient to employment destinations.[73] Another study of the Philadelphia region shows that gas price fluctuations play a significant role in explaining transit ridership over the 2000s.[74]

Fortunately, most metropolitan area workers do live in places where transit is indeed available. More than two-thirds of residents in the 100 largest metro areas live in neighborhoods served by transit. Of course, these figures vary widely among metro areas: 19 provide service to more than 80 percent of the population, while 30 serve fewer than half of their residents with transit. However, across these metro areas, the typical commuter can access only 30 percent of metropolitan jobs within 90 minutes by transit. This varies greatly too, with seven metro areas providing access to more than half of all metropolitan jobs, but 13 providing access to less than 20 percent. So while transit may be available it is not always convenient to employment, least of all to jobs in lower-skill industries.

To be sure, there is no agreement about the optimum level of transit job access. Certainly 100 percent coverage is not a realistic or desirable public policy goal. The transportation network has different components (e.g., highway, transit, and passenger rail) that should ideally work together to form a balanced multimodal system. Access to jobs by transit should not be the only policy goal; rather, accessibility to employment overall should be a focus of policymakers at all levels. With the average commuter in major metro areas such as Atlanta, Chicago, Dallas, and Houston unable to reach 800,000 metropolitan jobs via transit, however, rising energy prices and transit cuts in low-income neighborhoods raise significant concerns for those labor markets.

In that regard, this report points to three broad implications at the local, regional, state, and national levels.

Transportation: Make job access part of total transportation decision making

Transportation agencies and providers must do more to address the coverage gaps revealed in this report. Some metropolitan areas will forge ahead with investments in fixed-route systems. Denver, Houston, Los Angeles, and Washington each have major rail transit projects underway designed to move workers and to accommodate future and planned growth. Yet given the expense of these types of investments, smaller metro areas such as Jacksonville, Fresno, Austin, Grand Rapids, and Hartford are seeking instead to expand their systems in lower-cost, flexible ways such as bus rapid transit (BRT). Perhaps once viewed as a "second best option" and an alternative to rail investments, BRT is the subject of considerable attention due to its potentially lower costs, increased flexibility, ridership potential, and, if done correctly, job access.[75]

In all but seven metro areas, more commuters use standard municipal buses than trains to get to work.[76] This is largely due to the fact that fewer than one-third of large metro areas even have rail service. Given the severe fiscal constraints under which most agencies are operating and the dynamics of metropolitan growth, buses will remain the primary option for dealing with complicated mismatches between people and jobs, especially in low-income neighborhoods. Indeed, metro areas such as Philadelphia, Dayton, and Seattle are moving ahead with plans to introduce new bus routes to serve job-rich areas.

Public transit is not necessarily the best or only answer for increasing job access in some communities and metropolitan areas. To fill gaps in the metropolitan network, some large businesses and consortiums of private sector entities provide company-owned or company-contracted services to get workers to jobs. The services are usually from designated stops in the metro area in which their employees live or from the nearest transit station to their offices. In the Puget Sound region, probably the largest such service—Microsoft's Connector—runs over 15 routes and 55 buses equipped with Wi-Fi, bike racks, and power outlets serving over 3,000 workers each day. Google runs an extensive bus service in the San Francisco Bay Area.[77] Plans for other privately run routes to fill the gaps in bus networks are underway in metropolitan Atlanta, Pittsburgh, New York, and other areas.

In those places too decentralized or where densities are too low to make transit service efficient and effective, a broad array of solutions beyond transit are needed to help maintain or expand job access in the face of rising energy prices. Options such as ride sharing and carpooling are well known. Car sharing programs that essentially provide short-term rentals are gaining popularity.[78] Other programs to assist poor families with car ownership can help those workers who are spatially isolated access a wider range of labor market opportunities. But such an option is potentially an expensive one as a percentage of household income for low-income families. Additional research evaluating the impact of car ownership programs is still needed.[79]

Beyond Transportation: Link accessibility to next-generation metro growth policy and practice

As this report makes clear, the quantity of transit in a metropolitan area is not the only factor that determines job accessibility for residents. A complex web of private sector investments, governmental decisions, and public attitudes shape the outcomes discussed in this report. While strategically placed rail and bus lines with frequent service certainly matter, the twin challenges of household and job decentralization over the past few decades mean transit agencies and providers are basically running up a down escalator. Transit agencies have limited ability to directly affect wider metro growth trajectories, they are often not nimble enough to adapt to rapidly changing conditions, and they lack the resources to add service to all locations that need it.

To make the most of existing service and plan for future routes and investments, metro leaders need to pursue integrated problem solving across a range of disciplines. The combined rankings here indicate that those places with metropolitan growth management policies—that is, metro areas that employ urban growth boundaries, affordable housing, and infrastructure management along with zoning that permits comparatively high-density housing development—generally fare better in terms of transit job access than those with traditional land use regimes characterized by restrictive zoning, separated uses, and an overall lack of growth management policies.[80] This suggests that innovative and updated land use policies that aim to blunt decentralized growth could improve transit job access better than transit interventions alone.

Another strategy is so-called metropolitan "Blueprint Planning" or "Performance-Based Planning." This approach examines land use patterns, density, and urban form to find innovative solutions to challenges like housing, carbon emissions, agricultural preservation, economic development, and job access. Over the last five years, more than 80 cities and towns across the country have engaged in this kind of visioning process to chart a new future for their metropolitan areas.[81] Metropolitan Sacramento, Salt Lake City, and Minneapolis-St. Paul are examples of places working to move regional planning away from simply aggregating lists of local projects, and instead specifically connect metropolitan growth with transportation investments.

While coordinated long range comprehensive planning between transit agencies and other actors is a necessary step, our analysis demonstrates that those efforts must also explicitly address the apparent mismatch between household access and job skills. Most jobs in cities are oriented toward workers with higher levels of education, in industries like finance, professional services, and health care. Suburban areas host 69 percent of all metropolitan jobs in low- and middle-skill industries, such as retail, construction, manufacturing, and transportation. More highly educated workers are thus better served by high-capacity transit routes laid out in a hub-and-spoke form, typically converging in downtown neighborhoods rich with high-skill industries.

Preserving and locating affordable housing by rewarding location efficiency near affordable and convenient transit, particularly in suburban communities where affordable options are limited, is likely to have a significant impact on the overall economic well-being of low-income families. This requires multiple and targeted strategies and coordination. For example, programs such as the Low Income Housing Tax Credit and the Community Reinvestment Act could take better account of transit access in promoting affordable housing. For their part, local public housing authorities should ensure vouchers and other assistance directly connect residents to transit and jobs.[82]

In addition to increasing access to employment opportunities, these strategies can also provide greater access to a range of services for vulnerable populations, particularly if the social service sector is likewise transit-oriented. Whether public agencies and private nonprofits provide support services that help low-income workers find and maintain employment, programs for seniors, or assistance for the disabled, proximity of services to transit options can increase accessibility for these populations, particularly in farther-flung communities where safety net services are scarce.

Greater challenges lie in providing direct connections from suburb to suburb for the low- and middle-income commuters who are increasingly likely to live in suburbs, although not necessarily in areas near jobs. California's statewide mandate for its regional planning agencies to create "sustainable" growth plans underscores this implication. Even with the state's national leadership on integrated land use and transport planning, recent research confirms that California communities need to more explicitly address employment dynamics directly surrounding transit investments.[83] Transit-oriented development efforts of the past decade have focused on residential and mixed uses around station sites, but a stronger focus should also be placed on locating jobs in those areas.[84] For its part, the U.S. General Services Administration is revising its guidelines for federal buildings to explicitly target growth in locations that provide transit access for federal workers.[85] This contrasts sharply with federal Defense Base Closure and Realignment Commission (BRAC) decisions that are relocating workers to military sites without adequate transit access.[86]

Information: Deploy data and advanced technologies for decision making

Making smarter transit service and investment decisions, and coordinating those decisions with wider metropolitan priorities, requires comprehensive and integrated information across multiple policy domains. However, this research project revealed (most notably during the data collection phase) that many agencies lack the fundamental information and models to construct the measures necessary for next-generation policymaking.

Part of the problem is that there is no centralized repository for this kind of information. The Federal Transit Administration (FTA) captures basic information on all transit service, both federally funded and otherwise. Information in the National Transit Database (NTD) is reported by the transit agencies and reflects annual performance data from the systems.[87] While the NTD collects agency-level data, there is simply no national database of stop locations, transit routes, or how often transit vehicles serve those routes.[88] Many local and metropolitan-level transit agencies do not maintain consistent data on routes and service frequencies, which largely reflects their nonexistent or understaffed geographic information systems (GIS) units.

As a condition of federal financial support, the FTA should require transit agencies to submit the geographic locations of their stops and routes, along with digitized versions of their schedules and timetables. This reporting should be updated annually to not only assist federal decision makers, but also promote better local analysis. Indeed, many metropolitan planning organizations report that data limitations are a chief roadblock to generating regional transportation models.[89] And because accessibility models require more than just transportation data, other actors—such as the Department of Housing and Urban Development and the Census Bureau—should also enhance the quality and timeliness of related data on housing, commerce, and commuting.[90]

These information improvements will also enable competitive federal grant programs—from new transit capital projects, to national infrastructure investments, to sustainable communities—to consider job access by transit as a component of their merit-based criteria.[91] Today, applications for federal funding for new transit projects that include measures of access to employment for low income workers and others are only considered on a case-by-case basis. This analysis makes a strong case that measurable criteria deserve primary consideration.[92]

Some metropolitan areas do produce forecasts and analyses that examine job growth near transit, as well as equity and transit accessibility measures, but these are not ubiquitous or consistent. Only the federal government can assure the multi-agency coordination necessary to create such a database, maintain quality control, and keep it up to date. Yet such standardized information, presented in an accessible manner, would also be useful to private-sector actors seeking to locate facilities that provide good access to labor, suppliers, and consumers. Likewise, workers would benefit by having such information when they consider where in a metro area to live.

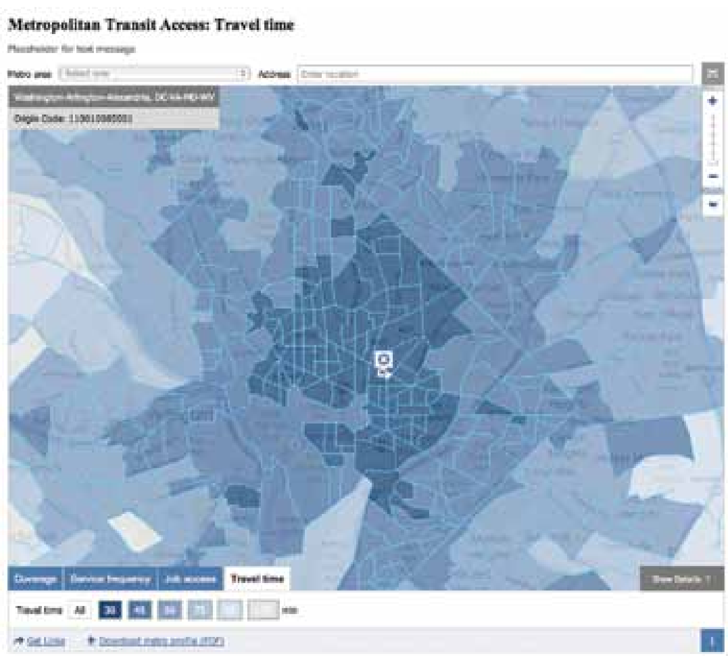
We are at a point in American history where the confluence of technology and infrastructure has tremendous ability to fundamentally change the way we experience places and engage in public policy dialogue. Much will occur through technologies we already understand and which are immediately deployable, but will require deliberate attention to standardization and uniformity to make it useful. By collecting this enormous set of information, analyzing it, and displaying it in a comprehensible way, this analysis helps reveal fundamental details about how metropolitan areas function, and how we can build a more productive and sustainable economy that actually works for working families.

Box 3. A New Interactive Transit Mapping Application

Huge amounts of data underlie the analysis in this report. GIS analysis is used to identify which neighborhoods (block groups) in the 100 largest metro areas are served by transit. Within each metropolitan area, a transit model estimates service frequency, as well as travel times from every origin (block group) to every destination (tract), often via multiple transit routes. The model generates results files ranging from under 10 MB in the smallest metro areas to over 10 GB in the largest metro areas. The resulting data sets amount to more than 450 GB of spatial and travel time data.

Of course, a report this length cannot possibly do justice to the rich analytical options that these data offer. This is especially the case for detailed neighborhood-level data, which in this report are aggregated to the city, suburban, and metropolitan levels. In addition, it is possible to analyze how these geographies perform under specifications different than those employed for this report—for instance, under shorter travel-time thresholds (e.g., 60 minutes), or for individual neighborhood income categories or job skill levels.

To make the full range of data behind this report more accessible and actionable, Brookings developed an online tool that enables users to examine the detailed results of this analysis. The tool combines modern online mapping technologies with this project's massive database, presenting accessibility measures at both the metropolitan and neighborhood scales. It visualizes all of the critical measures in this report for each of the 100 metropolitan areas studied. It also uses millions of origin-destination travel times across the country to generate unique travel time maps for neighborhoods within those metropolitan areas. The figure below shows an example of a job accessibility map in the Washington, DC region. To view and use the online mapping application, visit the Brookings web site at http://www.brookings.edu/metro/jobs_and_transit.aspx.



Box 4. Additional Research and Next Steps

By compiling and analyzing transit data in standardized and comparable ways for the first time, this analysis helps policymakers, transit agencies, researchers, employers, and workers better understand the shape of transit in metropolitan American and the role it can play in connecting people to jobs. But much more can be done to build on these findings that will allow for a deeper understanding of transit's current and potential role within a multi-layered and complex metropolitan landscape.

Brookings plans to refine and build on this initial report in several ways. These may include analyses to:

- ***Explore different travel time thresholds.*** Within the 90-minute travel threshold, how does the distribution of total trip travel times vary across and within different metro areas?
- ***Consider additional demographic characteristics in neighborhoods covered by transit.*** How does car ownership vary across neighborhoods with varying levels of access, particularly within low-income neighborhoods with limited or no access to transit? How do education levels in origin neighborhoods relate to the skills demands of the types of jobs reachable by transit?
- ***Examine jobs by industry in more detail.*** Beyond the three broad categories—high-, middle-, and low-skill—explored here, what do detailed industry data reveal about the types of jobs accessible via transit?
- ***Investigate households' costs for transit trips.*** Just because a neighborhood is served by transit does not mean it is affordable. Some services, like commuter rail, are more expensive than others. How would the analysis change if costs of the trip were included?
- ***Focus on particular subsets of the population that may depend most on transit.*** How well are neighborhoods with public, subsidized, and other affordable housing served by transit, and how well connected are they to job centers? How do these patterns vary by program, and what policy changes could enhance access for residents of these communities?
- ***Explore "coverage" for destinations as well as origins.*** Rather than limiting destinations based primarily on travel time, how would the analysis change if destinations were also subject to a coverage buffer like those used at the origin?

Future research may also make changes to the underlying model in order to:

- ***Assess different definitions of "covered."*** How would results change if the buffers to include a neighborhood were reduced from 3/4 mile to 1/2 mile or 1/4 mile?
- ***Analyze different travel periods or different days.*** How would access change for workers (especially lower-wage service workers) traveling at off-peak hours in the afternoon, late evening, or on a weekend?
- ***Add in a detailed street network, and in turn, accessibility by car.*** How do driving options and congestion concerns affect overall accessibility?
- ***Consider transit accessibility beyond employment and for more than the working-age population.*** How do transit and transport connect residents to other destinations, from retail and entertainment, to airports and train stations, to schools and child care? To what extent does transit connect seniors to services and opportunities throughout the region?
- ***Explore inter-metropolitan connections.*** For metro areas that are adjacent to other major metropolitan job centers, how do outcomes change if residents are able to cross metropolitan borders?

Conclusion

As the economic recovery evolves, policymakers and metropolitan leaders continue to wrestle with enormous concerns about budget gaps, gas price volatility, and stubborn unemployment. In some corners, short-term thinking and knee-jerk reactions to these challenges have thus far produced across-the-board cuts, tax gimmicks, and "shovel-ready" projects. While they may bring some modicum of relief, they do not put the nation on a path to sustainable economic recovery.

The findings and implications of this analysis about transit access to employment should help inform the long-term understanding of how the nation's metropolitan economies function. These are not the result of short-term decisions or immediate reactions. Rather they are wrapped up in a multifaceted and complex set of public policy decisions, land use rules and regulations, private sector locational choices, residential housing preferences, and infrastructure investments that span both budget and news cycles. Adding to this complexity are long-running demographic and economic trends such as poverty suburbanization and employment decentralization.

Yet this does not mean we should not act now. Although each metro area has its own unique challenges, the results clearly expose the need for broadly coordinated policies and updated thinking to create an interlocking network for opportunity. This report advances a new method and comprehensive data system for measuring access to that network, which in turn provides a platform for decision makers to strengthen metropolitan economies and help all residents share in their growth.

Appendix 1. Technical Methodology

This study combines detailed data on transit systems, demographics, and employment to determine the accessibility of jobs via transit within and across the country's 100 largest metropolitan areas.

Transit Data

For this analysis, an extensive original database was constructed to house information on routes, stops, and schedules for each eligible transit system within the nation's 100 most populous metropolitan areas—as defined by the U.S. Office of Management and Budget in 2008 and based on Census Bureau population estimates for that year.

Determining Transit System Eligibility

The most comprehensive source of information on transit agencies operating in the United States is the Federal Transit Administration's National Transit Database (NTD). The U.S. Code requires all agencies receiving federal support to report certain information to the NTD. Transit agencies and private providers that do not receive federal funding may also choose to be included in the database.[93] Every system registered in the NTD was eligible for inclusion in the analysis.

Systems in the 100 largest metro areas were identified based on two variables in the NTD: Urbanized Areas served and the ZIP code of the primary administrative office. That initial list was then analyzed using geographic information systems (GIS) mapping software to remove systems that do not actually operate in one of the 100 metro areas. Any systems that operate on a request basis as opposed to a scheduled route (e.g., vanpool and paratransit services) were also removed from the list.

Based on these eligibility criteria, 371 individual transit agencies were identified in the 100 largest metro areas, representing 10 modes of transit.[94] (Appendix 5 includes a full list of these providers.)

Collecting and Creating Model-Ready Transit Data

Data on routes, schedules, and stops for each of these 371 agencies were collected and cleaned over a period of several months, between May 2009 and February 2011.

Data collected for each transit agency were translated into a consistent format to ensure comparability. Google's open source format—General Transit Feed Specification (GTFS)—uses six to 12 text files that interact to provide a comprehensive representation of scheduled transit service.[95] Many of the country's largest transit systems publish their GTFS feeds. These pre-formatted feeds provided an important source of easily accessible data and significantly reduced the collection and cleaning workload.

Transit agencies without publicly available GTFS feeds were contacted directly to collect the relevant data. Some agencies provided the data in a GTFS format (though the feed had not been released publicly), but almost two-thirds did not. In these cases, they were asked to provide GIS shapefiles and digital schedules.

Some agencies without GTFS feeds maintain a comprehensive list of geocoded stop locations, stop order along routes, and associated digital schedules. This combination of digital schedules and shapefiles was only a few modifications away from a working GTFS feed.

When the shapefiles or digital schedules did not exist, GTFS feeds were created manually. In the case of digital schedules, this required transcribing PDF or paper schedules into an Excel file. Creating stop shapefiles was more challenging. Many agencies' data had stops without route or stop order fields. In these instances, those fields were created and populated manually in GIS. In scenarios without any stop locations, which invariably occurred with flag-a-bus systems, stops were drawn manually by following published route information, placing stops every two blocks and no more than every half mile in less populated areas.[96]

In the end, the database included 168 official system GTFS feeds and 203 manually created GTFS feeds.[97] Of the latter, over 130 systems included manually drawn stops.

Transit Model

Once data on schedules, routes, and stops were cleaned and standardized, the travel time between various origins and destinations was determined. This required specialized GIS software. Following an exhaustive survey of software alternatives, Brookings contracted with RAPIDIS, a Danish firm, to procure that firm's *Traffic Analyst* software. The software functions as an extension to ESRI's ArcGIS software suite.

Traffic Analyst offers multiple modeling features that made it an optimal choice for this analysis. First, it uses a GTFS import tool to model multiple transit systems within each metropolitan area and creates seamless interactions between different systems, effectively allowing riders to access all means of transit available to them within the region. Second, it enables the modeler to control elements like walking speed, number of transfer connections, time of day, and service date. Each of these elements is discussed in more detail below.

Origins and Destinations

The first step to modeling transit is to create origin-destination pairs. Within each metropolitan area, the analysis attempts to model travel via transit between every census block group (origin) and every census tract (destination).[98] The software uses block group population-weighted mean centroids (developed using Census 2000 block population data) as the origin point for each trip. Standard geographic centroids represent the census tract destinations.

Block groups, or "neighborhoods," not served by transit are removed from subsequent analysis. A block group is considered served if at least one transit stop falls within a 3/4-mile radius of its population-weighted centroid. The 3/4 mile radius is drawn around the block group centroid as a Euclidean buffer, which is a straight line distance that does not account for the street network or other geographic barriers.

While the literature sometimes uses 1/4 mile (bus) or 1/2 mile (rail) as the distance an individual will walk to access transit, consultation with experts for this project revealed that these distances are too short for many trips, especially for those individuals with no transportation alternatives.[99] Extending the distance to 3/4 mile better reflects the distances individuals will walk when faced with no transportation alternatives.[100] In addition, suburban block groups tend to be larger in land area than urban block groups. Because this analysis uses the centroids of block groups as the origin, shortening the distance of the "inclusion" buffer to 1/2 or 1/4 mile would disproportionately exclude suburban block groups that may cover more area yet still have transit options within walking distance for a large share of residents.

Walking Speed and Transfers

After establishing the origins and destinations, the analysis next connects each centroid to the nearest transit stop. These *connectors* are comparable to the time it takes an individual to walk from one's home to the closest transit stop, and then from one's destination transit stop to work. A connector is drawn from each origin centroid to any stop within 1,210 meters (roughly 3/4 mile). The same applies for destination centroids; however, if no stops are within that distance, then a connector is drawn to the single nearest stop of any distance.

The connectors are drawn in *Traffic Analyst* using Euclidean distances. Travel time for each connector is calculated using a formula of roughly *(5 km/hour) / 1.2*. The 5 km / hour is a generally accepted walking speed and the division by 1.2 controls for the use of Euclidean distances, which tend to be shorter than standard street network travel.

In addition to drawing origin and destination transit connectors, the model also generates stop-to-stop transfers. Using a limit of 400 Euclidean meters (roughly 3/4 mile), the model permits each stop to transfer to no more than eight neighboring stops. The transfers may exist between any system within the same metropolitan area, so there are no penalties for changing system operator. Finally, the model treats transfer walking speeds the same as connector walking speeds.

Travel Time

For each metropolitan area, the software models travel times over the course of a morning peak period commute—between 6:00 AM and 9:00 AM. According to the 2008 single-year American Community Survey (ACS) estimates, 65.6 percent of public transportation commuters in the 100 largest metropolitan areas leave for work during this three-hour period. In addition to the consistent time period, all travel is measured on a Monday, when transit service is typically more frequent than on weekend days. Any additional congestion due to morning rush hour commuting patterns, especially for bus routes, is accounted for in the system's published schedules.

Within the three-hour time period, the model uses a series of randomized "launches", or traveler departures, every five minutes.[101] This equates to 36 total launches from each covered block group to every tract in the three-hour window. These randomized launches mean that some travelers will "just catch the bus" while others just miss it. The final results of those 36 launches are then combined to determine an average travel time between each origin/destination pair.

Urban versus Rural

The 371 systems included in this analysis fall into two main categories of federal assistance as identified in the NTD—those in the Urbanized Area Formula Program (Urban) or the Rural Transit Assistance Program (Rural). The Urban systems are typically the major transit providers in these metropolitan areas (e.g., the New York Metropolitan Transit Authority (MTA)). The Rural systems are typically smaller providers on the outskirts of these large metropolitan areas (e.g., the Heart of Iowa Transit Agency near Des Moines).

Any Urban system operating scheduled fixed route service was coded and modeled in full as described above. If a Rural system included fixed commuter service to the major urban area, the database and model included those routes in full detail.[102] Any other Rural fixed route service was not modeled—meaning it was not included as an option for getting from origin to destination in the regional transit network—but was factored into final job access measures (see the ***Metrics*** section for more details).

Time versus Money

These models allow a rider to take advantage of all transit options available within his/her metro area, treating different systems as part of one metropolitan network. The result is a measure of cost in terms of the time it takes to get from each origin to each destination within the region. However, this analysis does not measure the monetary cost of these trips (and potential multiple transfers across different systems) as part of the accessibility metrics.

Demographic and Employment Data

Once transit service was fully modeled in each of the 100 largest metropolitan areas, the results were combined with detailed demographic and employment data to assess the extent to which these transit systems align with where people work and live.

Characteristics of Origins

To better understand the characteristics of neighborhoods served by transit, this analysis uses estimates from the Nielsen Pop-Facts 2010 Database. Working-age population is measured by the number of residents aged 18 to 64. Neighborhood income has one of three values. Low-income block groups have median household incomes below 80 percent of the metropolitan area's median household income (AMI).[103] Middle-income block groups have median incomes between 80 and 120 percent of the AMI, and high-income block groups are those with median household incomes above 120 percent of AMI.[104]

Characteristics of Destinations

Data on employment come from Nielsen Business-Facts Database and represent census tract job counts as of the second quarter of 2010. In addition to measuring the total number of jobs located in tracts reached via transit, the analysis also considers the types of jobs found in each tract, based on 2-digit Standard Industry Classification (SIC) codes included in the Business-Facts Database.

Jobs were grouped into three categories based on industry: low-, middle-, and high-skill. The analysis proxies the skill level of each industry by the ratio of workers in that industry who had less than a bachelor's degree to those with a bachelor's degree or higher.[105] Because the 2-digit aggregation for Services in the SIC captures both high-skill and low-skill services, the same approach—ratio of less-than-bachelor's to bachelor's and above—was used to break out services by type before assigning a final designation.[106] High-skill industries are those with a ratio less than 1; middle-skill industries have

Table A. Industry Skill Designations by Ratio of Workers without a BA to Workers with a BA

Industry	2000 Ratio of Non-BA Holders to BA Holders	Skill Designation
Services: business, legal, social, health, education	0.5	High
Public Administration	0.5	High
Finance, insurance, and real estate	0.5	High
Transportation, communications, and utilities	1.1	Middle
Wholesale trade	1.2	Middle
Manufacturing	1.5	Middle
Retail trade	1.6	Low
Mining	1.7	Low
Services: personal, entertainment, lodging, repair	1.8	Low
Agriculture, forestry, and fisheries	2.3	Low
Construction	2.4	Low

Source: Brookings Institution analysis of 1990 and 2000 Public Use Microdata Samples data

a ratio between 1 and 1.5; and low-skill industries are those with a ratio greater than 1.5. The resulting skill designations are presented in Table A.

Metrics

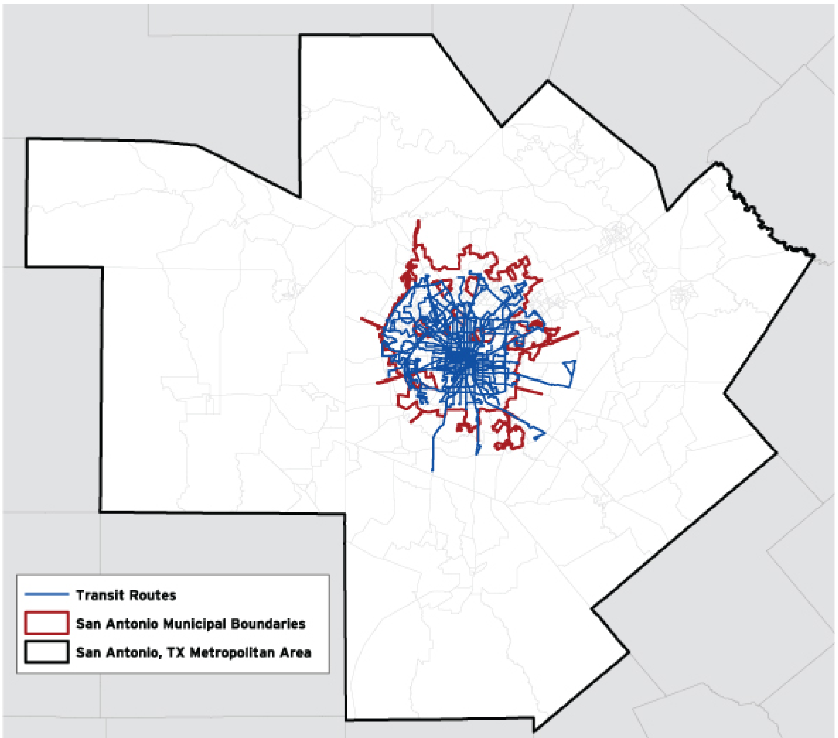
This analysis combines transit, demographic, and employment data to assess metropolitan performance in three key areas: transit coverage, service frequency, and share of metropolitan jobs accessible via transit.

Coverage—A metro area's transit coverage is measured by the share of working-age residents living in block groups that are considered "served" by transit (i.e. block groups with access to at least one transit stop within 3/4 mile of their population-weighted centroid).

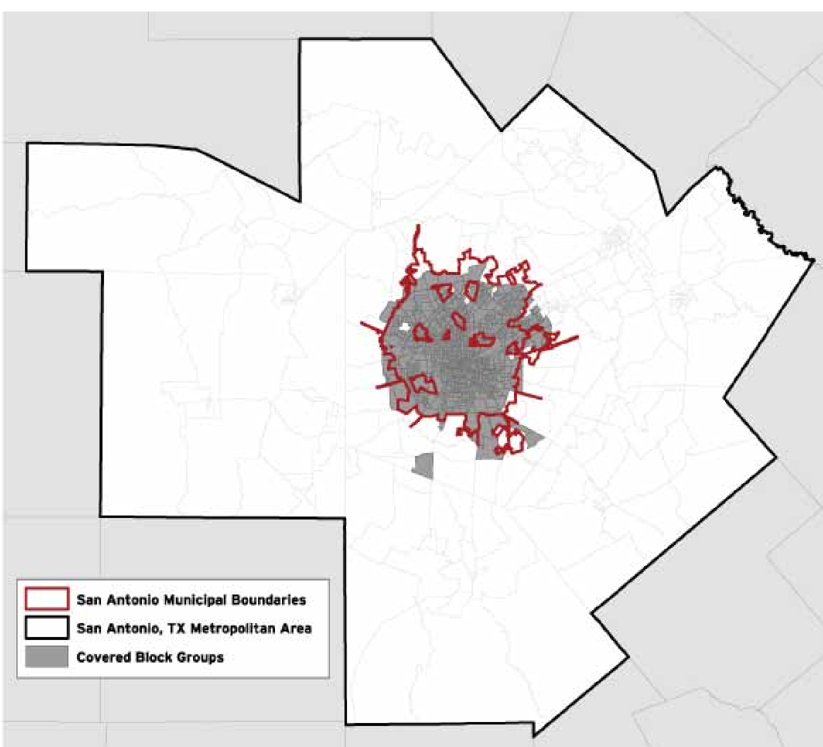
Service Frequency—For block groups considered "covered" by transit, this measure calculates the typical frequency at which that block group is serviced by any route during the morning rush hour, or how many minutes commuters must wait between buses or trains. The median frequency, or "headway," for each metropolitan area is then calculated based on the median headway in each covered block group, and weighted by block group working-age population. For example, many block groups in Midtown Manhattan see median headways of 3 minutes or less, while a neighborhood in Rockland County may see the typical wait time between buses extend more than two hours. When the headways in each covered block group in the region are taken into account, the median population-weighted frequency of service in New York's metropolitan area is 4.6 minutes.

Job Access—For block groups with transit service, this measure assesses the share of total metropolitan employment that can be reached via transit within 90 minutes.[107]

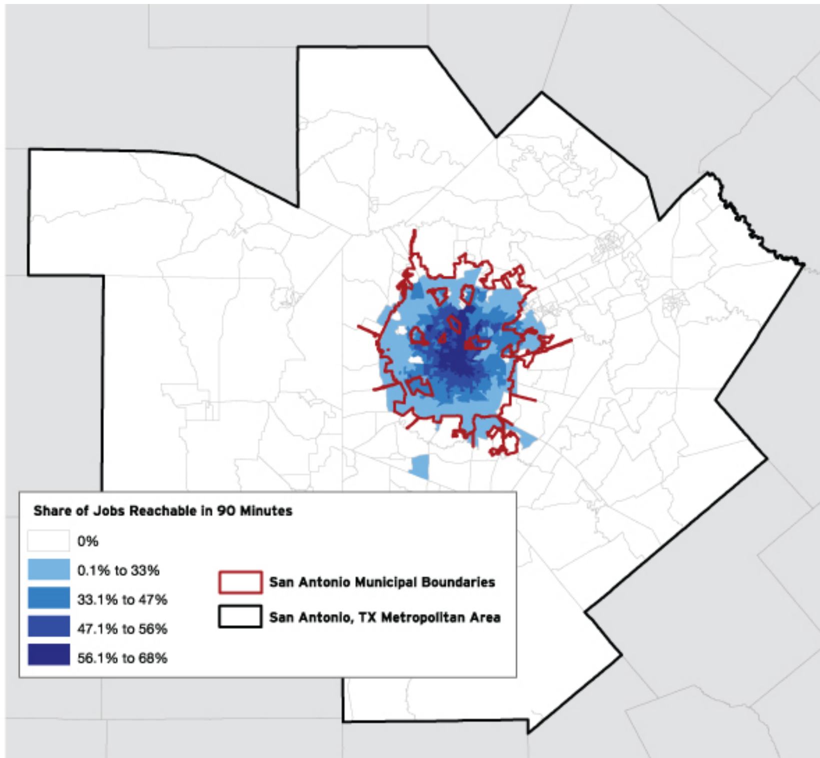
San Antonio Figure A.



San Antonio Figure B.



San Antonio Figure C.



For each block group, tracts reached within 90 minutes are flagged and the jobs in these census tracts are aggregated. That number is then divided by the total number of metropolitan jobs to determine the share of jobs that can be reached within 90 minutes from the relevant block group. (Jobs in a block group's home census tract are added to the reachable jobs total if not already assigned by the transit model, as are jobs in neighboring tracts considered reachable via the un-modeled rural transit services described above.)

Metro-wide job access is then calculated as the average share of jobs reachable within 90 minutes across all block groups, weighted by block group working-age population. (Note that covered block groups that cannot reach any destination within 90 minutes are removed from this measure.) In short, for neighborhoods that can reach at least one other destination within 90 minutes, this measure reflects the share of metropolitan jobs the typical working-age resident can reach via transit.

In addition to calculating the share of total jobs accessible via transit within 90 minutes, the analysis considers the share of low-, middle-, and high-skill jobs accessible via transit.

Each metric is also calculated by income group (i.e., low-, middle-, and high-income block groups), and separately for cities and suburbs. "Cities" are designated as the first city listed in the official metropolitan statistical area name, as well as any other city that appears in the name and has a population over 100,000. According to these criteria, there are 137 primary cities in the 100 largest metro areas. "Suburbs" make up the balance of these metropolitan areas outside of their primary cities.

Combined Access

Finally, to create one overall ranking of relative metropolitan performance, these metrics are incorporated into a combined score. Because frequency of service contributes to the number of destinations reachable in the job share measure, the final ranking relies on a metro area's coverage and job share measures. The share of working-age residents covered by transit is multiplied by the share of jobs reachable in 90 minutes, and the product is multiplied by 100. All metro areas are then ranked based on the outcome.

Appendix 2. Metropolitan Transit Accessiblity Metrics

		Coverage					Service Frequency (minutes)					Job Access				
Metropolitan Area	Combined Access Ranking	All (%)	Rank	Low Income (%)	Middle Income (%)	High Income (%)	All	Rank	Low Income (%)	Middle Income (%)	High Income (%)	All	Rank	Low Income (%)	Middle Income (%)	High Income (%)
Akron, OH	58	65.1	48	99.2	65.4	38.0	19.2	78	16.0	18.7	31.1	24.7	72	30.8	23.2	13.5
Albany-Schenectady-Troy, NY	29	64.3	49	93.8	56.2	51.9	14.3	57	9.2	15.7	21.2	35.6	29	44.2	31.4	28.8
Albuquerque, NM	7	73.1	29	82.4	70.3	68.4	14.0	50	11.4	14.7	15.1	52.9	7	59.0	51.3	48.7
Allentown-Bethlehem-Easton, PA-NJ	56	62.5	54	92.1	65.7	34.1	16.8	70	13.3	19.3	27.0	27.0	64	35.6	21.9	17.6
Atlanta-Sandy Springs-Marietta, GA	91	37.8	87	58.4	35.4	21.3	10.2	24	9.2	10.6	11.9	21.7	85	22.6	20.7	21.5
Augusta-Richmond County, GA-SC	98	30.2	96	57.1	24.3	14.2	27.9	96	25.1	34.1	37.2	16.4	92	16.8	15.2	17.2
Austin-Round Rock, TX	49	47.3	74	83.5	40.4	19.2	8.6	13	7.7	9.6	14.3	39.0	18	41.3	38.0	31.4
Bakersfield, CA	20	78.1	21	90.6	70.4	72.9	16.1	65	14.8	13.8	19.0	33.1	37	34.0	35.2	29.9
Baltimore-Towson, MD	36	68.3	38	97.6	79.4	37.9	7.7	9	5.6	9.4	20.1	30.2	42	41.4	26.7	13.6
Baton Rouge, LA	82	34.2	91	64.8	19.0	25.0	17.6	73	14.9	23.3	21.1	27.9	57	30.6	24.4	24.9
Birmingham-Hoover, AL	94	32.1	94	61.5	27.2	14.0	24.1	91	21.7	24.9	34.1	23.3	77	26.0	19.3	22.0
Boise City-Nampa, ID	52	51.6	68	84.3	46.1	35.7	22.4	90	20.8	23.2	23.8	34.4	32	33.6	34.8	34.8
Boston-Cambridge-Quincy, MA-NH	34	69.4	36	92.6	73.3	46.6	8.9	16	7.2	9.9	10.3	30.2	43	32.3	28.4	29.9
Bradenton-Sarasota-Venice, FL	57	69.1	37	98.8	75.2	40.4	21.0	84	20.9	22.2	16.4	24.2	73	26.3	21.8	26.1
Bridgeport-Stamford-Norwalk, CT	31	75.2	26	98.2	83.8	48.9	13.3	42	11.5	14.3	15.9	30.0	44	35.3	25.2	26.6
Buffalo-Niagara Falls, NY	21	77.7	22	98.4	83.4	57.9	14.0	49	7.6	14.8	21.3	33.1	38	42.4	31.6	22.9
Cape Coral-Fort Myers, FL	67	73.3	27	89.6	77.9	54.4	24.8	93	17.2	27.5	30.9	18.6	89	28.1	16.7	11.3
Charleston-North Charleston-Summerville, SC	55	61.4	55	80.2	61.9	45.6	21.6	86	18.0	25.5	22.5	27.5	60	35.9	22.2	22.6
Charlotte-Gastonia-Concord, NC-SC	75	42.3	84	65.0	35.0	30.6	13.4	44	13.1	14.3	13.0	29.7	49	33.1	28.0	25.4
Chattanooga, TN-GA	87	22.5	100	53.1	19.9	3.7	10.6	26	10.8	10.3	7.6	39.1	17	40.0	37.7	41.0
Chicago-Naperville-Joliet, IL-IN-WI	46	78.8	20	96.3	81.8	59.3	7.2	6	4.1	8.8	13.2	23.9	76	27.9	22.7	18.7
Cincinnati-Middletown, OH-KY-IN	71	48.0	72	70.2	48.3	30.2	11.4	34	8.9	12.1	14.4	27.8	58	32.2	27.4	20.5
Cleveland-Elyria-Mentor, OH	41	66.2	46	94.9	72.4	41.5	9.5	22	7.1	10.0	12.8	29.5	51	37.4	27.5	20.5
Colorado Springs, CO	37	50.7	70	86.9	64.8	5.8	17.6	74	14.4	24.6	22.0	40.3	15	48.6	31.1	40.0
Columbia, SC	79	36.7	89	62.3	32.5	20.9	24.8	92	22.3	26.9	25.4	27.3	63	30.1	25.6	23.0
Columbus, OH	45	55.7	65	80.8	53.7	37.3	11.4	33	9.8	12.9	13.3	34.1	33	41.3	31.0	25.5
Dallas-Fort Worth-Arlington, TX	89	46.3	77	70.7	40.9	28.0	11.1	31	10.2	11.5	12.7	19.0	88	20.1	18.3	17.4
Dayton, OH	27	67.0	43	90.4	71.6	44.7	12.9	41	10.1	14.9	15.5	34.5	31	42.5	30.9	27.9
Denver-Aurora, CO	6	83.7	12	97.6	87.4	68.2	8.1	10	6.7	8.3	9.9	47.5	10	57.0	45.5	37.1
Des Moines-West Des Moines, IA	22	62.5	53	81.3	61.7	48.6	12.7	39	10.0	14.8	13.0	41.0	14	44.1	39.1	39.4
Detroit-Warren-Livonia, MI	73	59.7	58	90.3	65.8	27.7	11.4	35	8.7	14.9	16.2	21.9	81	26.6	18.7	15.2
El Paso, TX	19	94.3	4	96.9	87.6	99.1	17.2	71	13.4	17.3	19.3	29.4	52	36.1	28.9	24.9
Fresno, CA	5	71.5	34	85.4	74.7	53.5	10.7	28	9.1	11.6	15.4	57.0	6	63.7	60.9	42.1
Grand Rapids-Wyoming, MI	32	47.7	73	76.0	51.7	18.8	9.1	19	8.6	9.5	11.1	46.8	11	49.3	46.6	39.9
Greensboro-High Point, NC	74	43.3	83	69.4	38.9	24.0	14.1	52	13.7	13.4	15.5	29.3	54	30.7	29.9	24.3
Greenville-Mauldin-Easley, SC	93	27.7	99	56.9	20.1	15.9	28.3	97	27.5	28.9	30.7	29.4	53	28.0	31.9	28.6
Harrisburg-Carlisle, PA	62	48.4	71	78.6	43.2	31.7	22.0	88	17.4	22.4	30.0	29.9	45	35.6	28.1	22.2

Appendix 2. Metropolitan Transit Accessiblity Metrics (continued)

Metropolitan Area	Combined Access Ranking	Coverage: All (%)	Coverage: Rank	Coverage: Low Income (%)	Coverage: Middle Income (%)	Coverage: High Income (%)	Service Frequency (minutes): All	Service Frequency: Rank	Service Frequency: Low Income (%)	Service Frequency: Middle Income (%)	Service Frequency: High Income (%)	Job Access: All	Job Access: Rank	Job Access: Low Income (%)	Job Access: Middle Income (%)	Job Access: High Income (%)
Hartford-West Hartford-East Hartford, CT	47	62.7	52	92.1	71.1	32.1	13.8	47	10.2	15.7	18.7	29.8	47	36.6	24.8	23.5
Honolulu, HI	1	97.0	1	95.1	97.7	97.9	9.0	18	5.4	9.2	11.1	59.8	1	67.9	58.0	55.1
Houston-Sugar Land-Baytown, TX	72	44.2	81	74.1	40.3	18.4	7.3	7	7.2	7.5	7.7	29.6	50	29.9	27.7	31.6
Indianapolis-Carmel, IN	64	41.6	85	81.9	40.3	10.7	13.3	43	12.3	13.8	16.2	33.1	36	36.4	30.0	24.5
Jackson, MS	76	30.0	97	66.2	19.7	10.7	15.4	61	14.6	16.2	19.3	38.4	21	39.6	37.1	34.7
Jacksonville, FL	70	57.5	62	87.8	62.2	28.1	15.2	60	14.6	16.0	15.9	23.2	78	27.8	20.5	16.9
Kansas City, MO-KS	90	47.2	75	74.1	48.2	24.4	14.2	54	11.5	17.3	24.7	18.3	90	23.1	15.3	10.8
Knoxville, TN	95	27.9	98	64.3	16.3	13.2	18.3	76	16.1	23.5	25.5	25.4	70	29.1	20.7	17.3
Lakeland-Winter Haven, FL	85	44.0	82	84.9	40.4	24.6	27.2	95	26.6	25.7	28.0	20.3	87	22.9	19.7	16.2
Las Vegas-Paradise, NV	8	85.5	10	97.8	84.4	76.9	11.1	30	9.4	11.3	14.0	44.0	12	60.6	42.5	28.6
Little Rock-North Little Rock-Conway, AR	66	37.2	88	63.7	30.7	26.7	19.3	79	19.3	18.8	19.5	36.7	23	40.0	36.8	29.9
Los Angeles-Long Beach-Santa Ana, CA	24	96.0	2	99.9	99.2	88.7	6.2	2	4.5	6.5	9.4	25.6	69	36.6	23.1	14.8
Louisville-Jefferson County, KY-IN	42	59.5	59	83.4	55.6	47.1	13.5	45	10.4	14.6	16.5	32.7	39	40.6	30.7	24.9
Madison, WI	15	55.7	64	84.7	49.6	40.6	9.3	21	6.3	9.8	10.1	58.2	4	64.5	56.1	51.1
McAllen-Edinburg-Mission, TX	86	53.3	67	38.5	51.0	72.0	58.4	100	62.6	58.4	56.5	16.6	91	15.2	16.0	17.5
Memphis, TN-MS-AR	69	51.4	69	83.0	48.2	28.6	15.8	64	14.3	15.7	22.7	26.2	68	30.0	25.1	18.3
Miami-Fort Lauderdale-Pompano Beach, FL	63	88.8	9	99.5	96.3	74.2	10.6	27	9.2	10.8	11.8	16.2	94	20.3	16.3	11.8
Milwaukee-Waukesha-West Allis, WI	14	67.4	41	97.9	78.7	33.2	6.4	3	4.9	7.5	9.9	48.6	8	55.4	46.3	36.0
Minneapolis-St. Paul-Bloomington, MN-WI	39	67.0	44	91.2	63.1	53.2	11.6	36	8.6	12.1	13.5	29.7	48	38.6	27.8	20.7
Modesto, CA	10	90.4	6	93.9	90.9	86.8	18.0	75	14.9	18.1	20.2	38.4	20	42.8	38.0	34.6
Nashville-Davidson--Murfreesboro--Franklin, TN	88	32.2	93	55.6	31.5	14.3	15.7	63	14.3	17.5	17.1	27.4	62	32.6	23.4	21.6
New Haven-Milford, CT	38	75.5	25	99.9	88.8	45.3	16.3	66	11.8	17.5	19.6	26.8	65	30.3	25.1	23.8
New Orleans-Metairie-Kenner, LA	26	65.3	47	86.6	62.1	50.5	10.8	29	9.7	11.0	12.9	36.1	27	41.0	34.4	31.1
New York-Northern New Jersey-Long Island, NY-NJ-PA	13	89.6	7	98.4	92.6	79.3	4.5	1	3.8	4.7	7.4	36.6	25	45.7	34.8	27.2
Ogden-Clearfield, UT	11	82.1	18	95.1	86.1	65.7	12.6	38	11.0	13.5	14.3	42.2	13	50.2	40.7	34.7
Oklahoma City, OK	84	41.6	86	78.1	37.0	16.0	19.2	77	17.8	18.9	23.4	22.7	80	24.7	22.7	14.2
Omaha-Council Bluffs, NE-IA	33	61.0	56	86.9	59.9	39.0	12.4	37	11.8	13.1	13.5	36.1	26	39.7	35.3	30.3
Orlando-Kissimmee, FL	83	60.1	57	89.0	69.2	28.9	14.5	58	12.8	14.8	27.3	15.8	95	17.1	15.6	13.3
Oxnard-Thousand Oaks-Ventura, CA	53	83.2	14	92.0	84.6	73.5	21.8	87	19.0	19.8	30.3	21.0	86	27.8	22.6	10.5

Palm Bay-Melbourne-Titusville, FL	99	64.1	50	91.8	75.9	35.2	38.4	98	31.9	33.5	45.2	7.4	100	8.7	7.5	5.7
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	50	76.9	24	97.8	85.1	53.6	9.8	23	4.9	11.7	14.9	24.0	75	33.6	20.2	14.4
Phoenix-Mesa-Scottsdale, AZ	43	70.5	35	83.4	73.1	56.8	9.0	17	7.4	9.1	11.8	27.4	61	35.3	27.3	16.8
Pittsburgh, PA	60	66.8	45	85.5	65.7	54.0	14.2	55	12.5	14.2	15.7	23.0	79	25.1	22.2	21.8
Portland-South Portland-Biddeford, ME	81	33.1	92	65.5	30.2	12.2	20.9	83	19.0	20.9	25.7	29.1	56	28.3	30.2	25.8
Portland-Vancouver-Beaverton, OR-WA	12	83.5	13	98.8	84.0	70.5	7.4	8	6.1	6.9	11.7	39.9	16	46.9	40.1	31.8
Poughkeepsie-Newburgh-Middletown, NY	100	45.8	80	87.4	40.5	20.3	51.0	99	51.0	49.1	71.4	8.2	98	8.8	7.8	4.4
Providence-New Bedford-Fall River, RI-MA	59	73.3	28	99.7	85.4	42.2	14.0	51	10.8	15.9	19.2	21.8	82	25.1	20.1	17.6
Provo-Orem, UT	9	73.1	31	95.6	67.2	59.4	14.1	53	11.6	14.9	16.0	48.3	9	59.9	45.9	33.5
Raleigh-Cary, NC	65	46.0	78	53.1	46.6	38.5	13.9	48	12.3	13.2	18.5	29.8	46	39.0	31.6	15.4
Richmond, VA	92	30.8	95	68.4	24.3	6.5	13.7	46	12.8	16.0	13.7	26.5	67	27.9	23.4	26.5
Riverside-San Bernardino-Ontario, CA	96	77.3	23	86.7	81.9	64.1	16.3	67	14.0	16.7	20.5	7.9	99	9.1	7.7	6.9
Rochester, NY	48	57.6	61	83.3	48.4	49.4	16.4	68	9.0	19.8	22.6	32.4	40	44.7	27.4	22.4
Sacramento--Arden-Arcade--Roseville, CA	54	79.9	19	93.7	76.9	69.5	14.2	56	11.2	14.0	20.4	21.7	84	28.9	20.8	13.1
Salt Lake City, UT	3	89.0	8	98.9	91.1	78.4	8.5	11	6.8	8.4	11.5	58.9	2	69.4	59.4	47.3
San Antonio, TX	23	68.2	39	90.8	61.0	54.0	10.4	25	7.8	10.9	15.3	37.0	22	46.5	34.9	24.3
San Diego-Carlsbad-San Marcos, CA	25	83.0	16	92.5	91.5	66.7	8.7	14	6.8	8.9	12.8	29.1	55	37.0	28.6	19.5
San Francisco-Oakland-Fremont, CA	16	91.7	5	98.1	96.7	81.0	8.5	12	6.5	8.8	12.7	34.8	30	44.1	34.3	25.5
San Jose-Sunnyvale-Santa Clara, CA	2	95.6	3	98.5	96.2	91.4	6.9	5	5.9	6.7	10.1	58.4	3	64.8	60.9	47.0
Scranton--Wilkes-Barre, PA	51	72.6	32	98.7	76.2	51.8	20.0	81	16.1	19.0	27.9	24.7	71	25.7	25.2	21.6
Seattle-Tacoma-Bellevue, WA	18	85.3	11	98.5	85.4	75.3	8.8	15	7.6	8.8	10.5	33.4	35	36.3	33.3	30.5
Springfield, MA	44	72.2	33	98.4	82.7	45.7	21.1	85	15.6	23.2	25.4	26.8	66	34.1	23.6	18.9
St. Louis, MO-IL	68	56.6	63	81.5	51.7	41.6	11.2	32	9.3	12.0	13.9	24.1	74	30.7	21.5	17.0
Stockton, CA	28	83.1	15	91.9	76.7	81.2	20.6	82	14.7	20.9	26.2	27.8	59	38.1	28.8	15.2
Syracuse, NY	30	63.1	51	92.5	50.6	57.4	17.4	72	12.7	18.8	22.6	35.8	28	40.1	37.9	28.6
Tampa-St. Petersburg-Clearwater, FL	77	68.0	40	91.1	73.3	45.5	12.9	40	11.6	13.8	12.4	16.3	93	18.0	16.3	13.7
Toledo, OH	40	59.1	60	81.2	60.6	39.6	15.4	62	13.0	18.0	21.1	33.5	34	41.7	30.8	23.8
Tucson, AZ	4	73.1	30	94.2	79.9	49.8	9.2	20	8.0	9.1	13.8	57.2	5	68.0	58.6	38.2
Tulsa, OK	61	46.9	76	69.8	40.3	37.6	19.6	80	17.6	19.1	22.5	30.9	41	34.0	32.6	23.9
Virginia Beach-Norfolk-Newport News, VA-NC	78	67.1	42	91.2	71.6	42.0	16.6	69	14.1	17.7	23.2	15.4	96	17.6	15.3	11.3
Washington-Arlington-Alexandria, DC-VA-MD-WV	17	82.5	17	92.1	82.3	74.6	6.6	4	4.5	7.2	8.5	36.6	24	43.2	35.0	31.7
Wichita, KS	35	54.0	66	85.5	51.9	33.8	14.7	59	13.5	15.0	24.8	38.6	19	46.5	38.5	24.6
Worcester, MA	80	45.9	79	84.3	46.6	17.5	22.2	89	16.2	25.5	26.6	21.7	83	24.1	19.7	19.0
Youngstown-Warren-Boardman, OH-PA	97	36.3	90	68.1	29.2	20.6	27.0	94	24.9	27.9	29.1	14.2	97	15.6	13.1	12.3

Appendix 3. City Transit Accessibility Metrics

		Coverage					Service Frequency (minutes)					Job Access				
Metropolitan Area	Combined Acess Ranking	All (%)	Rank Rank	Low Income (%)	Middle Income (%)	High Income (%)	All (%)	Rank	Low Income (%)	Middle Income (%)	High Income (%)	All (%)	Rank	Low Income (%)	Middle Income (%)	High Income (%)
Akron, OH	58	98.4	48	100.0	96.3	93.9	15.4	77	14.7	16.2	18.4	35.6	62	38.1	32.2	28.3
Albany-Schenectady-Troy, NY	29	100.0	1	100.0	100.0	100.0	5.8	12	5.3	6.6	12.2	55.0	13	57.0	52.1	50.6
Albuquerque, NM	7	97.5	54	100.0	100.0	92.6	12.8	59	11.2	13.1	15.1	57.1	10	61.8	56.4	53.1
Allentown-Bethlehem-Easton, PA-NJ	56	100.0	1	100.0	100.0	100.0	12.7	57	12.6	15.3	21.8	42.8	37	44.4	36.4	32.7
Atlanta-Sandy Springs-Marietta, GA	91	99.6	37	100.0	100.0	98.4	8.6	36	8.6	7.9	9.1	33.2	68	32.0	35.9	33.3
Augusta-Richmond County, GA-SC	98	55.8	100	90.5	31.4	37.3	22.8	94	22.8	22.9	30.8	20.0	94	20.3	19.7	19.6
Austin-Round Rock, TX	49	89.8	78	98.3	94.0	58.7	8.4	33	7.5	9.3	12.8	44.3	33	47.7	40.3	38.3
Bakersfield, CA	20	98.6	45	100.0	100.0	96.7	14.7	72	12.5	13.1	19.4	40.9	42	51.0	46.2	30.3
Baltimore-Towson, MD	36	100.0	1	100.0	100.0	100.0	5.1	7	5.0	5.2	6.0	49.0	22	49.5	47.3	48.2
Baton Rouge, LA	82	91.4	71	95.5	84.8	85.5	16.2	81	14.9	22.0	19.5	31.4	74	32.3	30.8	29.1
Birmingham-Hoover, AL	94	89.9	77	99.4	79.3	29.1	21.5	91	21.3	22.1	25.7	27.5	83	28.2	24.8	28.3
Boise City-Nampa, ID	52	97.0	56	100.0	99.1	89.7	18.6	88	17.7	17.6	23.4	47.4	27	50.1	46.5	44.8
Boston-Cambridge-Quincy, MA-NH	34	100.0	1	100.0	100.0	100.0	5.4	9	5.2	5.2	5.8	47.5	26	47.6	46.9	48.6
Bradenton-Sarasota-Venice, FL	57	100.0	1	100.0	100.0	100.0	17.9	85	18.9	17.4	15.3	21.6	92	24.3	20.1	18.0
Bridgeport-Stamford-Norwalk, CT	31	100.0	1	100.0	100.0	100.0	10.7	48	10.2	11.5	20.2	36.2	60	39.0	35.1	21.7
Buffalo-Niagara Falls, NY	21	100.0	1	100.0	100.0	100.0	7.0	22	6.7	7.6	8.1	52.5	15	53.1	50.4	53.6
Cape Coral-Fort Myers, FL	67	67.8	96	63.3	82.1	43.2	24.3	96	23.5	24.3	24.8	14.7	97	22.9	14.8	11.1
Charleston-North Charleston-Summerville, SC	55	73.8	94	100.0	100.0	29.9	19.0	89	17.3	21.4	20.3	37.3	55	44.5	29.8	33.3
Charlotte-Gastonia-Concord, NC-SC	75	86.7	82	100.0	85.8	68.4	12.9	60	12.3	13.9	12.0	35.5	63	39.0	33.1	31.1
Chattanooga, TN-GA	87	65.8	97	93.1	70.9	14.5	10.4	45	10.8	10.3	7.6	39.3	47	40.3	37.7	41.0
Chicago-Naperville-Joliet, IL-IN-WI	46	100.0	1	100.0	100.0	100.0	3.3	1	3.3	3.3	3.8	36.9	58	37.5	37.6	32.5
Cincinnati-Middletown, OH-KY-IN	71	100.0	1	100.0	100.0	100.0	7.6	25	6.8	8.9	11.4	37.6	54	38.9	35.1	34.4
Cleveland-Elyria-Mentor, OH	41	99.6	38	100.0	100.0	85.0	6.3	16	6.1	7.4	10.1	43.6	36	44.3	41.7	37.4
Colorado Springs, CO	37	61.6	98	98.1	76.7	8.6	15.0	76	14.1	19.6	22.0	47.0	29	52.9	38.8	41.4
Columbia, SC	79	90.4	76	100.0	82.1	84.2	20.3	90	18.8	30.3	17.3	32.0	72	34.9	30.5	25.7
Columbus, OH	45	93.2	65	99.0	84.2	96.3	10.7	49	9.6	11.8	13.3	36.9	57	42.8	32.8	24.9
Dallas-Fort Worth-Arlington, TX	89	75.9	93	86.6	71.8	51.7	9.6	41	9.4	9.7	10.9	20.9	93	21.1	19.8	22.1
Dayton, OH	27	99.1	41	100.0	94.7	100.0	9.2	39	9.2	9.0	15.5	49.5	19	50.9	49.3	36.5
Denver-Aurora, CO	6	97.0	57	99.8	100.0	81.4	6.1	14	5.8	6.6	7.0	60.0	8	63.5	55.3	55.7
Des Moines-West Des Moines, IA	22	97.0	58	97.6	98.9	80.6	10.8	50	9.6	12.4	17.3	43.6	35	44.7	42.2	42.0

Detroit-Warren-Livonia, MI	73	99.6	39	99.9	98.3	100.0	7.7	28	7.5	8.4	8.4	31.3	75	31.8	29.5	29.6
El Paso, TX	19	99.0	42	99.6	97.3	100.0	16.4	82	12.8	16.1	19.3	31.6	73	42.2	31.3	25.0
Fresno, CA	5	92.9	68	99.3	94.7	80.1	8.7	37	8.1	9.3	11.3	58.9	9	64.5	61.9	43.4
Grand Rapids-Wyoming, MI	32	100.0	1	100.0	100.0	100.0	7.6	26	7.3	7.7	9.1	52.1	16	53.4	51.2	47.4
Greensboro-High Point, NC	74	78.8	91	97.7	86.4	43.7	13.7	63	13.7	13.3	15.5	29.9	77	30.9	30.3	25.8
Greenville-Mauldin-Easley, SC	93	95.5	61	100.0	91.6	100.0	28.7	99	27.9	28.8	29.6	38.2	52	40.2	38.7	34.2
Harrisburg-Carlisle, PA	62	100.0	1	100.0	100.0	100.0	14.8	73	14.9	18.1	13.2	44.2	34	44.4	42.8	42.0
Hartford-West Hartford-East Hartford, CT	47	100.0	1	100.0	100.0	100.0	6.0	13	5.9	8.6	9.7	51.7	17	51.9	48.9	48.1
Honolulu, HI	1	98.6	46	100.0	99.1	95.4	5.7	11	4.9	6.2	8.6	77.0	1	84.2	75.0	66.1
Houston-Sugar Land-Baytown, TX	72	89.7	79	97.2	87.5	66.9	6.9	20	6.8	7.0	6.8	32.9	69	32.7	31.8	36.1
Indianapolis-Carmel, IN	64	81.3	88	98.7	85.5	35.7	13.4	62	12.4	13.8	16.1	33.8	66	37.1	30.2	25.8
Jackson, MS	76	91.5	70	98.2	75.0	93.1	15.0	75	14.6	15.4	19.3	38.9	49	39.8	38.8	34.9
Jacksonville, FL	70	67.9	95	95.7	73.6	21.4	15.0	74	14.6	15.0	15.9	26.4	89	30.3	23.2	23.5
Kansas City, MO-KS	90	81.2	89	92.8	80.4	40.5	10.4	46	10.0	11.8	11.2	24.9	90	27.1	20.4	22.9
Knoxville, TN	95	87.3	81	100.0	76.3	54.3	17.3	84	16.0	24.8	25.8	26.8	85	29.5	21.3	18.5
Lakeland-Winter Haven, FL	85	80.1	90	100.0	79.7	38.7	23.4	95	21.8	23.4	30.9	32.1	71	33.5	31.0	31.0
Las Vegas-Paradise, NV	8	90.7	74	100.0	99.1	70.5	10.6	47	9.5	10.6	13.0	50.8	18	66.1	49.9	27.3
Little Rock-North Little Rock-Conway, AR	66	82.8	86	99.0	96.2	40.4	21.6	92	23.4	20.8	22.1	41.7	40	41.6	43.5	36.4
Los Angeles-Long Beach-Santa Ana, CA	24	98.6	47	100.0	100.0	92.1	4.5	5	4.0	5.1	6.0	36.0	61	42.7	29.8	24.0
Louisville-Jefferson County, KY-IN	42	88.7	80	96.6	95.5	74.7	13.1	61	9.7	13.9	17.4	34.4	65	42.3	33.0	25.6
Madison, WI	15	98.8	43	100.0	100.0	92.7	8.1	31	6.3	9.7	8.7	61.6	6	66.4	57.5	59.3
McAllen-Edinburg-Mission, TX	86	97.9	52	100.0	93.0	100.0	27.1	97	27.6	26.9	26.9	29.0	81	33.0	29.7	27.7
Memphis, TN-MS-AR	69	94.0	64	99.4	93.4	79.2	14.5	69	13.3	15.6	15.7	29.8	78	32.1	26.2	27.5
Miami-Fort Lauderdale-Pompano Beach, FL	63	100.0	1	100.0	100.0	100.0	7.3	24	6.8	9.0	9.0	27.1	84	29.6	24.5	21.6
Milwaukee-Waukesha-West Allis, WI	14	99.8	33	100.0	100.0	96.6	5.1	8	4.6	6.7	6.2	56.3	11	57.5	54.4	50.7
Minneapolis-St. Paul-Bloomington, MN-WI	39	100.0	1	100.0	100.0	100.0	7.3	23	7.1	7.9	6.9	45.3	30	45.9	44.4	44.0
Modesto, CA	10	100.0	1	100.0	100.0	100.0	14.0	66	13.5	14.2	15.0	55.1	12	56.1	55.8	53.1
Nashville-Davidson--Murfreesboro--Franklin, TN	88	78.2	92	92.3	80.3	49.5	15.4	78	14.1	17.5	15.1	28.1	82	34.1	23.9	21.2
New Haven-Milford, CT	38	100.0	1	100.0	100.0	100.0	8.0	30	7.7	9.0	11.4	44.4	32	45.3	42.1	41.7
New Orleans-Metairie-Kenner, LA	26	98.7	44	99.9	100.0	94.3	8.8	38	8.6	8.9	9.1	45.3	31	49.1	41.9	41.5
New York-Northern New Jersey-Long Island, NY-NJ-PA	13	99.7	36	99.9	99.4	99.5	3.6	3	3.6	3.6	3.6	49.4	20	49.8	47.4	51.4
Ogden-Clearfield, UT	11	100.0	1	100.0	100.0	100.0	10.1	43	10.7	10.0	9.8	48.3	24	49.8	43.2	43.1
Oklahoma City, OK	84	59.2	99	96.8	63.0	17.7	16.0	80	15.5	15.8	21.3	29.3	80	30.8	29.5	19.9
Omaha-Council Bluffs, NE-IA	33	93.0	67	100.0	92.1	77.9	11.9	55	11.0	12.3	16.7	39.2	48	42.2	39.4	29.9
Orlando-Kissimmee, FL	83	97.6	53	100.0	96.3	94.9	11.2	53	10.6	11.4	7.4	26.6	87	28.0	24.5	31.0
Oxnard-Thousand Oaks-Ventura, CA	53	93.0	66	100.0	95.1	82.2	18.6	87	16.4	18.6	31.6	26.7	86	33.7	29.2	13.0
Palm Bay-Melbourne-Titusville, FL	99	83.4	85	100.0	84.8	37.4	29.9	100	26.5	30.5	45.2	4.2	100	6.6	3.6	2.9
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	50	100.0	1	100.0	100.0	100.0	4.0	4	4.0	4.2	4.8	40.7	43	42.3	36.8	34.6
Phoenix-Mesa-Scottsdale, AZ	43	90.7	75	99.7	97.0	70.7	8.2	32	7.2	8.6	11.2	30.8	76	37.5	29.0	19.4
Pittsburgh, PA	60	100.0	1	100.0	100.0	100.0	8.0	29	7.8	8.4	8.1	39.4	46	40.1	38.3	39.8
Portland-South Portland-Biddeford, ME	81	100.0	1	100.0	100.0	100.0	17.0	83	16.7	18.3	17.8	41.1	41	42.5	40.0	39.2
Portland-Vancouver-Beaverton, OR-WA	12	99.7	35	100.0	100.0	98.4	5.4	10	5.1	5.2	6.9	53.7	14	54.9	54.2	48.7
Poughkeepsie-Newburgh-Middletown, NY	100	100.0	1	100.0	100.0	100.0	28.7	98	35.9	26.8	23.1	13.2	98	13.7	10.7	10.3

Appendix 3. City Transit Accessibility Metrics (continued)

		Coverage					Service Frequency (minutes)					Job Access				
Metropolitan Area	Combined Acess Ranking	All (%)	Rank Rank	Low Income (%)	Middle Income (%)	High Income (%)	All (%)	Rank	Low Income (%)	Middle Income (%)	High Income (%)	All (%)	Rank	Low Income (%)	Middle Income (%)	High Income (%)
Providence-New Bedford-Fall River, RI-MA	59	100.0	1	100.0	100.0	100.0	6.8	19	6.7	7.1	8.9	42.3	38	42.4	42.2	41.7
Provo-Orem, UT	9	96.9	59	99.7	93.8	75.7	10.8	51	10.4	13.8	15.3	62.3	5	66.2	49.8	52.9
Raleigh-Cary, NC	65	85.4	84	96.6	95.6	55.1	12.8	58	11.7	13.1	15.1	36.3	59	41.8	35.0	25.9
Richmond, VA	92	100.0	1	100.0	100.0	100.0	9.5	40	9.0	11.2	13.7	32.3	70	33.3	30.7	27.5
Riverside-San Bernardino-Ontario, CA	96	98.0	51	100.0	99.0	92.8	14.0	65	12.6	14.1	19.4	12.8	99	15.0	13.3	7.9
Rochester, NY	48	99.9	32	99.8	100.0	99.2	8.4	35	8.4	8.4	9.7	49.0	21	49.3	47.2	49.2
Sacramento--Arden-Arcade--Roseville, CA	54	97.3	55	99.2	92.7	100.0	11.2	52	10.3	11.8	14.4	29.7	79	35.6	26.2	20.7
Salt Lake City, UT	3	99.9	31	100.0	100.0	99.3	6.7	18	6.5	6.7	7.7	69.4	2	71.0	68.4	62.7
San Antonio, TX	23	95.7	60	100.0	98.1	86.3	9.9	42	7.8	10.2	15.4	38.5	50	46.5	37.3	23.8
San Diego-Carlsbad-San Marcos, CA	25	86.1	83	98.1	96.7	63.9	6.9	21	5.9	7.0	10.2	42.2	39	48.8	42.1	31.6
San Francisco-Oakland-Fremont, CA	16	98.3	49	100.0	99.3	94.8	4.8	6	5.6	4.3	5.0	48.6	23	54.2	48.4	41.4
San Jose-Sunnyvale-Santa Clara, CA	2	99.5	40	100.0	99.4	98.9	6.3	15	5.5	6.4	8.6	66.1	4	74.5	66.3	52.9
Scranton--Wilkes-Barre, PA	51	98.2	50	95.8	100.0	100.0	14.2	68	13.3	15.0	17.9	26.5	88	28.4	26.4	20.9
Seattle-Tacoma-Bellevue, WA	18	100.0	1	100.0	100.0	100.0	6.4	17	6.1	6.6	6.8	47.4	28	46.8	47.9	47.5
Springfield, MA	44	100.0	1	100.0	100.0	100.0	12.0	56	11.4	12.8	19.5	40.3	44	44.4	36.6	31.3
St. Louis, MO-IL	68	100.0	1	100.0	100.0	100.0	7.6	27	7.7	7.6	7.6	37.9	53	38.4	36.5	35.2
Stockton, CA	28	100.0	1	100.0	100.0	100.0	15.8	79	13.7	16.0	27.6	37.1	56	43.7	37.5	22.7
Syracuse, NY	30	100.0	1	100.0	100.0	100.0	11.2	54	10.5	11.9	15.8	48.0	25	48.8	47.3	42.5
Tampa-St. Petersburg-Clearwater, FL	77	91.6	69	100.0	94.8	74.0	10.1	44	9.3	10.4	11.7	22.6	91	25.4	21.9	18.4
Toledo, OH	40	99.8	34	100.0	100.0	97.5	13.8	64	12.9	15.6	15.9	38.2	51	42.9	33.7	32.0
Tucson, AZ	4	94.7	63	100.0	96.9	75.9	8.4	34	7.7	8.7	10.7	66.5	3	70.3	66.0	54.2
Tulsa, OK	61	91.3	72	99.3	92.5	78.8	18.1	86	17.4	17.9	21.4	35.2	64	36.3	37.5	30.2
Virginia Beach-Norfolk-Newport News, VA-NC	78	82.0	87	95.2	89.7	57.4	14.7	71	12.4	15.1	20.9	18.6	96	21.3	18.2	14.3
Washington-Arlington-Alexandria, DC-VA-MD-WV	17	100.0	1	100.0	100.0	100.0	3.6	2	3.4	3.7	4.0	60.7	7	61.2	60.9	59.2
Wichita, KS	35	91.1	73	100.0	93.1	74.0	14.6	70	13.6	15.1	24.5	40.1	45	46.9	40.2	25.1
Worcester, MA	80	94.9	62	100.0	96.6	66.1	14.1	67	14.0	14.5	14.9	33.2	67	34.4	31.8	30.2
Youngstown-Warren-Boardman, OH-PA	97	100.0	1	100.0	100.0	100.0	22.4	93	21.9	25.2	33.2	19.5	95	20.3	16.6	5.5

Appendix 4. Suburban Transit Accessibility Metrics

Metropolitan Area	Combined Access Ranking	Coverage All (%)	Coverage Rank	Coverage Low Income (%)	Coverage Middle Income (%)	Coverage High Income (%)	Service Frequency (minutes) All	Service Frequency Rank	Service Frequency Low Income (%)	Service Frequency Middle Income (%)	Service Frequency High Income (%)	Job Access All	Job Access Rank	Job Access Low Income (%)	Job Access Middle Income (%)	Job Access High Income (%)
Akron, OH	58	51.0	49	97.6	53.7	35.3	29.3	85	22.6	27.6	32.7	15.0	77	16.6	16.6	11.4
Albany-Schenectady-Troy, NY	29	59.7	36	91.3	53.0	49.7	16.4	48	11.6	17.9	22.1	31.1	16	38.4	28.3	26.6
Albuquerque, NM	7	39.7	62	50.7	35.5	36.8	17.8	52	17.7	19.5	15.8	36.4	13	45.5	32.2	34.2
Allentown-Bethlehem-Easton, PA-NJ	56	56.9	44	87.6	63.7	33.4	18.9	55	13.8	20.3	27.7	22.2	47	28.6	20.4	17.1
Atlanta-Sandy Springs-Marietta, GA	91	30.8	71	48.8	31.2	15.1	10.8	12	9.7	11.2	16.1	17.4	71	18.1	17.4	15.4
Augusta-Richmond County, GA-SC	98	15.6	89	24.0	20.0	7.2	58.7	99	57.3	64.9	86.8	3.7	99	2.7	5.6	2.7
Austin-Round Rock, TX	49	14.5	91	49.2	7.6	6.9	13.2	27	10.4	11.7	17.4	14.0	79	11.9	20.1	14.4
Bakersfield, CA	20	66.0	29	86.5	55.5	50.6	18.2	53	41.1	15.7	18.2	24.9	34	23.7	24.0	29.3
Baltimore-Towson, MD	36	58.5	40	93.9	75.5	36.4	14.9	37	7.8	13.9	20.9	19.8	59	27.7	21.3	11.1
Baton Rouge, LA	82	14.1	93	27.5	10.7	11.8	23.4	70	14.6	25.0	27.4	19.9	58	23.5	17.9	18.2
Birmingham-Hoover, AL	94	18.5	85	27.5	19.7	13.4	26.7	79	23.5	25.7	34.1	17.9	70	18.8	16.0	21.1
Boise City-Nampa, ID	52	32.7	68	72.2	26.7	19.8	27.2	80	25.0	29.4	30.9	18.2	64	15.8	18.9	21.5
Boston-Cambridge-Quincy, MA-NH	34	62.7	33	88.6	68.8	42.5	13.1	25	12.3	13.6	13.0	24.1	38	22.8	23.6	26.4
Bradenton-Sarasota-Venice, FL	57	66.8	28	98.6	72.7	39.7	22.1	65	21.1	23.5	16.4	24.5	36	26.6	22.1	26.3
Bridgeport-Stamford-Norwalk, CT	31	64.9	31	95.6	78.9	44.1	15.4	40	14.8	16.0	15.9	25.9	30	29.9	21.3	27.6
Buffalo-Niagara Falls, NY	21	70.7	23	95.5	80.1	56.6	18.6	54	15.9	16.6	21.9	24.0	40	22.7	26.9	21.0
Cape Coral-Fort Myers, FL	67	75.6	15	93.6	75.6	59.4	25.9	75	16.8	30.3	35.1	20.0	56	28.6	17.7	11.4
Charleston-North Charleston-Summerville, SC	55	58.8	39	74.4	57.0	49.6	23.5	71	18.0	29.6	23.0	24.1	39	31.8	19.8	20.2
Charlotte-Gastonia-Concord, NC-SC	75	16.4	87	26.8	14.3	12.6	27.3	81	28.5	16.0	28.6	11.7	86	8.7	15.4	10.4
Chattanooga, TN-GA	87	0.7	100	4.6	0.0	0.0	20.0	59	20.0	0.0	0.0	31.8	15	31.8	0.0	0.0
Chicago-Naperville-Joliet, IL-IN-WI	46	68.7	27	91.2	74.5	52.9	14.4	35	12.9	14.1	15.9	13.7	81	13.5	14.0	13.4
Cincinnati-Middletown, OH-KY-IN	71	38.7	63	53.2	42.2	27.9	13.1	26	13.1	12.5	14.8	23.0	45	24.4	25.1	18.8
Cleveland-Elyria-Mentor, OH	41	57.8	43	87.5	68.4	40.9	11.8	17	10.3	10.6	13.1	23.2	44	25.7	24.5	20.0
Colorado Springs, CO	37	34.1	66	51.4	52.9	1.7	26.1	76	26.1	26.6	4.6	20.3	52	23.0	19.0	30.3
Columbia, SC	79	24.3	78	45.9	22.3	12.9	26.4	78	25.1	26.9	27.1	23.8	41	25.5	23.3	20.9
Columbus, OH	45	30.5	72	40.4	33.4	25.3	13.2	28	10.9	14.1	13.4	27.6	25	31.3	27.6	25.9
Dallas-Fort Worth-Arlington, TX	89	29.2	73	45.9	29.1	21.5	12.8	23	11.9	12.8	13.7	16.1	73	17.1	16.8	14.3
Dayton, OH	27	59.2	38	79.0	69.2	42.2	15.1	38	12.1	15.6	16.6	28.2	23	29.9	28.3	26.9
Denver-Aurora, CO	6	76.1	14	94.4	80.1	65.9	9.6	8	8.4	9.4	10.3	38.3	10	46.8	38.3	32.9
Des Moines-West Des Moines, IA	22	45.4	57	40.0	45.7	46.3	13.6	32	11.8	15.8	13.0	38.0	12	40.7	36.0	39.1
Detroit-Warren-Livonia, MI	73	47.9	53	78.1	60.3	26.3	15.5	44	13.5	16.1	16.8	16.0	75	18.0	15.7	14.0
El Paso, TX	19	74.9	17	90.5	57.9	81.9	43.5	94	43.9	43.3	21.5	3.6	100	1.4	4.5	16.8
Fresno, CA	5	52.5	47	64.3	60.8	37.5	55.0	98	98.7	99.0	16.2	50.6	2	59.1	57.6	39.9
Grand Rapids-Wyoming, MI	32	31.2	70	54.4	35.7	15.6	11.5	16	12.1	11.1	12.2	41.5	6	42.4	42.3	37.9
Greensboro-High Point, NC	74	8.2	95	15.8	5.7	7.1	48.5	96	75.4	29.0	42.3	19.0	62	1.6	24.4	13.4
Greenville-Mauldin-Easley, SC	93	20.9	84	52.1	11.3	10.9	27.9	82	27.1	29.7	37.2	24.7	35	25.2	24.7	21.1
Harrisburg-Carlisle, PA	62	43.6	59	69.2	42.0	31.2	23.2	68	22.1	22.7	30.0	26.8	27	29.9	27.4	21.8

Appendix 4. Suburban Transit Accessibility Metrics (continued)

Metropolitan Area	Combined Access Ranking	Coverage All (%)	Coverage Rank	Coverage Low Income (%)	Coverage Middle Income (%)	Coverage High Income (%)	Service Frequency (minutes) All	Service Frequency Rank	Service Frequency Low Income (%)	Service Frequency Middle Income (%)	Service Frequency High Income (%)	Job Access All	Job Access Rank	Job Access Low Income (%)	Job Access Middle Income (%)	Job Access High Income (%)
Hartford-West Hartford-East Hartford, CT	47	58.5	41	88.2	70.5	32.1	15.4	41	13.9	15.7	18.7	25.2	33	27.9	24.0	23.5
Honolulu, HI	1	95.9	1	87.5	96.7	98.8	10.9	13	8.8	9.8	11.7	47.6	4	38.5	46.9	51.3
Houston-Sugar Land-Baytown, TX	72	15.5	90	32.7	15.9	7.9	10.3	9	12.0	10.0	9.1	16.6	72	14.1	15.6	22.5
Indianapolis-Carmel, IN	64	8.1	96	28.1	9.9	1.6	12.2	21	12.1	13.0	29.0	26.7	28	27.2	28.9	13.6
Jackson, MS	76	2.3	99	5.1	3.5	0.5	20.2	60	17.0	20.2	21.1	29.0	21	32.7	26.9	30.1
Jacksonville, FL	70	41.0	61	57.2	43.6	33.9	24.2	72	18.7	40.9	12.9	7.0	95	7.9	6.1	7.5
Kansas City, MO-KS	90	33.0	67	49.4	38.1	22.0	30.1	86	29.4	30.8	30.1	9.8	89	11.9	10.6	6.9
Knoxville, TN	95	6.6	97	9.2	4.8	7.7	21.4	61	20.9	19.7	22.1	18.1	67	22.0	18.7	16.0
Lakeland-Winter Haven, FL	85	38.1	64	79.2	34.6	23.3	28.0	84	28.9	26.0	28.0	16.0	74	17.6	15.7	13.7
Las Vegas-Paradise, NV	8	83.6	8	96.6	79.4	78.9	11.4	15	9.4	11.5	14.6	41.2	8	57.5	39.4	28.9
Little Rock-North Little Rock-Conway, AR	66	21.1	83	35.5	15.9	22.1	16.1	47	16.0	13.4	17.1	29.9	18	36.4	28.1	26.0
Los Angeles-Long Beach-Santa Ana, CA	24	94.5	2	99.8	98.8	87.8	7.9	1	5.6	7.4	10.5	19.4	61	28.8	19.9	12.4
Louisville-Jefferson County, KY-IN	42	22.1	81	42.8	22.2	14.1	15.3	39	15.6	16.6	13.1	23.4	43	28.8	21.8	19.3
Madison, WI	15	25.3	77	53.3	14.6	26.2	12.9	24	11.8	13.3	14.1	48.9	3	57.3	49.3	43.1
McAllen-Edinburg-Mission, TX	86	43.8	58	33.5	44.3	57.9	66.1	100	65.3	63.5	70.2	6.4	97	6.5	6.7	6.0
Memphis, TN-MS-AR	69	14.1	92	26.5	5.3	14.9	35.0	90	298.4	27.8	34.1	5.4	98	3.7	7.0	5.8
Miami-Fort Lauderdale-Pompano Beach, FL	63	87.3	5	99.3	95.9	73.0	11.2	14	10.5	11.1	12.0	14.5	78	17.2	15.4	11.2
Milwaukee-Waukesha-West Allis, WI	14	47.4	55	87.4	67.4	29.8	9.2	5	7.6	8.9	10.9	38.0	11	43.6	39.6	33.2
Minneapolis-St. Paul-Bloomington, MN-WI	39	58.2	42	81.7	57.2	50.4	13.6	31	12.5	13.7	14.1	22.5	46	28.9	23.0	17.8
Modesto, CA	10	84.7	7	88.6	86.3	79.9	27.9	83	25.7	37.9	26.2	25.4	32	29.9	25.2	21.7
Nashville-Davidson--Murfreesboro--Franklin, TN	88	3.9	98	10.6	2.7	2.1	45.4	95	47.4	44.7	51.8	11.8	85	8.5	10.9	32.0
New Haven-Milford, CT	38	71.0	22	99.8	87.5	44.4	18.9	56	16.5	18.6	19.8	22.0	49	20.5	22.5	23.0
New Orleans-Metairie-Kenner, LA	26	50.2	51	73.2	47.6	40.9	15.4	43	13.6	15.6	16.8	28.0	24	29.9	28.4	25.8
New York-Northern New Jersey-Long Island, NY-NJ-PA	13	80.9	9	94.1	87.1	73.8	8.6	3	5.8	8.1	10.4	22.0	48	32.1	22.8	17.6
Ogden-Clearfield, UT	11	78.8	12	90.9	85.2	64.7	13.5	30	11.0	13.8	14.6	40.7	9	50.6	40.5	34.4
Oklahoma City, OK	84	26.6	76	52.7	22.4	14.7	38.0	91	38.4	35.8	41.3	9.1	92	8.4	10.7	8.3
Omaha-Council Bluffs, NE-IA	33	36.2	65	57.7	40.3	25.1	14.2	34	17.0	14.0	10.8	29.9	19	29.7	29.4	30.7
Orlando-Kissimmee, FL	83	55.5	45	86.5	65.2	26.6	15.7	46	13.8	15.7	28.5	13.4	82	14.2	13.7	11.1
Oxnard-Thousand Oaks-Ventura, CA	53	74.3	18	81.7	76.1	66.7	26.4	77	23.3	26.2	30.1	14.0	80	18.3	15.3	7.7

Palm Bay-Melbourne-Titusville, FL	99	59.3	37	90.5	70.9	35.1	42.2	93	42.7	38.4	42.5	8.5	93	9.1	9.8	5.9
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	50	69.2	25	94.4	81.8	52.5	13.8	33	11.6	13.8	15.4	15.6	76	19.2	15.5	13.3
Phoenix-Mesa-Scottsdale, AZ	43	49.1	52	54.0	47.6	47.5	10.8	11	9.0	10.0	12.6	20.6	51	27.8	23.5	14.3
Pittsburgh, PA	60	61.4	34	80.1	61.1	50.9	19.8	58	23.9	20.2	17.0	18.1	66	16.9	18.2	19.0
Portland-South Portland-Biddeford, ME	81	23.3	79	52.8	20.9	9.3	31.0	88	53.3	28.4	27.8	19.4	60	14.1	23.0	19.7
Portland-Vancouver-Beaverton, OR-WA	12	75.6	16	97.3	76.4	65.3	9.5	7	7.2	8.5	12.2	30.8	17	36.8	30.9	27.0
Poughkeepsie-Newburgh-Middletown, NY	100	43.4	60	85.4	39.8	19.9	53.1	97	53.3	49.8	74.1	7.4	94	7.5	7.7	4.0
Providence-New Bedford-Fall River, RI-MA	59	69.9	24	99.6	84.6	40.7	15.6	45	12.8	16.4	19.9	17.9	69	18.2	18.6	15.8
Provo-Orem, UT	9	65.4	30	89.5	63.2	58.6	15.4	42	14.9	15.2	16.1	41.3	7	48.9	45.0	32.1
Raleigh-Cary, NC	65	21.5	82	12.2	19.4	30.6	25.4	74	25.6	27.6	25.4	12.7	84	17.9	20.3	6.4
Richmond, VA	92	17.8	86	46.1	19.0	2.1	17.5	51	17.5	17.4	19.4	20.2	54	19.7	20.6	23.7
Riverside-San Bernardino-Ontario, CA	96	73.2	20	83.1	78.4	60.6	17.4	50	14.8	18.2	20.8	6.6	96	7.1	6.2	6.7
Rochester, NY	48	47.2	56	50.3	45.1	48.8	21.9	64	19.3	20.9	22.6	23.5	42	26.4	24.5	21.7
Sacramento--Arden-Arcade--Roseville, CA	54	73.9	19	90.4	71.8	64.2	16.5	49	12.9	15.9	22.6	18.0	68	24.5	18.5	10.9
Salt Lake City, UT	3	86.8	6	98.3	89.9	77.2	9.2	4	6.8	8.8	11.9	56.5	1	68.4	58.0	46.1
San Antonio, TX	23	23.3	80	20.5	23.8	23.3	12.1	20	7.7	12.4	13.4	26.9	26	43.3	25.3	25.8
San Diego-Carlsbad-San Marcos, CA	25	80.6	10	87.1	87.9	68.6	11.9	18	9.1	11.6	14.4	18.1	65	24.5	18.3	11.0
San Francisco-Oakland-Fremont, CA	16	88.2	4	96.6	95.3	76.0	12.1	19	8.5	11.7	15.5	25.5	31	35.3	25.6	16.5
San Jose-Sunnyvale-Santa Clara, CA	2	89.0	3	95.3	89.5	84.7	9.2	6	8.4	7.7	10.9	43.8	5	41.9	48.0	40.7
Scranton--Wilkes-Barre, PA	51	68.7	26	99.8	72.9	49.0	21.6	62	18.0	20.6	27.9	24.2	37	24.7	25.0	21.7
Seattle-Tacoma-Bellevue, WA	18	79.5	11	97.6	79.4	69.8	10.7	10	9.0	11.0	11.9	26.4	29	29.0	25.8	25.0
Springfield, MA	44	64.8	32	97.1	79.0	40.9	25.4	73	23.6	25.1	29.7	20.2	53	25.1	19.5	15.7
St. Louis, MO-IL	68	50.3	50	72.3	47.5	41.1	12.5	22	10.8	12.6	13.9	20.0	55	25.3	18.6	16.6
Stockton, CA	28	72.2	21	79.0	66.1	74.5	21.9	63	19.5	22.4	25.2	18.7	63	26.7	22.3	11.2
Syracuse, NY	30	52.8	46	79.1	44.2	55.1	23.4	69	28.5	20.6	23.5	28.6	22	20.7	34.7	27.0
Tampa-St. Petersburg-Clearwater, FL	77	60.0	35	85.8	66.5	39.5	14.5	36	14.2	15.4	12.8	13.0	83	12.8	13.7	11.7
Toledo, OH	40	27.7	74	16.9	25.5	31.4	23.1	67	25.9	24.4	22.5	19.9	57	17.2	20.5	19.9
Tucson, AZ	4	47.7	54	68.3	53.5	41.1	13.3	29	10.5	10.2	17.6	35.1	14	52.9	36.5	28.3
Tulsa, OK	61	16.2	88	19.4	13.1	18.1	40.4	92	20.8	38.9	55.8	9.3	91	13.8	11.3	4.4
Virginia Beach-Norfolk-Newport News, VA-NC	78	51.6	48	85.6	51.6	30.0	23.0	66	18.0	24.5	26.1	9.9	88	11.9	9.7	6.3
Washington-Arlington-Alexandria, DC-VA-MD-WV	17	78.5	13	88.5	79.1	71.3	8.4	2	5.9	9.1	9.9	29.3	20	33.7	28.7	26.5
Wichita, KS	35	9.9	94	9.1	8.4	11.1	19.6	57	11.8	13.8	28.4	21.7	50	24.9	19.0	22.6
Worcester, MA	80	31.3	69	68.9	34.4	13.5	32.9	89	39.7	39.2	30.5	9.7	90	6.5	10.4	14.1
Youngstown-Warren-Boardman, OH-PA	97	27.3	75	47.4	25.1	20.3	30.3	87	45.3	29.2	28.4	11.2	87	9.1	12.2	12.4

Appendix 5. Share of Jobs Accessible on Average via Transit, by Time Threshold, 100 Metropolitan Areas

		45 Minutes			60 Minutes			90 Minutes		
Metropolitan Area	Combined Access Ranking	Total Jobs Reachable	Access Rate (%)	Access Rate Rank	Total Jobs Reachable	Access Rate (%)	Access Rate Rank	Total Jobs Reachable	Access Rate (%)	Access Rate Rank
Akron, OH	58	24,037	6.6	47	44,931	12.3	60	90,449	24.7	72
Albany-Schenectady-Troy, NY	29	57,718	10.8	15	90,392	16.9	23	190,903	35.6	29
Albuquerque, NM	7	48,992	11.8	11	108,243	26.2	7	218,818	52.9	7
Allentown-Bethlehem-Easton, PA-NJ	56	23,687	6.2	60	46,655	12.2	62	103,140	27.0	64
Atlanta-Sandy Springs-Marietta, GA	91	90,629	3.4	88	209,054	7.9	87	573,032	21.7	85
Augusta-Richmond County, GA-SC	98	8,896	3.6	85	20,844	8.4	84	40,852	16.4	92
Austin-Round Rock, TX	49	88,447	10.3	20	179,274	21.0	14	333,462	39.0	18
Bakersfield, CA	20	23,312	7.7	36	50,450	16.7	25	100,170	33.1	37
Baltimore-Towson, MD	36	106,384	7.9	33	198,657	14.8	36	405,188	30.2	42
Baton Rouge, LA	82	18,089	4.5	74	38,533	9.6	75	111,368	27.9	57
Birmingham-Hoover, AL	94	24,386	4.3	76	50,206	8.8	79	132,810	23.3	77
Boise City-Nampa, ID	52	30,737	9.9	22	50,921	16.3	28	107,205	34.4	32
Boston-Cambridge-Quincy, MA-NH	34	346,424	12.6	9	514,089	18.7	16	832,215	30.2	43
Bradenton-Sarasota-Venice, FL	57	11,742	3.6	84	28,160	8.7	81	78,223	24.2	73
Bridgeport-Stamford-Norwalk, CT	31	39,603	7.4	41	72,485	13.5	41	160,989	30.0	44
Buffalo-Niagara Falls, NY	21	66,875	9.9	21	106,488	15.7	31	223,914	33.1	38
Cape Coral-Fort Myers, FL	67	11,983	4.0	78	21,836	7.3	90	55,850	18.6	89
Charleston-North Charleston-Summerville, SC	55	20,834	6.2	61	32,336	9.6	76	92,749	27.5	60
Charlotte-Gastonia-Concord, NC-SC	75	59,587	6.4	54	123,990	13.4	43	274,983	29.7	49
Chattanooga, TN-GA	87	29,536	11.1	13	58,388	22.0	13	104,020	39.1	17
Chicago-Naperville-Joliet, IL-IN-WI	46	317,096	6.3	57	611,323	12.2	61	1,194,812	23.9	76
Cincinnati-Middletown, OH-KY-IN	71	73,964	6.4	56	147,162	12.7	55	321,455	27.8	58
Cleveland-Elyria-Mentor, OH	41	80,148	6.5	51	164,808	13.3	46	364,457	29.5	51
Colorado Springs, CO	37	19,258	6.3	58	45,763	14.9	35	123,783	40.3	15
Columbia, SC	79	25,014	6.5	49	48,795	12.7	54	104,598	27.3	63
Columbus, OH	45	70,838	6.5	52	145,783	13.3	47	372,692	34.1	33
Dallas-Fort Worth-Arlington, TX	89	73,112	2.3	93	195,934	6.3	92	593,045	19.0	88
Dayton, OH	27	32,951	7.5	39	66,324	15.1	34	151,633	34.5	31
Denver-Aurora, CO	6	87,354	6.7	45	218,482	16.8	24	617,584	47.5	10
Des Moines-West Des Moines, IA	22	53,245	14.3	4	88,044	23.6	11	152,647	41.0	14
Detroit-Warren-Livonia, MI	73	51,005	2.4	92	140,454	6.6	91	461,789	21.9	81

El Paso, TX	19	11,717	4.0	79	28,743	9.7	74	86,945	29.4	52
Fresno, CA	5	49,352	14.2	5	99,403	28.5	4	198,469	57.0	6
Grand Rapids-Wyoming, MI	32	60,647	13.0	8	118,660	25.4	8	218,764	46.8	11
Greensboro-High Point, NC	74	21,452	5.2	70	51,821	12.6	56	120,433	29.3	54
Greenville-Mauldin-Easley, SC	93	6,952	2.2	95	27,072	8.6	82	92,790	29.4	53
Harrisburg-Carlisle, PA	62	38,842	10.5	17	61,109	16.6	27	110,215	29.9	45
Hartford-West Hartford-East Hartford, CT	47	60,819	8.2	31	102,331	13.9	39	219,729	29.8	47
Honolulu, HI	1	86,095	18.7	2	135,297	29.4	3	274,691	59.8	1
Houston-Sugar Land-Baytown, TX	72	126,364	4.6	73	306,875	11.2	66	812,343	29.6	50
Indianapolis-Carmel, IN	64	61,859	5.9	65	137,788	13.2	50	346,347	33.1	36
Jackson, MS	76	27,479	8.9	26	55,153	17.9	19	118,574	38.4	21
Jacksonville, FL	70	24,274	3.7	81	53,103	8.1	86	151,752	23.2	78
Kansas City, MO-KS	90	68,545	6.0	63	107,246	9.4	77	210,121	18.3	90
Knoxville, TN	95	22,201	5.4	68	44,209	10.7	69	104,490	25.4	70
Lakeland-Winter Haven, FL	85	7,931	3.5	87	17,024	7.5	89	46,304	20.3	87
Las Vegas-Paradise, NV	8	53,096	4.5	75	156,148	13.3	48	516,389	44.0	12
Little Rock-North Little Rock-Conway, AR	66	34,984	8.6	29	66,177	16.2	29	149,743	36.7	23
Los Angeles-Long Beach-Santa Ana, CA	24	225,838	3.7	80	542,196	9.0	78	1,544,990	25.6	69
Louisville-Jefferson County, KY-IN	42	41,277	6.2	59	80,384	12.1	63	216,864	32.7	39
Madison, WI	15	97,352	22.2	1	167,104	38.2	1	254,973	58.2	4
McAllen-Edinburg-Mission, TX	86	7,505	3.1	90	23,449	9.8	72	39,928	16.6	91
Memphis, TN-MS-AR	69	33,979	5.1	72	69,545	10.4	70	174,922	26.2	68
Miami-Fort Lauderdale-Pompano Beach, FL	63	56,681	2.0	97	142,472	5.1	95	455,208	16.2	94
Milwaukee-Waukesha-West Allis, WI	14	135,829	13.8	7	263,553	26.8	5	477,083	48.6	8
Minneapolis-St. Paul-Bloomington, MN-WI	39	130,967	6.5	53	250,934	12.4	57	603,562	29.7	48
Modesto, CA	10	23,392	11.2	12	50,580	24.2	10	80,224	38.4	20
Nashville-Davidson--Murfreesboro--Franklin, TN	88	55,246	6.6	46	100,499	12.1	64	227,932	27.4	62
New Haven-Milford, CT	38	36,221	8.6	28	56,393	13.4	42	112,784	26.8	65
New Orleans-Metairie-Kenner, LA	26	50,433	7.6	37	100,611	15.2	33	238,497	36.1	27
New York-Northern New Jersey-Long Island, NY-NJ-PA	13	946,058	9.8	23	1,751,041	18.1	18	3,539,294	36.6	25
Ogden-Clearfield, UT	11	18,883	9.2	25	36,382	17.8	20	86,382	42.2	13
Oklahoma City, OK	84	28,478	4.2	77	58,579	8.6	83	155,146	22.7	80
Omaha-Council Bluffs, NE-IA	33	39,540	7.2	42	84,215	15.3	32	198,527	36.1	26
Orlando-Kissimmee, FL	83	22,179	1.9	98	50,596	4.4	98	181,593	15.8	95
Oxnard-Thousand Oaks-Ventura, CA	53	20,275	5.5	67	36,157	9.8	73	77,980	21.0	86
Palm Bay-Melbourne-Titusville, FL	99	3,622	1.5	99	4,361	1.8	100	17,752	7.4	100
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	50	202,724	6.5	50	341,665	11.0	68	747,972	24.0	75
Phoenix-Mesa-Scottsdale, AZ	43	66,427	3.5	86	165,790	8.8	80	516,331	27.4	61
Pittsburgh, PA	60	102,333	8.1	32	161,816	12.8	52	290,210	23.0	79
Portland-South Portland-Biddeford, ME	81	34,367	10.8	16	59,438	18.6	17	92,656	29.1	56
Portland-Vancouver-Beaverton, OR-WA	12	84,607	7.8	35	183,471	16.9	22	433,624	39.9	16
Poughkeepsie-Newburgh-Middletown, NY	100	8,534	2.8	91	13,979	4.6	97	24,817	8.2	98
Providence-New Bedford-Fall River, RI-MA	59	48,298	5.9	66	85,397	10.4	71	179,431	21.8	82
Provo-Orem, UT	9	24,969	13.8	6	45,070	25.0	9	87,045	48.3	9

Appendix 5. Share of Jobs Accessible on Average via Transit, by Time Threshold, 100 Metropolitan Areas (continued)

		45 Minutes			60 Minutes			90 Minutes		
Metropolitan Area	Combined Access Ranking	Total Jobs Reachable	Access Rate (%)	Access Rate Rank	Total Jobs Reachable	Access Rate (%)	Access Rate Rank	Total Jobs Reachable	Access Rate (%)	Access Rate Rank
Raleigh-Cary, NC	65	34,681	6.4	55	72,446	13.4	44	161,606	29.8	46
Richmond, VA	92	57,093	8.5	30	93,536	13.9	38	177,793	26.5	67
Riverside-San Bernardino-Ontario, CA	96	18,224	1.3	100	39,610	2.9	99	109,074	7.9	99
Rochester, NY	48	56,297	10.4	19	86,476	15.9	30	175,938	32.4	40
Sacramento--Arden-Arcade--Roseville, CA	54	30,737	3.2	89	71,595	7.5	88	206,866	21.7	84
Salt Lake City, UT	3	73,678	11.1	14	176,015	26.5	6	391,860	58.9	2
San Antonio, TX	23	56,413	5.9	64	126,767	13.3	45	351,964	37.0	22
San Diego-Carlsbad-San Marcos, CA	25	79,222	5.2	69	181,502	12.0	65	441,965	29.1	55
San Francisco-Oakland-Fremont, CA	16	240,819	10.5	18	381,341	16.6	26	798,327	34.8	30
San Jose-Sunnyvale-Santa Clara, CA	2	88,454	9.3	24	223,814	23.6	12	553,213	58.4	3
Scranton--Wilkes-Barre, PA	51	22,349	7.0	43	39,501	12.3	58	78,987	24.7	71
Seattle-Tacoma-Bellevue, WA	18	117,441	6.7	44	231,666	13.3	49	583,301	33.4	35
Springfield, MA	44	26,841	7.6	38	44,896	12.7	53	94,233	26.8	66
St. Louis, MO-IL	68	55,813	3.7	82	125,089	8.3	85	363,208	24.1	74
Stockton, CA	28	16,066	6.5	48	30,281	12.3	59	68,273	27.8	59
Syracuse, NY	30	48,684	12.3	10	78,471	19.9	15	141,377	35.8	28
Tampa-St. Petersburg-Clearwater, FL	77	28,601	2.2	94	70,746	5.5	94	209,227	16.3	93
Toledo, OH	40	28,970	7.9	34	51,663	14.1	37	122,869	33.5	34
Tucson, AZ	4	69,903	15.8	3	139,428	31.5	2	252,937	57.2	5
Tulsa, OK	61	24,427	5.1	71	52,694	11.0	67	147,967	30.9	41
Virginia Beach-Norfolk-Newport News, VA-NC	78	16,550	2.1	96	38,422	4.8	96	124,193	15.4	96
Washington-Arlington-Alexandria, DC-VA-MD-WV	17	277,092	8.8	27	535,202	17.1	21	1,148,904	36.6	24
Wichita, KS	35	21,829	6.2	62	48,634	13.7	40	136,720	38.6	19
Worcester, MA	80	28,926	7.4	40	50,222	12.9	51	84,809	21.7	83
Youngstown-Warren-Boardman, OH-PA	97	10,750	3.6	83	18,416	6.2	93	42,071	14.2	97

Appendix 6. Transit Systems Included in Database

Primary Metropolitan Area	Transit System
Akron, OH	Metro Regional Transit Authority
Akron, OH	Portage Area Regional Transportation Authority
Akron, OH	Stark Area Regional Transit Authority
Albany-Schenectady-Troy, NY	Capital District Transportation Authority
Albany-Schenectady-Troy, NY	City of Mechanicville Transit
Albany-Schenectady-Troy, NY	Schoharie County Public Transportation
Albuquerque, NM	ABQ Ride
Albuquerque, NM	City of Belen Transit
Albuquerque, NM	Pueblo of Santa Ana Transit
Albuquerque, NM	Rail Runner (NMDOT)
Albuquerque, NM	Sandoval County Transit
Allentown-Bethlehem-Easton, PA-NJ	County of Carbon Transit
Allentown-Bethlehem-Easton, PA-NJ	Lehigh and Northampton Transportation Authority
Atlanta-Sandy Springs-Marietta, GA	Buckhead Community Improvement District
Atlanta-Sandy Springs-Marietta, GA	City of Canton Transit
Atlanta-Sandy Springs-Marietta, GA	Cobb Community Transit
Atlanta-Sandy Springs-Marietta, GA	Georgia Regional Transportation Authority
Atlanta-Sandy Springs-Marietta, GA	Gwinnett County Board of Commissioners
Atlanta-Sandy Springs-Marietta, GA	Metropolitan Atlanta Rapid Transit Authority
Augusta-Richmond County, GA-SC	Augusta Richmond County Transit Department
Augusta-Richmond County, GA-SC	Best Friends Express (Lower Savannah COG)
Austin-Round Rock, TX	Capital Metropolitan Transportation Authority
Austin-Round Rock, TX	Capitol Area Rural Transportation System
Bakersfield, CA	City of Arvin Transit
Bakersfield, CA	City of Delano Transit
Bakersfield, CA	Golden Empire Transit District
Bakersfield, CA	Kern Regional Transit
Bakersfield, CA	Taft Area Transit
Baltimore-Towson, MD	Annapolis Department of Transportation
Baltimore-Towson, MD	Carroll Area Transit System
Baltimore-Towson, MD	Harford Transit
Baltimore-Towson, MD	Maryland Transit Administration
Baltimore-Towson, MD	Queen Anne's County Transit
Baton Rouge, LA	Capital Area Transit System
Birmingham-Hoover, AL	Birmingham-Jefferson County Transit Authority
Boise City-Nampa, ID	Valley Regional Transit
Boston-Cambridge-Quincy, MA-NH	Brockton Area Transit Authority
Boston-Cambridge-Quincy, MA-NH	Cape Ann Transportation Authority
Boston-Cambridge-Quincy, MA-NH	Cooperative Alliance for Seacoast Transportation
Boston-Cambridge-Quincy, MA-NH	Lexpress
Boston-Cambridge-Quincy, MA-NH	Lowell Regional Transit Authority
Boston-Cambridge-Quincy, MA-NH	Massachusetts Bay Transportation Authority
Boston-Cambridge-Quincy, MA-NH	Massachusetts Ferries
Boston-Cambridge-Quincy, MA-NH	Massport Logan Express
Boston-Cambridge-Quincy, MA-NH	Merrimack Valley Regional Transit Authority
Boston-Cambridge-Quincy, MA-NH	Metrowest RTA
Boston-Cambridge-Quincy, MA-NH	Paul Revere Transportation
Boston-Cambridge-Quincy, MA-NH	Plymouth & Brockton Street Railway Company
Bradenton-Sarasota-Venice, FL	Manatee County Area Transit

Appendix 6. Transit Systems Included in Database (continued)

Primary Metropolitan Area	Transit System
Bradenton-Sarasota-Venice, FL	Sarasota County Area Transit
Bridgeport-Stamford-Norwalk, CT	Connecticut Transit - Stamford Division
Bridgeport-Stamford-Norwalk, CT	Greater Bridgeport Transit Authority
Bridgeport-Stamford-Norwalk, CT	Housatonic Area Regional Transit
Bridgeport-Stamford-Norwalk, CT	Norwalk Transit District
Buffalo-Niagara Falls, NY	Niagara Frontier Transportation Authority
Cape Coral-Fort Myers, FL	Lee County Transit
Charleston-North Charleston-Summerville, SC	Berkeley Charleston Dorchester Rural Transportation Management Authority
Charleston-North Charleston-Summerville, SC	Charleston Area Regional Transportation Authority
Charlotte-Gastonia-Concord, NC-SC	Charlotte Area Transit System
Charlotte-Gastonia-Concord, NC-SC	Gastonia Transit
Chattanooga, TN-GA	Chattanooga Area Regional Transportation Authority
Chicago-Naperville-Joliet, IL-IN-WI	Chicago Transit Authority
Chicago-Naperville-Joliet, IL-IN-WI	City of DeKalb
Chicago-Naperville-Joliet, IL-IN-WI	City of Valparaiso (V-Line)
Chicago-Naperville-Joliet, IL-IN-WI	East Chicago Transit
Chicago-Naperville-Joliet, IL-IN-WI	Gary Public Transportation Corporation
Chicago-Naperville-Joliet, IL-IN-WI	Hammond Transit System
Chicago-Naperville-Joliet, IL-IN-WI	Kenosha Transit
Chicago-Naperville-Joliet, IL-IN-WI	Metra Rail
Chicago-Naperville-Joliet, IL-IN-WI	Northern Indiana Commuter Transportation District
Chicago-Naperville-Joliet, IL-IN-WI	Pace - Suburban Bus Division
Cincinnati-Middletown, OH-KY-IN	Clermont Transportation Connection
Cincinnati-Middletown, OH-KY-IN	Middletown Transit System
Cincinnati-Middletown, OH-KY-IN	Southwest Ohio Regional Transit Authority
Cincinnati-Middletown, OH-KY-IN	Transit Authority of Northern Kentucky
Cleveland-Elyria-Mentor, OH	Brunswick Transit Alternative
Cleveland-Elyria-Mentor, OH	Laketran
Cleveland-Elyria-Mentor, OH	Loraine County Transit
Cleveland-Elyria-Mentor, OH	Medina County Transit
Cleveland-Elyria-Mentor, OH	The Greater Cleveland Regional Transit Authority
Colorado Springs, CO	Mountain Metropolitan Transit
Columbia, SC	Central Midlands Regional Transit Authority
Columbia, SC	Santee Wateree Regional Transportation Authority
Columbus, OH	Central Ohio Transit Authority
Columbus, OH	Delaware Area Transit Agency
Dallas-Fort Worth-Arlington, TX	City of Cleburne Transit
Dallas-Fort Worth-Arlington, TX	Dallas Area Rapid Transit
Dallas-Fort Worth-Arlington, TX	Denton County Transportation Authority
Dallas-Fort Worth-Arlington, TX	Fort Worth Transportation Authority
Dayton, OH	Greater Dayton Regional Transit Authority
Dayton, OH	Greene County Transit Board
Denver-Aurora, CO	Denver Regional Transportation District
Des Moines-West Des Moines, IA	Des Moines Area Regional Transit Authority
Detroit-Warren-Livonia, MI	Blue Water Area Transportation Commission
Detroit-Warren-Livonia, MI	City of Detroit Department of Transportation
Detroit-Warren-Livonia, MI	Detroit Transportation Corporation
Detroit-Warren-Livonia, MI	Suburban Mobility Authority for Regional Transportation
El Paso, TX	El Paso County Rural Transit

Appendix 6. Transit Systems Included in Database (continued)

Primary Metropolitan Area	Transit System
El Paso, TX	Sun Metro
Fresno, CA	Fresno Area Express
Fresno, CA	Fresno County Rural Transit
Grand Rapids-Wyoming, MI	Interurban Transit Partnership
Greensboro-High Point, NC	Greensboro Transit Authority
Greensboro-High Point, NC	High Point Transit
Greensboro-High Point, NC	Higher Education Area Transit
Greensboro-High Point, NC	Piedmont Authority for Regional Transportation
Greenville-Mauldin-Easley, SC	Clemson Area Transit Authority
Greenville-Mauldin-Easley, SC	Greenville Transit Authority
Harrisburg-Carlisle, PA	Capital Area Transit
Hartford-West Hartford-East Hartford, CT	Connecticut Transit - Hartford Division
Hartford-West Hartford-East Hartford, CT	Connecticut Transit - Hartford Express Routes
Hartford-West Hartford-East Hartford, CT	DATTCO
Hartford-West Hartford-East Hartford, CT	Estuary Transit District
Hartford-West Hartford-East Hartford, CT	Middletown Transit
Hartford-West Hartford-East Hartford, CT	New Britain Transportation Company, Inc.
Hartford-West Hartford-East Hartford, CT	Shore Line East (CDOT)
Honolulu, HI	City and County of Honolulu Department of Transportation Services
Houston-Sugar Land-Baytown, TX	Brazos Transportation District
Houston-Sugar Land-Baytown, TX	Fort Bend County Public Transportation
Houston-Sugar Land-Baytown, TX	Island Transit
Houston-Sugar Land-Baytown, TX	Metropolitan Transit Authority of Harris County, Texas
Indianapolis-Carmel, IN	Indianapolis and Marion County Public Transportation
Jackson, MS	City of Jackson Transit System
Jacksonville, FL	Clay County Council on Aging Inc.
Jacksonville, FL	Jacksonville Transportation Authority
Jacksonville, FL	Sunshine Bus Company (St. Johns County)
Kansas City, MO-KS	City of Bonner Springs Transit
Kansas City, MO-KS	City of Excelsior Springs Transit
Kansas City, MO-KS	Johnson County Transit
Kansas City, MO-KS	Kansas City Area Transportation Authority
Knoxville, TN	Knoxville Area Transit
Lakeland-Winter Haven, FL	Lakeland Area Mass Transit District
Lakeland-Winter Haven, FL	Polk County Transit Services Division
Las Vegas-Paradise, NV	Las Vegas Monorail Company
Las Vegas-Paradise, NV	Regional Transportation Commission of Southern Nevada
Las Vegas-Paradise, NV	Southern Nevada Transit Coalition
Little Rock-North Little Rock-Conway, AR	Central Arkansas Transit Authority
Los Angeles-Long Beach-Santa Ana, CA	Antelope Valley Transit Authority
Los Angeles-Long Beach-Santa Ana, CA	City of Commerce Municipal Buslines
Los Angeles-Long Beach-Santa Ana, CA	City of Gardena Transportation Department
Los Angeles-Long Beach-Santa Ana, CA	City of Redondo Beach - Beach Cities Transit
Los Angeles-Long Beach-Santa Ana, CA	Culver City Municipal Bus Lines
Los Angeles-Long Beach-Santa Ana, CA	Foothill Transit
Los Angeles-Long Beach-Santa Ana, CA	Irvine Shuttle
Los Angeles-Long Beach-Santa Ana, CA	LA County Metropolitan Transit Authority
Los Angeles-Long Beach-Santa Ana, CA	LADOT Transit Services
Los Angeles-Long Beach-Santa Ana, CA	Laguna Beach Municipal Transit

Appendix 6. Transit Systems Included in Database (continued)

Primary Metropolitan Area	Transit System
Los Angeles-Long Beach-Santa Ana, CA	Long Beach Transit
Los Angeles-Long Beach-Santa Ana, CA	Montebello Bus Lines
Los Angeles-Long Beach-Santa Ana, CA	Municipal Area Express
Los Angeles-Long Beach-Santa Ana, CA	Norwalk Transit System
Los Angeles-Long Beach-Santa Ana, CA	Orange County Transportation Authority
Los Angeles-Long Beach-Santa Ana, CA	Santa Clarita Transit
Los Angeles-Long Beach-Santa Ana, CA	Santa Monica's Big Blue Bus
Los Angeles-Long Beach-Santa Ana, CA	Southern California Regional Rail Authority
Los Angeles-Long Beach-Santa Ana, CA	Torrance Transit System
Louisville/Jefferson County, KY-IN	Transit Authority of River City
Louisville-Jefferson County, KY-IN	HDB Service Group, Inc
Louisville-Jefferson County, KY-IN	Southern Indiana Transit System
Madison, WI	Metro Transit System
McAllen-Edinburg-Mission, TX	Lower Rio Grande Valley Development Council
McAllen-Edinburg-Mission, TX	McAllen Express Transit
Memphis, TN-MS-AR	Memphis Area Transit Authority
Miami-Fort Lauderdale-Pompano Beach, FL	Broward County Office of Transportation
Miami-Fort Lauderdale-Pompano Beach, FL	Miami-Dade Transit
Miami-Fort Lauderdale-Pompano Beach, FL	PalmTran, Inc.
Miami-Fort Lauderdale-Pompano Beach, FL	South Florida Regional Transportation Authority (Tri-Rail)
Milwaukee-Waukesha-West Allis, WI	City of Waukesha Transit Commission
Milwaukee-Waukesha-West Allis, WI	Milwaukee County Transit System
Milwaukee-Waukesha-West Allis, WI	Washington County Transit
Minneapolis-St. Paul-Bloomington, MN-WI	Metro Transit (Aggregates Multiple Systems)
Minneapolis-St. Paul-Bloomington, MN-WI	Minnesota Valley Transit Authority
Modesto, CA	Modesto Area Express
Modesto, CA	Stanislaus Regional Transit
Nashville-Davidson--Murfreesboro--Franklin, TN	Nashville Metropolitan Transit Authority
Nashville-Davidson--Murfreesboro--Franklin, TN	Regional Transportation Authority
New Haven-Milford, CT	Connecticut Transit - New Haven Division
New Haven-Milford, CT	Milford Transit District
New Haven-Milford, CT	Northeast Transportation Company, Inc.
New Orleans-Metairie-Kenner, LA	Crescent City Connection Division (LDOT)
New Orleans-Metairie-Kenner, LA	Jefferson Parish Department of Transit Administration
New Orleans-Metairie-Kenner, LA	New Orleans Regional Transit Authority
New Orleans-Metairie-Kenner, LA	St. Bernard Urban Rapid Transit
New York-Northern New Jersey-Long Island, NY-NJ-PA	Academy Lines, Inc.
New York-Northern New Jersey-Long Island, NY-NJ-PA	Adirondack Transit Lines, Inc
New York-Northern New Jersey-Long Island, NY-NJ-PA	BillyBey Ferry Company, LLC
New York-Northern New Jersey-Long Island, NY-NJ-PA	City of Long Beach
New York-Northern New Jersey-Long Island, NY-NJ-PA	Clarkstown Mini-Trans
New York-Northern New Jersey-Long Island, NY-NJ-PA	Coach USA
New York-Northern New Jersey-Long Island, NY-NJ-PA	DeCamp Bus Lines
New York-Northern New Jersey-Long Island, NY-NJ-PA	Huntington Area Rapid Transit
New York-Northern New Jersey-Long Island, NY-NJ-PA	Lakeland Bus Lines, Inc.
New York-Northern New Jersey-Long Island, NY-NJ-PA	Metropolitan Transportation Authority - Long Island Bus
New York-Northern New Jersey-Long Island, NY-NJ-PA	Metropolitan Transportation Authority - Long Island Railroad
New York-Northern New Jersey-Long Island, NY-NJ-PA	Metropolitan Transportation Authority - Metro-North Railroad
New York-Northern New Jersey-Long Island, NY-NJ-PA	Metropolitan Transportation Authority - New York City

Appendix 6. Transit Systems Included in Database (continued)

Primary Metropolitan Area	Transit System
New York-Northern New Jersey-Long Island, NY-NJ-PA	New Jersey Transit Corporation
New York-Northern New Jersey-Long Island, NY-NJ-PA	Port Authority Trans-Hudson Corporation
New York-Northern New Jersey-Long Island, NY-NJ-PA	Putnam County Transit
New York-Northern New Jersey-Long Island, NY-NJ-PA	Suffolk County Department of Public Works - Transportation Division
New York-Northern New Jersey-Long Island, NY-NJ-PA	Trans-Bridge Lines, Inc.
New York-Northern New Jersey-Long Island, NY-NJ-PA	Transport of Rockland
New York-Northern New Jersey-Long Island, NY-NJ-PA	Village of Spring Valley Bus
New York-Northern New Jersey-Long Island, NY-NJ-PA	Westchester County Bee-Line System
Oklahoma City, OK	Central Oklahoma Transportation and Parking Authority
Oklahoma City, OK	CityLink (Edmond)
Oklahoma City, OK	Cleveland Area Rapid Transit
Oklahoma City, OK	First Capital Trolley
Omaha-Council Bluffs, NE-IA	Transit Authority of Omaha
Orlando-Kissimmee, FL	Central Florida Regional Transportation Authority
Orlando-Kissimmee, FL	Lake County Board of County Commissioners
Oxnard-Thousand Oaks-Ventura, CA	Camarillo Area Transit
Oxnard-Thousand Oaks-Ventura, CA	Gold Coast Transit
Oxnard-Thousand Oaks-Ventura, CA	Moorpark Transit
Oxnard-Thousand Oaks-Ventura, CA	Ojai Trolley Service
Oxnard-Thousand Oaks-Ventura, CA	Simi Valley Transit
Oxnard-Thousand Oaks-Ventura, CA	Thousand Oaks Transit
Oxnard-Thousand Oaks-Ventura, CA	VISTA Transit
Palm Bay-Melbourne-Titusville, FL	Space Coast Area Transit
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	Borough of Pottstown - Pottstown Area Rapid Transit
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	Cecil County Government Transit
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	Delaware Transit Corporation
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	Port Authority Transit Corporation
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	Southeastern Pennsylvania Transportation Authority
Phoenix-Mesa-Scottsdale, AZ	City of Coolidge Transit
Phoenix-Mesa-Scottsdale, AZ	Maricopa Express
Phoenix-Mesa-Scottsdale, AZ	Regional Public Transportation Authority (Valley Metro)
Phoenix-Mesa-Scottsdale, AZ	Scottsdale Trolley
Pittsburgh, PA	Beaver County Transit Authority
Pittsburgh, PA	Butler Transit Authority
Pittsburgh, PA	Fayette Area Coordinated Transportation
Pittsburgh, PA	G G and C Bus Company, Inc.
Pittsburgh, PA	Mid Mon Valley Transit Authority
Pittsburgh, PA	Myers Coach Lines
Pittsburgh, PA	Port Authority of Allegheny County
Pittsburgh, PA	Town & County Transit
Pittsburgh, PA	Westmoreland County Transit Authority
Portland-South Portland-Biddeford, ME	Biddeford-Saco-Old Orchard Beach Transit Committee Shuttle Bus
Portland-South Portland-Biddeford, ME	Casco Bay Island Transit District
Portland-South Portland-Biddeford, ME	City of Bath Transit
Portland-South Portland-Biddeford, ME	Greater Portland Transit District
Portland-South Portland-Biddeford, ME	South Portland Bus Service
Portland-South Portland-Biddeford, ME	York County Community Action Corporation
Portland-Vancouver-Beaverton, OR-WA	Canby Area Transit
Portland-Vancouver-Beaverton, OR-WA	City of Sandy Transit

Appendix 6. Transit Systems Included in Database (continued)

Primary Metropolitan Area	Transit System
Portland-Vancouver-Beaverton, OR-WA	Clark County Public Transportation Benefit Area Authority
Portland-Vancouver-Beaverton, OR-WA	Columbia County Rider
Portland-Vancouver-Beaverton, OR-WA	Ride Connection, Inc.
Portland-Vancouver-Beaverton, OR-WA	South Clackamas Transportation District
Portland-Vancouver-Beaverton, OR-WA	South Metro Area Regional Transit
Portland-Vancouver-Beaverton, OR-WA	Tri-County Metropolitan Transportation District of Oregon
Portland-Vancouver-Beaverton, OR-WA	Yamhill County Transit
Poughkeepsie-Newburgh-Middletown, NY	City of Poughkeepsie Transit
Poughkeepsie-Newburgh-Middletown, NY	Dutchess County Division of Mass Transportation
Poughkeepsie-Newburgh-Middletown, NY	Middletown Transit
Poughkeepsie-Newburgh-Middletown, NY	Newburgh Beacon Bus Corporation
Poughkeepsie-Newburgh-Middletown, NY	Village of Kiryas Joel
Providence-New Bedford-Fall River, RI-MA	Greater Attleboro-Taunton Regional Transit Authority
Providence-New Bedford-Fall River, RI-MA	Rhode Island Public Transit Authority
Providence-New Bedford-Fall River, RI-MA	Southeastern Regional Transit Authority
Raleigh-Cary, NC	Capital Area Transit
Raleigh-Cary, NC	Chapel Hill Transit
Raleigh-Cary, NC	C-Tran (Town of Cary)
Raleigh-Cary, NC	Durham Area Transit Authority
Raleigh-Cary, NC	NC State University Transportation Department
Raleigh-Cary, NC	Research Triangle Regional Public Transportation Authority
Richmond, VA	Greater Richmond Transit Company
Richmond, VA	Petersburg Area Transit
Riverside-San Bernardino-Ontario, CA	City of Barstow Transit
Riverside-San Bernardino-Ontario, CA	City of Corona Transit
Riverside-San Bernardino-Ontario, CA	City of Needles Transit
Riverside-San Bernardino-Ontario, CA	Morongo Basin Transit Authority
Riverside-San Bernardino-Ontario, CA	Omnitrans
Riverside-San Bernardino-Ontario, CA	Riverside Transit Agency
Riverside-San Bernardino-Ontario, CA	SunLine Transit Agency
Riverside-San Bernardino-Ontario, CA	Victor Valley Transit Authority
Rochester, NY	Regional Transit Service, Inc. and Lift Line, Inc.
Sacramento--Arden-Arcade--Roseville, CA	City of Elk Grove (e-tran)
Sacramento--Arden-Arcade--Roseville, CA	City of Lincoln Transit
Sacramento--Arden-Arcade--Roseville, CA	El Dorado Transit
Sacramento--Arden-Arcade--Roseville, CA	Folsom Transit
Sacramento--Arden-Arcade--Roseville, CA	Placer County Department of Public Works, Transit Division
Sacramento--Arden-Arcade--Roseville, CA	Roseville Transit
Sacramento--Arden-Arcade--Roseville, CA	Sacramento Regional Transit District
Sacramento--Arden-Arcade--Roseville, CA	Tahoe Area Regional Transit
Sacramento--Arden-Arcade--Roseville, CA	Unitrans
Sacramento--Arden-Arcade--Roseville, CA	Yolo County Transportation District
Salt Lake City, UT	Park City Municipal Corporation
Salt Lake City, UT	Utah Transit Authority
San Antonio, TX	VIA Metropolitan Transit
San Diego-Carlsbad-San Marcos, CA	North County Transit District
San Diego-Carlsbad-San Marcos, CA	San Diego Metropolitan Transit System
San Francisco-Oakland-Fremont, CA	Alameda-Contra Costa Transit District - Local Service
San Francisco-Oakland-Fremont, CA	Alameda-Contra Costa Transit District - Transbay Service

Appendix 6. Transit Systems Included in Database (continued)

Primary Metropolitan Area	Transit System
San Francisco-Oakland-Fremont, CA	Altamont Commuter Express
San Francisco-Oakland-Fremont, CA	Bay Area Rapid Transit District
San Francisco-Oakland-Fremont, CA	Benicia & Breeze (Benicia, CA)
San Francisco-Oakland-Fremont, CA	Blue and Gold Fleet
San Francisco-Oakland-Fremont, CA	Caltrain
San Francisco-Oakland-Fremont, CA	Capitol Corridor Joint Powers Authority
San Francisco-Oakland-Fremont, CA	County Connection (Concord, CA)
San Francisco-Oakland-Fremont, CA	Dumbarton Express
San Francisco-Oakland-Fremont, CA	Emery Go-Round
San Francisco-Oakland-Fremont, CA	Fairfield and Suisan Area Transit
San Francisco-Oakland-Fremont, CA	Golden Gate Ferry
San Francisco-Oakland-Fremont, CA	Golden Gate Transportation District
San Francisco-Oakland-Fremont, CA	Harbor Bay Ferry
San Francisco-Oakland-Fremont, CA	Livermore Amador Valley Transit Authority
San Francisco-Oakland-Fremont, CA	Rio Vista Transit
San Francisco-Oakland-Fremont, CA	San Francisco Municipal Transportation Authority
San Francisco-Oakland-Fremont, CA	San Mateo County Transit
San Francisco-Oakland-Fremont, CA	Stanford Shuttle
San Francisco-Oakland-Fremont, CA	Tri Delta Transit
San Francisco-Oakland-Fremont, CA	Union City Transit
San Francisco-Oakland-Fremont, CA	Vallejo Baylink Ferry
San Francisco-Oakland-Fremont, CA	Vallejo Transit
San Francisco-Oakland-Fremont, CA	Western Contra Costa Transit Authority
San Jose-Sunnyvale-Santa Clara, CA	San Benito County LTA
San Jose-Sunnyvale-Santa Clara, CA	Santa Clara Valley Transportation Authority
Scranton--Wilkes-Barre, PA	County of Lackawanna Transit System
Scranton--Wilkes-Barre, PA	Hazleton Public Transit
Scranton--Wilkes-Barre, PA	Luzerne County Transportation Authority
Seattle-Tacoma-Bellevue, WA	Central Puget Sound Regional Transit Authority
Seattle-Tacoma-Bellevue, WA	Community Transit
Seattle-Tacoma-Bellevue, WA	Everett Transit
Seattle-Tacoma-Bellevue, WA	King County Department of Transportation - Metro Transit Division
Seattle-Tacoma-Bellevue, WA	Pierce County Ferry Operations
Seattle-Tacoma-Bellevue, WA	Pierce County Transportation Benefit Area Authority
Seattle-Tacoma-Bellevue, WA	Seattle Center Monorail Transit
Seattle-Tacoma-Bellevue, WA	Washington State Ferries
Springfield, MA	Franklin Regional Transit Authority
Springfield, MA	Pioneer Valley Transit Authority
St. Louis, MO-IL	Bi-State Development Agency (Metro Transit)
St. Louis, MO-IL	Madison County Transit District
Stockton, CA	City of Lodi - Transit Division
Stockton, CA	eTrans
Stockton, CA	San Joaquin Regional Transit District
Stockton, CA	Tracer Bus Services (City of Tracy)
Syracuse, NY	CNY Centro, Inc.
Tampa-St. Petersburg-Clearwater, FL	Hernando County Board of County Commissioners (The Bus)
Tampa-St. Petersburg-Clearwater, FL	Hillsborough Area Regional Transit Authority
Tampa-St. Petersburg-Clearwater, FL	Pasco County Public Transportation
Tampa-St. Petersburg-Clearwater, FL	Pinellas Suncoast Transit Authority

Appendix 6. Transit Systems Included in Database (continued)

Primary Metropolitan Area	Transit System
Toledo, OH	Toledo Area Regional Transit Authority
Tucson, AZ	Sun Shuttle
Tucson, AZ	Sun Tran
Tucson, AZ	Tucson Inner City Express Transit
Tulsa, OK	Metropolitan Tulsa Transit Authority
Virginia Beach-Norfolk-Newport News, VA-NC	Transportation District Commission of Hampton Roads
Virginia Beach-Norfolk-Newport News, VA-NC	Williamsburg Area Transport
Washington-Arlington-Alexandria, DC-VA-MD-WV	Alexandria Transit Company
Washington-Arlington-Alexandria, DC-VA-MD-WV	Arlington Transit
Washington-Arlington-Alexandria, DC-VA-MD-WV	Calvert County Government
Washington-Arlington-Alexandria, DC-VA-MD-WV	Central Maryland Regional Transit
Washington-Arlington-Alexandria, DC-VA-MD-WV	City of Fairfax CUE Bus
Washington-Arlington-Alexandria, DC-VA-MD-WV	Fairfax Connector
Washington-Arlington-Alexandria, DC-VA-MD-WV	Fredericksburg Regional Transit
Washington-Arlington-Alexandria, DC-VA-MD-WV	Loudoun County Commuter Bus Service
Washington-Arlington-Alexandria, DC-VA-MD-WV	Loudoun County Local Bus Service
Washington-Arlington-Alexandria, DC-VA-MD-WV	Potomac and Rappahannock Transportation Commission
Washington-Arlington-Alexandria, DC-VA-MD-WV	Prince George's County Transit
Washington-Arlington-Alexandria, DC-VA-MD-WV	Ride-On Montgomery County Transit
Washington-Arlington-Alexandria, DC-VA-MD-WV	Transit Services of Frederick County
Washington-Arlington-Alexandria, DC-VA-MD-WV	VanGO (Charles County, MD)
Washington-Arlington-Alexandria, DC-VA-MD-WV	Virginia Railway Express
Washington-Arlington-Alexandria, DC-VA-MD-WV	Washington Metropolitan Area Transit Authority
Wichita, KS	Wichita Transit
Worcester, MA	Montachusett Regional Transit Authority
Worcester, MA	Worcester Regional Transit Authority
Youngstown-Warren-Boardman, OH-PA	Shenango Valley Shuttle Service
Youngstown-Warren-Boardman, OH-PA	Western Reserve Transit Authority

Endnotes

1. Brookings analysis of U.S. Census Bureau's Public Use Microdata Sample files from the American Community Survey.

2. There are numerous studies that deal with transit accessibility *within* certain metros. See e.g.,: Ahmed El-Geneidy, David Levinson, "Access to Destinations: Development of Accessibility Measures," Report No. MN/RC-2006-16 (Minneapolis: Minnesota Department of Transportation, 2006); Inshu Minocha and others, "Analysis of Transit Quality of Service and Employment Accessibility for the Greater Chicago, Illinois, Region," *Journal of the Transportation Research Board* , Vol. 2042 (2008); University of Minnesota Center for Transportation Studies, editor, *Access to Destinations Conference Proceedings* (2007); Bureau of Transportation Statistics, "Special Issue on Methodological Issues in Accessibility," *Journal of Transportation and Statistics*, Vol. 4, No. 2/3 (2001).

3. National Transportation Policy Project, "Performance Driven: A New Vision for U.S. Transportation Policy" (Washington: Bi-Partisan Policy Center, 2009); and Todd Litman, "Evaluating Accessibility for Transportation Planning" (Victoria, BC: Victoria Transport Policy Institute, 2011).

4. See e.g.,: Jeanette M. Hercik and others, "Overcoming Transportation Barriers: A Path to Self-Sufficiency," ICF International for the U.S. Department of Health and Human Services, Contract No.: 233-02-0094 (2009); Evelyn Blumenberg and Margy Waller, "The Long Journey to Work: A Federal Transportation Policy for Working Families," in *Taking the High Road: A Metropolitan Agenda for Transportation Reform*, B. Katz and R. Puentes, eds. (Washington: Brookings Press, 2005).

5. David Levinson and Emilia Istrate, "Access for Value: Financing Transportation through Land Value Capture" (Washington: Brookings, 2011).

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7. Reversing a pair of 40-year trends, the share of Americans that commute by transit increased from 2000 to 2008 (0.5 percent), while the share of those that drive alone to work fell slightly (-0.2 percent.) Unless otherwise noted, data cited in this section come from Brookings Institution, "The State of Metropolitan America: On the Front Lines of Demographic Change" (Washington: 2010). Available online at www.brookings.edu/metro/stateofmetroamerica.aspx.

8. For a detailed discussion see: Richard Mudge and Keith Jasper, "Performance Metrics for the Evaluation of Transportation Programs" (Washington: Bi-Partisan Policy Center, 2009).

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10. Ashley R. Hair and Randy B. Machemeh, "Impact of Rising Fuel Prices on U.S. Transit Ridership," *Journal of the Transportation Research Board*, Vol. 1992 (2007).

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13. Robert E. Lang, *Edgeless Cities: Exploring the Elusive Metropolis* (Washington: Brookings Institution Press and Brookings Metro Series, 2003).

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15. David Erickson and others, "The Enduring Challenge of Concentrated Poverty in America: Case Studies from Communities Across the U.S" (Washington: The Federal Reserve System and Brookings, 2008).

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23. Charles L. Baum, "The Effects of Vehicle Ownership on Employment," *Journal of Urban Economics,* No. 66 (2009); Center for Transit-Oriented Development and Center for Neighborhood Technology, "The Affordability Index: A New Tool for Measuring the True Affordability of a Housing Choice" (Washington: Brookings, 2006); and Peter Haas and others, "Estimating Transportation Costs by Characteristics of Neighborhood and Household" *Journal of the Transportation Research Board*, [Vol. 2011 (2008): 62-70].

24. Thomas Sanchez and Lisa Schweitzer, "Assessing Federal Employment Accessibility Policy: An Analysis of the JARC Program" (Washington: Brookings, 2008).

25. 75 FR 30460 (2010-06-01).

26. For a discussion of the lack of accurate indicators of transit accessibility see: Chao-Lun Cheng and Asha Agrawal "TTSAT: A New Approach to Mapping Transit Accessibility," *Journal of Public Transportation*, Vol. 13, No. 1 (2010): 55-72.

27. Cambridge Systematics, Inc., "Technical Methods to Support Analysis of Environmental Justice Issues," National Cooperative Highway Research Program Project 8-36 (11) (Washington: Transportation Research Board, 2002).

28. Notably, the Center for Transit-Oriented Development and Reconnecting America developed a National TOD Database with the location of existing and proposed rail and bus rapid transit stations in 47 U.S. metro areas. The database is available: toddata.cnt.org.

29. See Appendix 1: Technical Methodology for a discussion of the 3/4 mile threshold.

30. Transit schedules include controls for time of day congestion. Therefore, these models account for the possibility of slower travel times during the morning rush hour.

31. Researchers find that transit travelers prefer longer in-vehicle times over transferring, but since this model does not aim to predict behavior it does not include transfer penalties. The model will simply determine the shortest travel times, some of which will include transfers. For more information regarding transfers, see: Steve Polzin and Xuehao Chu, "Public Transit in America: Results from the 2001 National Household Travel Survey" (Tampa: Center for Urban Transportation Research, 2005).

32. The most recent county-level 3-year CTPP estimates, from 2006 to 2008, can be accessed at www.fhwa.dot.gov/ctpp. This analysis removes counties with fewer than 500 transit commuters.

33. A recent literature review found that whether someone will take transit *at all* (i.e., not just to work) is strongly associated with access to a transit stop. Reid Ewing and Robert Cervero, "Travel and the Built Environment, *Journal of the American Planning Association,* Vol. 76, No. 3 (2010).

34. See William Fulton, et al, "Who Sprawls Most? How Growth Patterns Differ Across the U.S." (Washington: Brookings Institution, 2001).

35. Pendall, Puentes, and Martin, "From Traditional to Reformed."

36. Low-income people may also move to neighborhoods served by transit at higher rates than other groups. Edward L. Glaeser, Matthew E. Kahn, and Jordan Rappaport, "Why Do the Poor Live in Cities?" (Cambridge, MA: Harvard Institute of Economic Research, Harvard University, April 2000).

37. These older systems include Boston, Chicago, Cleveland, New York, and Philadelphia. Atlanta, Baltimore, Los Angeles, Miami, San Francisco, and Washington, DC each built their heavy rail (subways) systems after the start of the Interstate Era and the rapid suburbanization that followed.

38. It also accords with the finding that residents of low-income neighborhoods are better covered by transit than those in higher-income areas, as cities retain higher poverty rates than their surrounding suburbs. Elizabeth Kneebone, "The Great Recession and Poverty in Metropolitan America" (Washington: Brookings, 2010).

39. The correlation coefficient between metropolitan and city transit coverage is 0.44; the coefficient between metropolitan and suburban transit coverage is 0.92.

40. Research shows that each 1 percent increase in transit service increases ridership by 0.5 percent, equivalent

to an elasticity of 0.5. However, elasticities vary by time of day and current neighborhood service levels, among other factors. For more information regarding service frequency and its effects on ridership, see: Transportation Research Board, "Traveler Response to Transportation System Changes," Transit Cooperative Research Program Report 95, Chapter 9 (Washington: Transportation Research Board, 2007); Armando Lago, Patrick Mayworm, and J. Matthew McEnroe, "Transit Service Elasticities: Evidence from Demonstrations and Model," *Journal of Transport Economics and Policy,* Vol. 15 (1981).

41. According to one study: "A suitable frequency assignment should provide sufficiently regular service to satisfy the users and sufficiently sparse service to reduce the required fleet size, and thereby the operator's costs." Valerie Guihaire and Jin-Kao Hao, "Transit Network Design and Scheduling: A Global Review," Transportation Research Part A 42 (2008): 1260.

42. See the full Methodological Appendix for more details on how block groups access origin transit stops. Service frequency is measured with respect to all transit stops to which a neighborhood has access, rather than individual stops or routes.

43. The Southeastern Wisconsin Regional Planning Commission completed a feasibility study in 1998 for a commuter rail line from Milwaukee to Kenosha, where it would connect to metropolitan Chicago's commuter rail. The project received modeling approval from the Federal Transit Administration and preliminary engineering is pending. See The Kenosha-Racine-Milwaukee Commuter Link website: maps.sewrpc.org/KRMonline/background.shtm.

44. American Public Transportation Association's Ridership Report, Third Quarter 2010. www.apta.com/resources/statistics/Documents/Ridership/2010_q3_ridership_APTA.pdf. Each of these metro areas count daily rail transit ridership of at least 500,000.

45. The correlation between metro area rankings on share of working-age population in neighborhoods covered by transit, and median service frequency for working-age population in those neighborhoods, is 0.46.

46. Only Greenville, Little Rock, and Indianapolis register lower median suburban than city headways. Transit systems in San Antonio, Las Vegas, Indianapolis, Wichita, Little Rock, Cape Coral, and Greenville have shorter headways in low-income suburban than city neighborhoods.

47. Analysis of U.S. Department of Transportation 2009 National Household Travel Survey data.

48. Federal Highway Administration, "Congestion: Who is Traveling in the Peak?" National Household Travel Survey Brief (U.S. Department of Transportation, 2007).

49. In addition to in-vehicle time, travel times include walking time between the origin point and the transit stop, waiting and walking times between transfers, and walking time between the last stop and the destination centroid.

50. Kneebone, "Job Sprawl Revisited."

51. Brookings analysis of Nielsen Pop-Facts 2010 and Business-Facts data.

52. Census Bureau, ACS 1-year estimate, 2008.

53. Steve Polzin and Xuehao Chu, "Public Transit in America: Results from the 2001 National Household Travel Survey" (Tampa: Center for Urban Transportation Research, 2005).

54. It is not clear from the national questionnaires whether walking time is excluded from total commute time. The American Community Survey asks questions about total commute time while the National Household Transportation Survey asks separate questions concerning the walk to transit. This research's travel time equation includes calculations for two walking distances: residence to origin transit stop and destination transit stop to place of work. For more information regarding these origin/destination connectors, see the full methodology (Appendix 1).

55. We confirmed this threshold with a select group of transportation experts in October 2010. That group confirmed a complete model including full OD access should exceed 60 minutes and that a 90-minute threshold was appropriate.

56. Metro area job access rankings under 45- and 90-minute travel time thresholds are highly correlated (R = 0.80).

57. Kneebone, "Job Sprawl Revisited"; and Arthur Nelson and Casey J. Dawkins. *Urban Containment in the United States: History, Models, and Techniques for Regional and Metropolitan Growth Management,* PAS Report Number 520 (Chicago: American Planning Association, 2004).

58. No significant correlation exists between a metropolitan area's size rank and job access rank among the 100 largest metro areas.

59. The correlation between the percent of jobs located beyond 10 miles of the central business district, and the percent of metro area jobs accessible by our transit model, is -0.51.

60. Kneebone, "Job Sprawl Revisited."

61. The fact that nearly half of metropolitan jobs are identified as "high-skill" reflects the imperfect nature of the job classification scheme; occupation bears a much stronger relationship to worker educational attainment than industry, but our data only include detail by industry. Therefore, this section normalizes the analysis by focusing on the share of total metropolitan employment accessible via transit within each industry skill class, rather than the skill distribution of all jobs accessible via transit.

62. Edward L. Glaeser, "Demand for Density? The Functions of the City in the 21st Century." *The Brookings Review* (Summer 2000): 12-15.

63. Steven Raphael and Michael Stoll, "Job Sprawl and the Suburbanization of Poverty" (Washington: Brookings, 2010).

64. Because the combined access measure has no real-world significance, this section focuses primarily on how metro areas compare to one another on the measure. The measure does represent total accessibility by capturing two statistics that are independent of one another (correlation coefficient of 0.27). This intuitively works because the a system's coverage range does not indicate if that system will provide strong or weak accessibility—household and job location are just two other factors affecting accessibility.

65. The correlation coefficient between metro area rankings on combined access for residents of all neighborhoods, and residents of low-income neighborhoods, is 0.95.

66. Larry Thomas, "Reductions in Transit Service or Increases in Fares: Civil Rights, ADA, Regulatory, and Environmental Justice Implications," Transit Cooperative Research Program Legal Research Digest 35 (Washington: Transportation Research Board, 2011). Also see: Transportation for America and Others, "Stranded at the Station: The Impact of the Financial Crisis in Public Transportation" (Washington, 2009) and the interactive website: t4america.org/resources/transitfundingcrisis.

67. Brookings State of Metropolitan American Interactive Map, online at www.brookings.edu/metro/stateofmetroamerica.aspx.

68. Joel Rast, "Out of Service: The Impact of Transit Cuts on Access to Jobs in Metropolitan Milwaukee" (University of Wisconsin-Milwaukee, Center for Economic Development, 2008).

69. American Public Transportation Association, "Public Transportation Fact Book," Appendix A (Washington: 2010).

70. American Public Transportation Association, "Impact of Rising Fuel Costs on Transit Services" (Washington: 2008).

71. Energy Information Administration, "Short-Term Energy Outlook," U.S. Department of Energy (April 12, 2011).

72. Robert Puentes and Adie Tomer, "The Road…Less Traveled: An Analysis of Vehicle Miles Traveled Trends in the U.S." (Washington: Brookings, 2008).

73. Congressional Budget Office, "Effects of Gasoline Prices on Travel Behavior and Vehicle Markets", Publication No. 2883 (2008).

74. Donnie Maley and Rachel Weinberger, "Does Gas Price Fuel Transit Ridership?" *Panorama* 2009 (University of Pennsylvania).

75. See e.g., Institute for Transportation and Development Policy, "Advancing World Class BRT in the US" (New York, 2011).

76. Those with a higher share on rail include the top six when ranked by share of total commuters that use transit—New York, San Francisco, Washington, Boston, Chicago, Bridgeport—plus Poughkeepsie.

77. Community Transportation Association of America, "Profiles of Employer-Sponsored Transportation Programs" (Washington: March 2011).

78. Chicago's I-GO car sharing uses 100 percent low-emission vehicles. For more on car sharing see: Susan Shaheen, Adam Cohen, Melissa Chung, "North American Carsharing: 10-Year Retrospective," *Journal of the Transportation Research Board,* Vol. 2110 (2009): 35-44.

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80. Pendall, Puentes, and Martin, "From Traditional to Reformed."

81. See: Federal Highway Administration, "What is Scenario Planning?" (U.S. Department of Transportation, 2011). www.fhwa.dot.gov/planning/scenplan.

82. Casey Dawkins and Ralph Buehler, "Promoting Affordable Housing Near Public Transit: The Role of Planning," Prepared for the U.S. Department of Housing and Urban Development (Alexandria, VA: Metropolitan Institute at Virginia Tech, 2010).

83. Jed Kolko, "Making the Most of Transit: Density, Employment Growth, and Ridership around New Stations" (San Francisco: Public Policy Institute of California, 2011).

84. See e.g., G.B. Arrington and Robert Cervero, "Effects of TOD on Housing, Parking, and Travel," Transit Cooperative Research Program Report 128 (Washington: Transportation Research Board, 2008).

85. Sarah Krouse, "New Federal Initiative Aims to Bolster Transit-Oriented Sites," *Washington Business Journal*, February 18, 2011.

86. Transportation Research Board, "Federal Funding of Transportation Improvements in BRAC Cases," Special Report 302 (Washington: 2011).

87. See the full methodology (Appendix 1) for what systems must report data to the NTD.

88. U.S. Government Accountability Office, "Federal Transit Programs: Federal Transit Administration Has Opportunities to Improve Performance Accountability," Report GAO-11-54 (2010).

89. U.S. Government Accountability Office, "Metropolitan Planning Organizations: Options Exist to Enhance Transportation Planning Capacity and Federal Oversight" Report GAO-09-868 (2009).

90. The GAO finds that the U.S. Department Housing and Urban Development (HUD) does not provide adequate subsidized housing data for research purposes. See: U.S. Government Accountability Office, "Affordable Housing in Transit-Oriented Development: Key Practices Could Enhance Recent Collaboration Efforts between DOT-FTA and HUD," Report GAO-09-871 (2009.) In terms of employment, the Census Bureau's Longitudinal Employer-Household Dynamics program offers great opportunities for modelers to rely on free data for analysis, but the dataset is incomplete.

91. These programs are: New Starts Project Planning and Development, the Transportation Investment Generating Economic Recovery II grants, and the Partnership for Sustainable Communities grants.

92. Federal Transit Administration, "Advancing Major Transit Investments through Planning and Project Development, Part II – Project Justification and Local Financial Commitment Criteria," (U.S. Department of Transportation, 2003).

93. Title 49 U.S.C. 5335(a).

94. The ten modes are automated guideway, cable car, commuter rail, ferryboat, heavy rail, inclined plane, light rail, bus, monorail, and trolleybus.

95. Originally called Google Transit Feed Specification, General Transit Feed Specification's entire history can be found on the web: code.google.com/p/googletransit-datafeed/wiki/FeedSpecHistory.

96. A stop was always placed as close as possible to a block group or tract centroid. Since flag-a-bus systems stop anywhere, this increased transit coverage and job access by reducing walking times between origins or destinations and the nearest stop.

97. Of these 203 systems, 161 are Urban and 42 are Rural. Of those rural systems, 32 included fixed route services with headways of an hour or less.

98. Metro areas are analyzed separately. For a discussion of commuters who cross metropolitan boundaries, see Box 1 in the full report.

99. This distance is also consistent with U.S. Code of Federal Regulations regarding paratransit service requirements surrounding transit routes. See Title 49 § 37.131.

100. See, e.g.: Michael Iacono, Kevin Krizek, and Ahmed El-Geneidy, "Access to Destinations: How Close is Close Enough? Estimating Accurate Distance Decay Functions for Multiple Modes and Different Purposes" (Minnesota Department of Transportation, Research Services Section, May 2008).

101. In this case, randomized means travel is not always on the same five minute number. For example, a launch may occur at 6:03, 6:06, and 6:14. This contrasts with non-random launch times of 6:05, 6:10, and 6:15.

102. Due to metric qualifications, models only included commuter routes with service headways of one hour or less between 6:00 AM and 9:00 AM. Routes with longer headways would not deliver average travel times of 90 minutes or less.

103. This threshold (80 percent of AMI) is in keeping with U.S. Department of Housing and Urban Development definitions of "low income".

104. While there is no one definition of "middle" or "high" income, the 120 percent of AMI threshold has been used elsewhere in the literature to delimit these categories. See, e.g., Brookings Institution, "Getting to Market: Supermarket Access in Lower-Income Areas" (Washington, 2010). To ensure consistency in income benchmarks, 2010 AMIs were created by aggregating Pop-Facts 2010 block group data on the distribution of households by income to the metropolitan level. From there, linear interpolation was used to determine the metropolitan median, or AMI.

105. Brookings analysis of decennial census microdata from 1990 and 2000. The data were extracted from IPUMS. The 1990 census used SIC codes, while NAICS codes were used in the 2000 census. However, IPUMS recoded 2000 industry data to the 1990 SIC codes to preserve comparability. The industry designations by skill class hold for both 1990 and 2000.

106. High skill services include: business, educational, engineering and management, health, legal, miscellaneous, and social services; membership organizations; motion pictures; and museum, botanical, and zoological gardens. Low skill services include: amusement and recreation; auto repair, services, and parking; hotels and other lodging; miscellaneous repair services; and private household and personal services.

107. For a discussion of the effects of selecting different time thresholds, see Box 2 in the full report.

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For More Information

Adie Tomer
Senior Research Analyst
Metropolitan Policy Program at Brookings
202.797.6060
atomer@brookings.edu

Elizabeth Kneebone
Senior Research Associate
Metropolitan Policy Program at Brookings
202.797.6108
ekneebone@brookings.edu

For General Information

Metropolitan Policy Program at Brookings
202.797.6139
www.brookings.edu/metro

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BROOKINGS

1775 Massachusetts Avenue, NW
Washington D.C. 20036-2188
telephone 202.797.6000
fax 202.797.6004
web site www.brookings.edu

Metropolitan Policy Program
at BROOKINGS

telephone 202.797.6139
fax 202.797.2965
web site www.brookings.edu/metro