

Overview of Demographic Trends

Demographic data includes characteristics of a population such as age, sex, race, income, educational attainment and employment status. This data has a profound effect on business marketing strategies and location choices, as well as on public policy decisions and government funding allocations. Additionally, analysis of demographic trends plays a critical role in the planning process at all levels of government in areas including community and economic development and land use, transportation and environmental planning. This paper highlights a selection of demographic trends that are timely, and are likely to have significant impacts upon the future of the Baltimore region.

increased by eight years from 1980 to 2019, from 30.6 to 38.6. The Census Bureau projects that in 2034 the number of seniors will surpass the number of children for the first time. The share of seniors in the Baltimore region has risen as the share of children has declined. Meanwhile, the share of the population available to support these “dependent” cohorts is decreasing. These changes in age structure will affect the demand for age-specific services, as well as the region’s ability to fulfill future job growth and to support dependent populations.



Components of Population Change

Population change occurs through natural change (births and deaths) and net migration (international and domestic). Understanding the components driving growth can help guide the policies needed to meet regional growth expectations. The Baltimore region has mirrored national natural change trends, with declining fertility rates and an aging population translating to slowing population growth. International migration has been trending downward in the region since 2015 (and nationally since 2016). While rates vary by jurisdiction, domestic migration at the regional level has been negative for the past ten years. If the trends in the natural change component continue, positive regional population growth will be reliant upon attracting greater shares of international and domestic migrants.

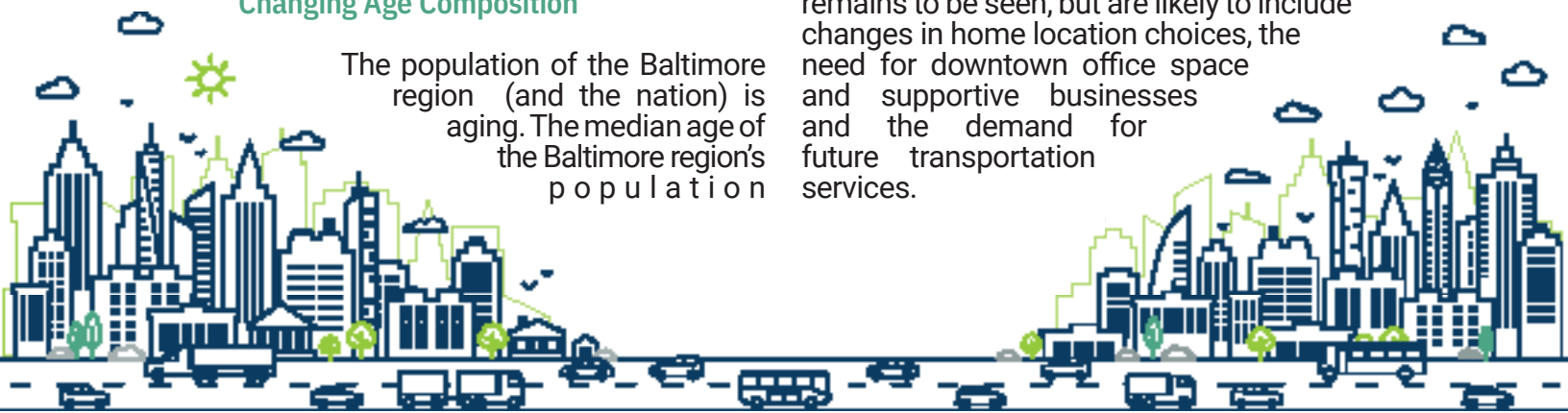
Work From Home Trends

Before the pandemic, the share of the population who worked from home was increasing, but was still a small share of all workers in the region (3.9% in 2010 and 5.6% in 2019). The pandemic brought on a large-scale work from home (WFH) experiment, where most jobs that could be performed remotely were performed remotely. Estimates from the American Community Survey indicate that WFH was the primary work arrangement for nearly 20% of the region’s population in 2020. However, while the share of workers that WFH has grown over time, there is variance in the rates of adoption by demographic characteristics of workers and by industry.

While it is certain that WFH adoption is higher than pre-pandemic years, and that WFH will continue to evolve and grow, it is likely that the rates will settle somewhere above pre-pandemic years but below the rates observed at the outset of the pandemic. The full breadth and scale of future impacts of the increase in WFH adoption remains to be seen, but are likely to include changes in home location choices, the need for downtown office space and supportive businesses and the demand for future transportation services.

Changing Age Composition

The population of the Baltimore region (and the nation) is aging. The median age of the Baltimore region’s population

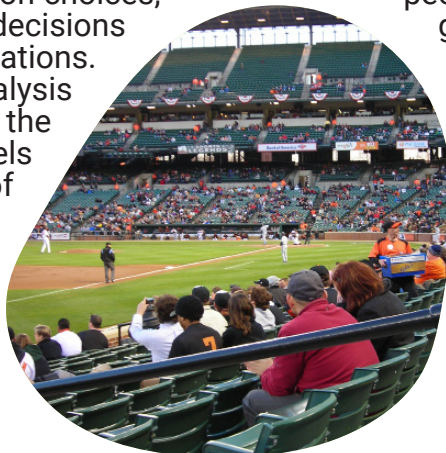


Demographic Trends

Introduction

The term demographics refers to the characteristics of a population, and includes information such as age, sex, race, income, educational attainment and employment status, among other data points. Demographic data helps to provide an understanding of the composition of a population, beyond a simple consideration of population size and growth. It also has a profound effect upon business marketing strategies and location choices, as well as upon public policy decisions and government funding allocations. Additionally, demographic analysis plays a critical role in the planning process at all levels of government. Planners of all types use demographic data, including community development, economic development, housing, environmental, land use and transportation planners.

The purpose of this paper is to highlight a selection of demographic trends that are timely and likely to have significant impacts upon the future of transportation in the Baltimore region. These are just a few among many demographic trends that could affect transportation in the Baltimore region over the next several decades, many of which may not yet be known. There are three topics presented in this paper:



- Components of Population Change explores factors driving future population growth in the Baltimore region, including births, deaths, and migration.
- Age Composition of the Population looks at the historic trends and projections of the age structure of the region's population over time.
- Work From Home Trends looks at how the pandemic accelerated a shift toward people working from home at greater rates. It explores the levels of work from home and pace of growth, the populations and industries associated with higher levels of work from home and the potential future scale of work from home.

Components of Population Change

In order to understand and plan for future transportation needs, planners start with a general question – what is the demand for future transportation services? To help answer this question, a population forecast is needed to estimate the future travel behavior and choices of all persons.

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Future population change can be estimated by understanding three components: 1) births, 2) deaths, and 3) net migration. Demographers refer to the difference between the number of births and deaths as the natural change in population. When births exceed the number of deaths in a given time period, an area's population increases, and decreases when the opposite is true. Likewise, migration has two components: persons moving in and persons moving out. When a greater number of people move to an area compared to moving out, the population increases, and decreases when the opposite is true. Persons migrating to the Baltimore region can be from either international (outside the USA) or domestic (from another state or Maryland jurisdiction) locations.

At its July 15, 2022 meeting, the Baltimore Regional Transportation Board (BRTB) endorsed the locally developed Round 10 Cooperative Forecasts (our [Socioeconomic Forecasting White Paper](#) provides details on the development process and summarizes demographic variables). The Round 10 forecasts include population, household and employment estimates through 2050. The forecasts extend through 2050 because the BRTB's upcoming Long-Range Transportation Plan (LRTP), *Resilience 2050*, includes a list of planned major federally funded capital projects that the region expects to implement by 2050. The forecasts are important inputs for the analysis of the potential impacts associated with these transportation projects.

The endorsed forecast indicates a slowing of regional population growth. The region's population during the prior three decades (1990 to 2020) grew by an average of 15,600 persons per year. Population in the region is forecast to grow by 12,000 persons per year over the next three decades (2020 to 2050). The region's slowing growth rate is consistent with national trends and projections from the U.S. Census Bureau indicating a reduction in the pace of growth (Census Bureau 2017). Why has the Baltimore region's population growth slowed? The region's components

pOPulation Trends: Interpreting Cohort Shifts (pOPTICS) Model Development

pOPTICS uses data from the Maryland Department of Health Vital Statistics Administration and the U.S. Census Bureau on births, deaths, and migration (population components of change) from 2010 to 2015. The pOPTICS spreadsheet uses these historical population trends to estimate the age and gender of the population in 5-year increments extending from 2025 to 2050. pOPTICS output is provided at the jurisdiction level and includes population by gender and 18 age cohorts (0-4, 5-9... .80-84,85+). The current model version does not include vital statistics inputs from pandemic years.

of population growth (births, deaths, and net migration) have and will continue to change. A spreadsheet-based cohort-component model (called "pOPTICS") was developed to explore and analyze the demographic data developed by the Cooperative Forecasting Group, including Round 10.

Natural Population Change

The region's population growth resulting from natural increase (births minus deaths) is projected to turn negative (natural decrease) as a result of an increasingly older population and declining births. Deaths are expected to exceed births around 2030.

The "Graying" of the Population

The region's population is becoming older. In 2010, persons 65 years of age and older comprised 13% (342,500/2,710,500) of the region's population. Persons 65 years of age and older increased 36% from 2010 to 2020 and comprised 16% of the population (466,400/2,848,900) in 2020. The pOPTICS component of change model estimates 1 in 5 persons (20%) in the region will be 65 years of age or older by 2030 (606,700/2,995,200). The

“graying” of the region’s population is a result of the “Baby Boomer” generation (born 1946 through 1964, currently between 58 and 76 years old) becoming seniors.

Fertility and Births

Demographers use Total Fertility Rates (TFR) to track and describe trends in births. During the “baby boom,” the U.S. recorded a TFR of 3.68 in 1957. The Population Reference Bureau reported a 2020 national TFR of 1.64, the lowest level on record (PRB 1). The declining TFR is a result of various societal shifts over the course of the past 65 years (including expanding education and employment opportunities for women, changing social norms and evolving gender roles). In the Baltimore region, births are estimated to decline through the year 2035. However, individual jurisdictions may experience an increase in births even with a declining national TFR, if their populations include larger shares of women in family formation ages.

Baltimore Region: Natural Increase, 2020-2050

HORIZON YEAR	BIRTHS	DEATHS	NATURAL INCREASE
2020	180,496	-145,822	34,674
2025	180,358	-161,386	18,972
2030	179,129	-180,186	-1,057
2035	178,451	-200,072	-21,621
2040	181,830	-217,442	-35,612
2045	185,521	-229,310	-43,789
2050	189,699	-234,935	-45,236

Source: BMC cohort component model (pOPTICS)

isolated to the Baltimore region. Almost three-quarters (73.1%) of U.S. counties had more deaths than births from July 1, 2020 to June 30, 2021, up from 55.5% during the same period a year earlier (Census Bureau 2022). While the COVID-19 pandemic contributed to increased mortality over that time period, the trends of an aging population and declining births were evident in the large share of U.S. counties experiencing natural decrease prior to the pandemic as well, with 45.5% experiencing more deaths than births in 2019.

Population Migration

Migration in and out of the Baltimore region has and will continue to be an important element of the region’s population change. The Round 10 forecasts predict that population in the Baltimore region will increase through the year 2050. With deaths soon anticipated to exceed births, forecasted Round 10 population growth assumes that more people will move into the Baltimore region compared to moving out (positive net migration).

International Migration

Baltimore region international migration continues to be a positive source of population growth. However, international migration to the United States has been in decline since

Total Fertility Rates

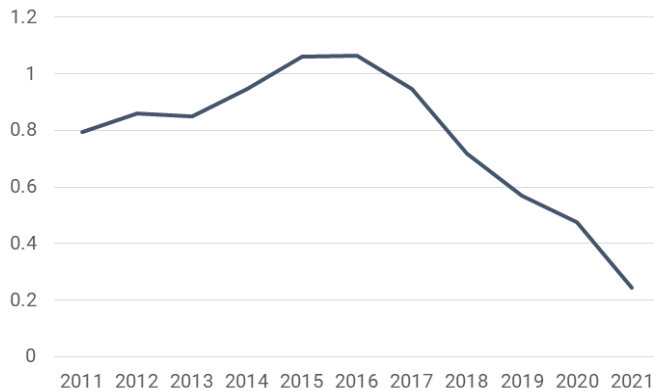
The Total Fertility Rate (TFR) is the average number of children that a woman would have over her lifetime if she were to live from birth through the end of her reproductive life, and she was to experience the current age-specific fertility rates through her lifetime. Demographers use a TFR of 2.10 as the minimal population replacement rate.

Natural Population Change through 2050

While both trends affect the natural change in population, the slowing of population growth is largely a result of the “graying” of the population. The last of the large “baby boomer” generation turn 65 in 2029. The region is expected to decline in population via natural population change from 2030 to 2050.

The expectation that deaths may soon exceed births is a change from past trends, but is not

Figure 1 - Net International Migration, United States (in millions)



Source: U.S. Census Bureau, Population Estimates Program (Vintage 2020 and 2021)

2016. The federal government monitors and reports on international migration. The nation had an international migration decade high of 1.05 million between 2015 and 2016. This decreased to 477,000 international migrating persons between 2019 and 2020. The decline in international migration preceded the COVID-19 pandemic. Border closures and travel restrictions between 2020 and 2021 further reduced net international migration to 247,000 (Schachter 2021).

The Census Bureau's Population Estimates Program (PEP) produces annual population estimates for the nation, states and counties based upon the demographic components of change. International migration is one of the data points considered and reported with the annual PEP estimates. The PEP reported 3,800 net international migrants to the Baltimore region in 2020, a 58% decline from the peak of 9,200 in 2015. Net international migration declined further to 2,000 in 2021. The nation and the region had similar rates of decline. It is unknown if or when the nation's net international migration will return to previous levels, or what share of the nation's international migrants will call the Baltimore region home.

Domestic Migration

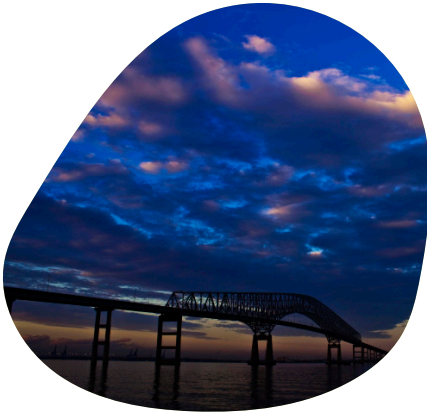
The percentage of people moving in the U.S. (known as the mover rate) has been declining and reached a historical low in 2021, according to the Census Bureau's Current Population Survey, Annual Social and Economic Supplement. The 2021 mover rate (8.4%) was less than half what it was in 1948 (Kerns-D'Amore, 2022). At a time when population growth via natural change is declining, the share of the population that are movers is slowing as well. The Baltimore region will need to become more attractive to a declining number of movers in order to meet population growth expectations.

U.S. Number of Movers and Mover Rates: 2017-2021

YEAR	TOTAL NUMBER OF MOVERS (IN THOUSANDS)	OVERALL MOVER RATE (PERCENT)
2017	34,902	11.0
2018	32,352	10.1
2019	31,371	9.8
2020	29,780	9.3
2021	27,059	8.4

Source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplement

The Census Bureau's PEP reports on net domestic migration in counties and regions. For the period July 1 2010 through June 30 2021, most Baltimore region jurisdictions experienced positive net migration on a cumulative basis, attracting more movers from other jurisdictions (inside and outside of the region and state) than the numbers that moved out. Baltimore City and Baltimore County experienced negative net domestic migration for the time period. This means that a greater number of residents moved to other jurisdictions compared to those moving in. Regardless of the movement of residents within the Baltimore region, net domestic migration has been negative at the regional level since 2013. This means that more people moved out of the Baltimore region



than moved to it on an annual basis for the subsequent eight years.

Projected Population Growth

There are only three sources of population change: births, deaths and net migration. Declining TFR below replacement levels (2.10), combined with an aging population will result in reduced population growth via natural change for the region. This is anticipated to become negative (natural decrease, as deaths exceed births) around 2030. In this scenario, positive regional population growth is contingent upon attracting domestic and international migrants, while retaining current residents.

Components of Population Change, Transportation and Resilience 2050

Based upon recent demographic trends, including an aging population and declining birth rates resulting in a negative natural population change, the Baltimore region's future population growth will be dependent upon migration (both international and domestic). These trends and observations are important in transportation planning, as both the size (number of persons) and population characteristics (working vs. retired and adult vs. child, for example) affect travel demand. A few relevant questions include:

- If Baltimore region seniors choose to stay and age in place, how might this choice affect travel?
 - » Will Vehicle Miles Traveled (VMT) decrease? VMT might decrease as fewer seniors are employed and many age-out of their ability to drive safely.
 - » There may be an increase in demand for off-peak alternative transportation services related to medical and social appointments.
- If migration is to drive future regional population growth, who are the migrants and where will they choose to live?
 - » What will migrants' ages and household structure look like (number of workers and dependents), since larger households produce more travel?
 - » Where will migrants choose to live - urban, suburban or rural areas? Will migrants' residential location choices continue the region's sprawling residential pattern (and increase demand for automobile infrastructure improvements)? Or will migrants' residential location choices cluster in densely populated urban neighborhoods served by non-automobile modes (transit, walking and biking)?

Future demographic composition is uncertain since many factors affect components of population change. As the region's population growth slows, population characteristics (working vs. retired, adult vs. child) will play an increasingly important role in determining transportation service needs.

- How many schools might a jurisdiction need in the future?
- What will be the demand for senior services and facilities?
- What kinds of adjustments to the transportation system will help to accommodate the changing age structure?

Age Composition of the Population

When attempting to understand the current and future needs of the population of a given area, it is important to consider not only the size of the population, but also the characteristics of the population. One of the characteristics that is critical in planning to accommodate the future needs of a population is its age structure. For example, understanding the age structure of the population can help planners anticipate the demand for age-specific government services such as:

Understanding the age composition of the population can also help inform analyses regarding the future of the economy such as:

- Are there enough workers to fill jobs and to support dependent populations?
- If not, how can we attract more workers to live in the region?
- If workers are not living in the region, are they able to travel efficiently to jobs in the region?

The population of the United States is aging. National population projections from the

Figure 2 - Median Age by Jurisdiction, 1980-2019

JURISDICTION	1980	1990	2000	2010	2019	CHANGE 1980-2019	
						NUMERIC	PERCENT
Anne Arundel County	29.3	32.8	36.0	38.4	38.5	9.2	31%
Baltimore City	30.2	32.7	35.0	34.4	35.9	5.7	19%
Baltimore County	32.4	35.2	37.7	39.1	39.5	7.1	22%
Carroll County	30.7	33.4	36.9	41.1	42.4	11.7	38%
Harford County	28.9	32.2	36.2	39.4	41.1	12.2	42%
Howard County	30.1	32.3	35.5	38.4	38.9	8.8	29%
Queen Anne's County	32.5	35.6	38.8	42.6	39.0	6.5	20%
Baltimore Region	30.6	33.3	36.3	38.2	38.6	8.0	26%
Maryland	30.3	33.1	36.0	38.0	39.0	8.7	29%
United States	30.0	33.0	35.3	37.2	38.5	8.5	28%

Source: U.S. Census Bureau Decennial Censuses and American Community Survey, Tables B01002, K200103; NHGIS, University of Minnesota

Census Bureau indicate that in 2034, for the first time in history, the number of seniors (persons 65 and older) will surpass the number of children (persons younger than 18) (Vespa 2018). A variety of factors contribute to the demographic shift, several of which were discussed in the previous section. These include the large size of the aging “baby-boomer” generation, advances in science and medicine that have resulted in longer lifespans, as well as declines in fertility rates largely due to differences in family formation preferences (many are having fewer children later in-life).

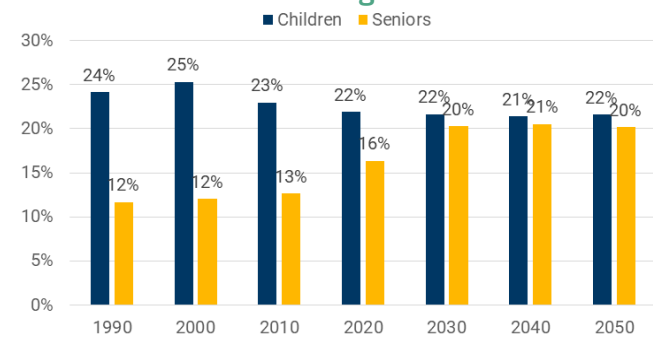
The population in the Baltimore region is aging as well. Figure 2 (on the previous page) provides information on the growth of the median age of the population in the Baltimore region, the pace of growth over time and some geographical context.

Figure 2 shows that the median age of the population in the Baltimore region increased by eight years (26%) over the nearly 40-year time period. This is just slightly slower than the median age growth for Maryland and the United States. The county-level data shows great variation in median age, with a 2019 low of 35.9 years in Baltimore City, and a high of 42.4 years in Carroll County. The pace of growth between jurisdictions also varies, with Baltimore City showing the smallest increase in median age of 19%, compared with the largest increase of 42% in Harford County. It’s worth noting that the most densely populated jurisdiction (Baltimore City) had both the lowest and smallest increase in median age, and two of the region’s more rural jurisdictions (Carroll and Harford Counties) had both the highest and largest increases in median age over time. This may present challenges related to transportation service needs, as transit options are often limited in rural areas, and seniors in these locations that cannot drive may require assistance getting to medical appointments and accessing other key services.

While the median age is helpful to get a general sense of the age of a population, it does not provide much detail regarding the age

distribution of the population. When analyzing the current and projected age structure of a population, it can be helpful to understand the shares that are children and seniors, as well as the shares that are of working age. These shares have significant impacts upon the economy. There are a few differing definitions of the age groups that are considered to be economically dependent populations. For the purposes of this analysis, dependent populations are comprised of children (persons younger than 18) and seniors (persons 65 and older). The working age population consists of those between 18 and 64 years old.

Figure 3 - Share of Population that are Children and Seniors: Baltimore Region

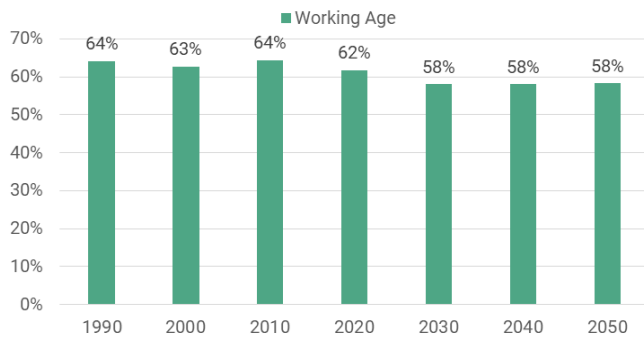


Source: U.S. Census Bureau (Decennial Censuses, American Community Survey); BMC cohort component model (pOPTICS)

Figure 3 illustrates a decline in the share of the population that are children and an increase in the share that are seniors. By 2030, it is projected that the share of the population that are children and seniors will be nearly the same after many years of the share of children far exceeding that of seniors. In particular, the share of the population that were children was double the share that were seniors from 1990 to 2000.

Another consideration is the observed decline in the share of the population that is of working age, depicted in Figure 4. In 1990, the share of the population in the Baltimore region that was of working age stood at 64%. It declined to 62% in 2020 and is projected to drop further to 58% from 2030 through 2050. This decline prompts a number of important questions for planners,

Figure 4 - Share of Population that is Working Age (18-64): Baltimore Region



Source: U.S. Census Bureau (Decennial Censuses, American Community Survey); BMC cohort component model (pOPTICS)

government officials, economic development professionals and businesses such as:

- Is the projected size of the working age population adequate to accommodate future job growth?
- Is the projected size of the working age population adequate to support the increase in the dependent population?
- Are adjustments necessary to accommodate changes in the demand for services that could accompany smaller shares that are children and working age and larger shares that are seniors?
- Will adjustments be necessary to help increase the size of the employed population, such as attempts to attract additional workers or to increase labor force participation rates?

Analysis of the age composition of the population can also help inform an understanding of the demand for travel. Two of the most significant age-related factors to consider are the presence of senior populations and the number and share of households with workers and children present. For example, senior populations tend to generate fewer trips, as seniors are less likely to be in the labor force and to have

children present in their households. Larger households with both workers and children tend to generate more trips, as work and child escort trips increase travel demand. These age-related differences in travel behavior and choices are accounted for in the region's travel demand modeling efforts.

Work From Home Trends

In the decade prior to the Covid-19 pandemic, working from home (WFH) experienced significant growth, but still represented only a small portion of the workforce. The Census Bureau's American Community Survey (ACS) asks a question regarding means of transportation to work (How did this person usually get to work LAST WEEK?), where one of the multiple choice options is "Worked from home." Between 2010 and 2019, the share of respondents in the Baltimore region indicating that they worked from home increased from 3.9% to 5.6%, an increase of 53%. It is important to note that the WFH share presented in the ACS is likely a lower bound for an estimate of the number of workers that work remotely. The question refers to the "usual" means of transportation, and thus accounts for only

Figure 5 - Means of Transportation to Work: Baltimore Region, 2010 and 2019

MODE	2010	2019
Car, Truck or Van	86.1%	84.6%
Public Transportation (excluding taxicab)	6.3%	5.9%
Taxicab/Motorcycle/Other	1.0%	1.3%
Bicycle	0.2%	0.3%
Walk	2.5%	2.4%
Work From Home	3.9%	5.6%

Source: U.S. Census Bureau, American Community Survey 1-Year Estimates, Public Use Microdata Sample

those that have WFH as their primary work arrangement at the exclusion of many of those that may work from home on a hybrid basis.

Then came the COVID-19 pandemic in early 2020, and the immediate impacts upon employment and WFH adoption. The onset of the pandemic brought with it a large-scale WFH experiment, where most jobs that could be performed remotely were performed remotely. An economics working paper from the Hoover Institution states that “Americans, for example, supplied roughly half of paid workhours from home between April and December 2020, as compared to five percent before the pandemic” (Barrero, 1). The Current Population Survey (CPS), a monthly household survey conducted for the Bureau of Labor Statistics, added questions to their survey to attempt to quantify the scale of the transition to WFH at the outset of the pandemic. The CPS found that in May 2020, 35.4% of employed workers “teleworked because of the coronavirus pandemic” (BLS 2020). While there are differences in the measurements of the scale of the transition to WFH during the pandemic (and the methods utilized in their development), there is agreement that there has been a marked rise in WFH adoption.

Who is Working From Home?

There are multiple governmental sources and surveys regarding WFH behavior. The supplemental questions added to the CPS were helpful in providing a sense of the scale of the shift to WFH at the beginning of the pandemic. However, these questions focused on those that worked from home “because of the coronavirus pandemic” and did not capture those that might have worked from home for other reasons or preferences. CPS questions were also time limited in that they only began in 2020. On the other hand, the Census Bureau’s ACS has annually captured detailed information on commutation, including WFH, for over

Figure 6 - Share of Workers that Worked From Home: Baltimore Region

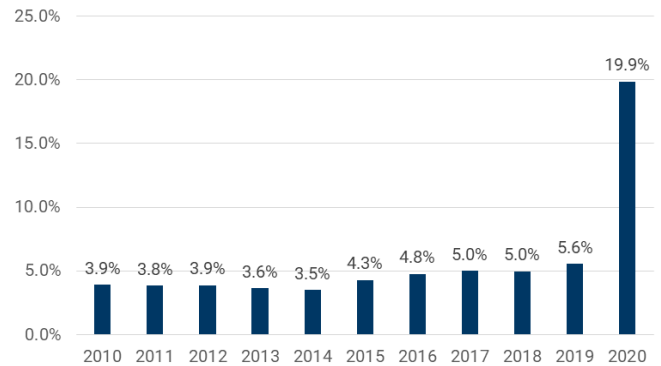


Figure 7 - Share of Workers that Worked From Home by Sex: Baltimore Region

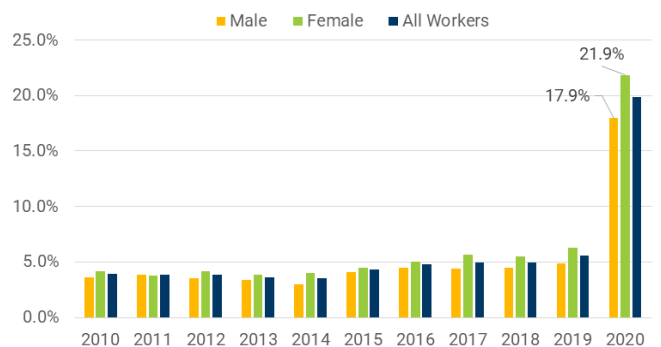
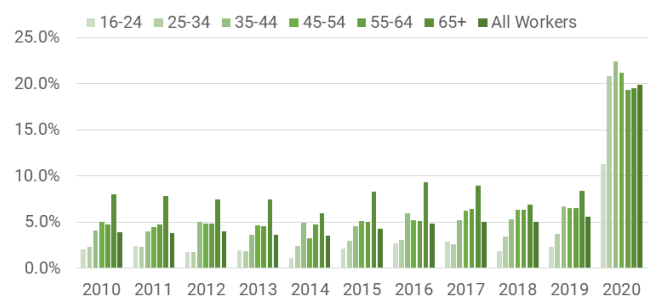


Figure 8 - Share of Workers that Worked From Home by Age: Baltimore Region



Source: U.S. Census Bureau, American Community Survey 1-Yr Estimates, Public Use Microdata Sample Files

Figure 9 - Share of Workers that Worked From Home by Race: Baltimore Region

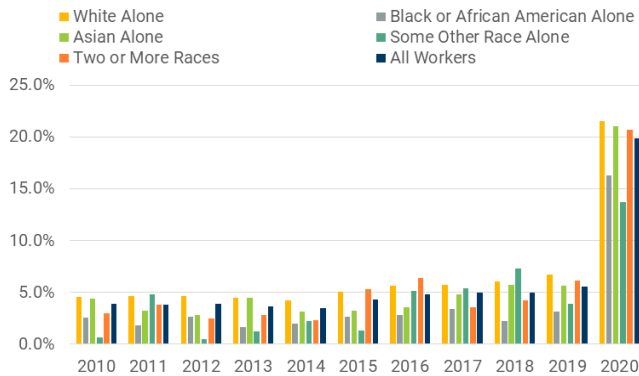


Figure 10 - Share of Workers that Worked From Home by Educational Attainment: Baltimore Region

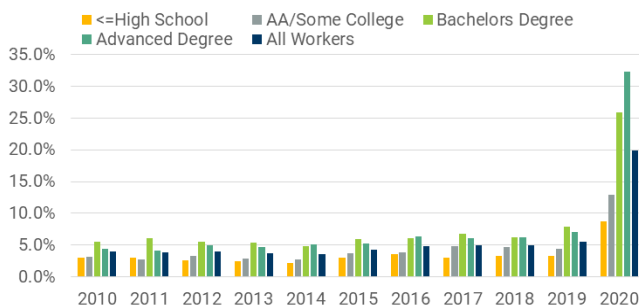
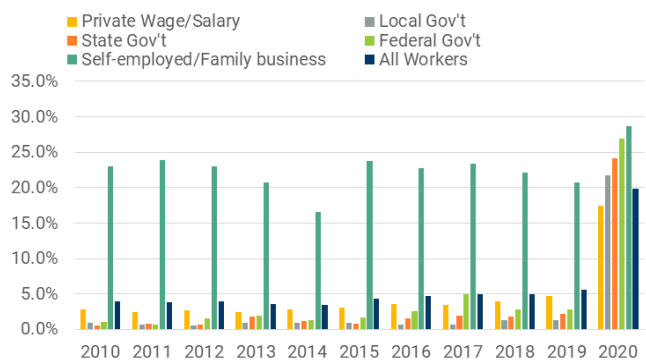


Figure 11 - Share of Workers that Worked From Home by Class of Worker: Baltimore Region



Source: U.S. Census Bureau, American Community Survey 1-Yr Estimates, Public Use Microdata Sample Files

15 years. ACS data also captures additional details regarding the demographics and location of those that WFH. The trend analysis presented here is based upon the ACS due to its consistency, demographic detail and geographic coverage.

To gain a basic understanding of the trend in WFH adoption from 2010 through 2020, Figure 6 displays the share of workers 16 years and over in the Baltimore region that worked from home.

Figure 6 illustrates slow-paced growth in the share of workers that WFH through 2019, with a sharp increase in 2020 as the pandemic began. Note that while the increase in annual 2020 data is dramatic (reaching 19.9%), it is well below the monthly share reported by the CPS (35.4% in May 2020) and some private sector sources during the peak of the pandemic-associated closures. The disparities in measure are largely due to differences in methods and definitions of WFH. For example, the ACS figures are annual (rather than a figure from a peak month) and they provide a more conservative estimate of workers that WFH than some other measures, as only hybrid workers that “usually” work from home are included.

The Census Bureau’s ACS data give an indication of not only the scale of the population that WFH, but also present details regarding the characteristics of the population that WFH. The charts in this section provide information on selected characteristics of the population in the Baltimore region engaged in WFH over time, including sex, age, race, educational attainment, class of worker and industry of employment.

Figure 7 indicates that a greater proportion of women WFH than men. The gap was generally smaller in the earlier years of the time period, but grew to over one percentage point from 2017 through 2019 and increased further in 2020 when 21.9% of women and 17.9% of men worked from home.

Figure 8 shows that prior to the pandemic, the share of the population that WFH generally increased with age, with a substantial jump from the 55-64 to the 65+ age category. However, once the pandemic began in 2020, workers from 25 to 54 had the greatest shares engaged in WFH.

Figure 9 indicates that the White Alone, Asian Alone and Two or More Races categories generally have greater shares of their populations that WFH than do the Black or African American Alone and Some Other Race Alone categories. All race categories showed an increase in the share working from home over the course of the time period – even when the pandemic year 2020 is excluded.

Figure 10 shows the share of workers that WFH by their educational attainment levels. It is clear in the chart that educational attainment (which is closely linked to household income levels) is correlated with WFH, with higher levels of educational attainment (Bachelor's Degree and Advanced Degree) associated with greater shares of WFH. The gaps between the shares that WFH in lower versus higher educational attainment levels had been fairly consistent through most of the time period (2010-2018), but became more pronounced in 2019 and even more so in 2020.

“Class of Worker” refers to the type of ownership of the employing organization and identifies whether the worker is employed by the private sector, government, or is self-employed. Figure 11

indicates that self-employed/family business workers have the highest rates of WFH. In fact, the Self-employed/family business workers accounted for over 40% of all workers that worked from home from 2010 through 2017. In the years prior to the pandemic, private sector workers had the next highest rates of WFH, followed by federal, state and local government workers (in that order). In 2020, WFH adoption increased dramatically for all classes, with the order shifting as government workers (at all levels) surpassed the private sector in terms of the share of workers that worked from home.

Figure 12 depicts an analysis of ACS data on the share of workers that WFH by industry. This analysis reveals substantial variation across industries.

Figure 12 shows that while all industries showed growth in 2020 in the share of workers that WFH, some industries have much higher rates than others, both before and during the pandemic. Industries such as Agriculture, Forestry, Fishing, Hunting & Mining; Professional and Scientific, Management, Admin & Waste Management Services; Finance and Insurance & Real Estate; and Information were industry leaders in the share of workers that WFH in the years prior to the pandemic, and continued to be in 2020. The Information and Public Administration sectors had the largest increase in share of workers that WFH from 2019 to 2020. Information

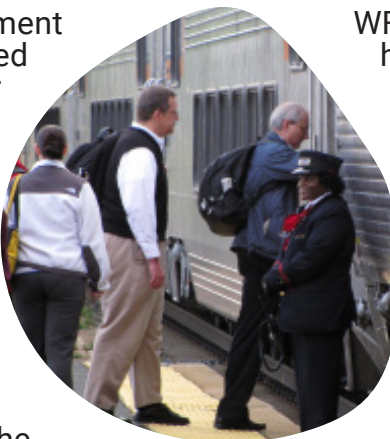


Figure 12 - Percentage of Workers that Worked From Home by Industry: Baltimore Region

INDUSTRY	2012	2013	2014	2015	2016	2017	2018	2019	2020
Agriculture, Forestry, Fishing, Hunting & Mining	9.8%	5.6%	6.5%	28.3%	10.8%	13.4%	13.3%	15.9%	21.1%
Construction	3.4%	4.1%	2.3%	4.0%	4.3%	4.0%	3.7%	5.5%	9.0%
Manufacturing	3.6%	3.3%	3.7%	4.3%	5.7%	6.1%	5.3%	3.1%	14.2%
Wholesale Trade	4.2%	3.8%	5.5%	9.3%	5.5%	7.5%	7.4%	3.8%	16.2%
Retail Trade	2.2%	2.4%	2.2%	2.6%	2.7%	2.5%	3.1%	2.8%	9.6%
Transportation and Warehousing & Utilities	2.0%	1.9%	1.5%	4.4%	3.1%	1.8%	3.5%	4.2%	11.1%
Information	6.6%	4.8%	9.5%	11.6%	10.8%	10.5%	6.1%	10.8%	39.4%
Finance and Insurance & Real Estate	7.2%	4.0%	3.9%	6.3%	8.0%	8.0%	8.3%	11.2%	31.0%
Professional and Scientific, Management, Admin & Waste Management Services	9.0%	8.1%	7.0%	8.9%	9.0%	9.6%	10.1%	13.3%	31.5%
Educational Services & Health Care and Social Assistance	2.6%	2.6%	2.9%	2.4%	3.4%	3.5%	3.0%	3.7%	18.4%
Arts, Entertainment and Recreation & Accommodation, Food Services	2.7%	3.5%	1.5%	2.1%	2.2%	3.2%	4.0%	1.8%	12.0%
Other Services (except public admin)	4.6%	3.1%	6.7%	5.4%	7.4%	6.0%	6.4%	4.8%	19.8%
Public Administration	0.7%	1.7%	1.3%	1.2%	1.8%	3.5%	2.6%	2.1%	24.2%
All Workers	3.9%	3.6%	3.5%	4.3%	4.8%	5.0%	5.0%	5.6%	19.9%

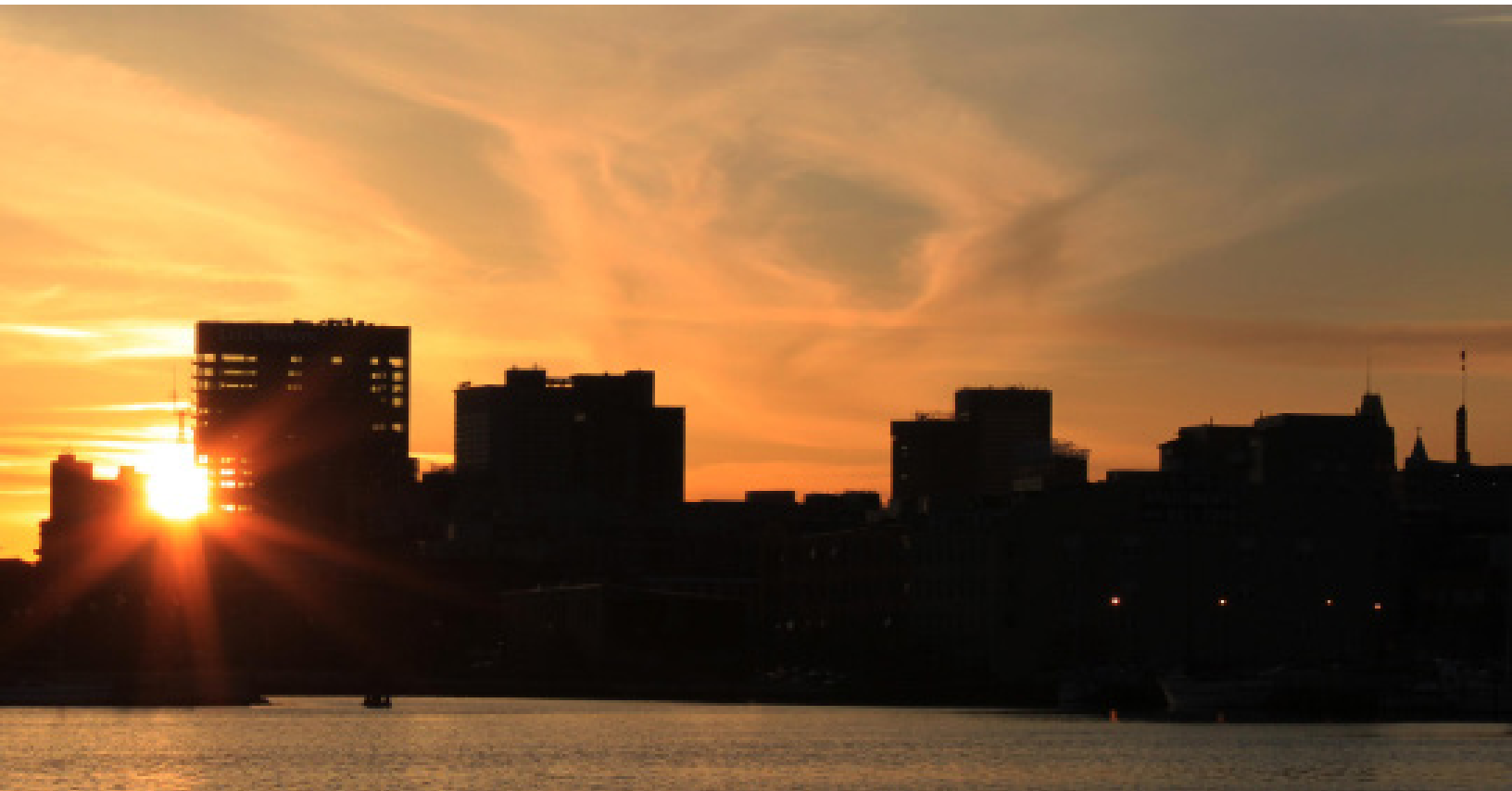
increased nearly four-fold from 10.8% to 39.4%, and Public Administration increased by nearly twelve times from 2.1% to 24.2%. Industries that are more reliant upon customer interaction or otherwise require in-person work, such as Arts, Entertainment and Recreation & Accommodation and Food Services; Retail Trade; Construction; and Manufacturing had lower shares of WFH.

The ACS data shows that while the share of workers that WFH has grown over time, there is variance in the rates of adoption by demographic characteristics and by industry.

While the rapid adoption of WFH at the onset of the pandemic has been widely reported, the longer-term post-pandemic future of WFH is less clear.

Future of WFH

According to a University of Chicago study, approximately 37% of jobs in the United States can be performed entirely at home (Dingel 2). As the pandemic-related public health measures began to subside, many workers that were able to WFH continued to do so,



due to preference rather than mandate. A Pew Research Center study from February 2022 found that “. . . roughly six-in-ten U.S. workers who say their jobs can mainly be done from home (59%) are working from home all or most of the time.” The same study indicated that for those that telework and have a workplace outside the home (and were working from home all or most of the time), 61% were now choosing to not go into the workplace, while 38% indicated that their workplace was closed or unavailable (Parker 4).

While the specific rates of adoption in the future may be uncertain, it is clear that WFH is more than a short-lived response to a public health crisis. The question is not about whether WFH will continue, but rather about its scale (number of workers) and frequency (number of days per week). A study from the Federal Reserve Bank of St. Louis attempts to

quantify what WFH adoption might look like in post-pandemic years compared with pre-pandemic years. A quantitative model used in the study suggests that twice as many workers may WFH full-time post-pandemic compared with pre-pandemic times (14.6% vs 7.5%), that 51.3% of the workforce would have the option to at least partially WFH and that 21.3% of all workdays would be WFH (Bick 31-32).

While it is certain that WFH adoption is now higher than in pre-pandemic years, and that WFH will continue to evolve and grow, it is likely that the rates will settle somewhere above pre-pandemic years, yet below the rates observed at the outset of the pandemic. While many more people will WFH than before the pandemic, it is still anticipated to comprise a relatively modest share of all work.

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WFH, Transportation and *Resilience 2050*

While it is beyond the scope of this paper to analyze and quantify potential impacts of WFH adoption on transportation in the future, there are a variety of potential effects that warrant additional consideration, including:

- Travel Differences: What are the differences in trip rates generated by WFH workers? If there is a reduction in trips to the workplace, are other trips taken in their place (kids/errands/other) and with what frequency? What is the overall impact on Vehicle Miles Traveled (VMT) (Up/Down)?
 - » What are the implications for traffic volume and transit?
 - » What does expansion of WFH mean to future funding for transportation? Would gas tax revenue decline?
- Changes in Home Location Choice: For those that can WFH full-time or on a hybrid basis, the reduction in frequency of commute may lead some to consider living farther from their traditional work location. Will WFH increase sprawl? What are the implications to future land use?
- Impacts upon Downtowns
 - » Will there be reduced demand for downtown office space and if so, what are the potential effects? Will rents decrease? Will adaptive reuse of some office buildings that are no longer viable increase?
 - » Will there be reduced demand for office-supportive businesses (such as restaurants) that primarily rely on office workers?
- Equity Considerations: Many of the jobs that are WFH capable are not accessible to all. For example, educational attainment and income are strong predictors of the ability to work from home. Will low-income individuals and those with lower educational attainment be able to access opportunities enabling them to transition into WFH careers if they would like? Will adequate service be available for those that must commute to work by transit?

The BRTB looks forward to continuing to monitor trends and projections related to the expansion of WFH across the country and within the Baltimore region. Consideration of the size, location and characteristics of the WFH segment of the workforce will be important for future land use and transportation planning efforts.



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