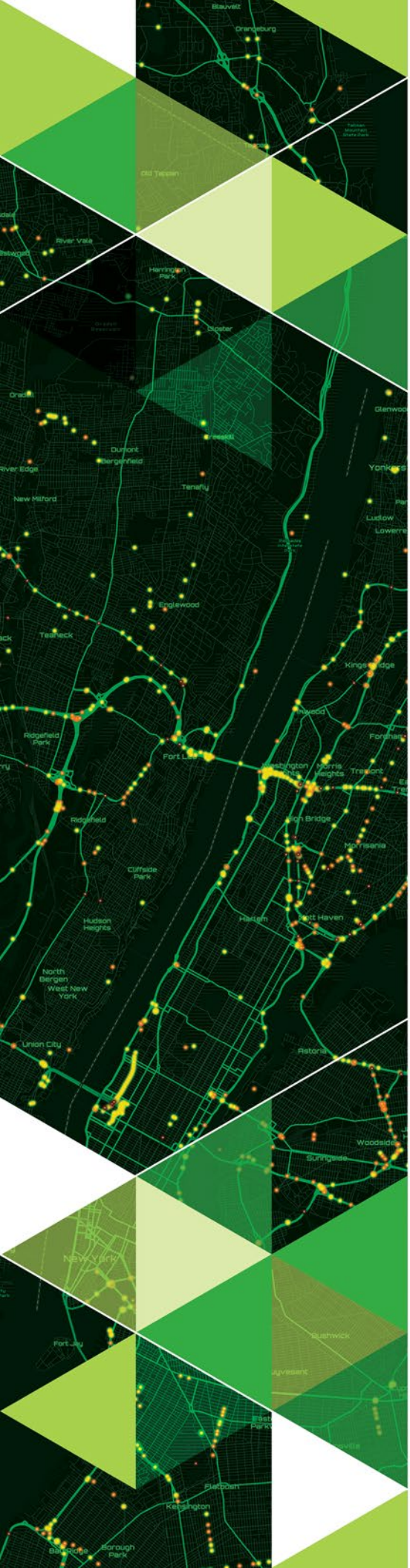

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TECHNICAL PAPER

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Methodology statement: 2024/2029 Esri Updated Demographics

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Methodology statement: 2024/2029 Esri Updated Demographics

Data vintage and variables

Esri's 2024/2029 release of Updated Demographics incorporates detailed Census 2020 data from the Demographic and Housing Characteristics (DHC) file. Last year's data release used Census 2020 P.L. 94-171 data to update the population, housing, race, and ethnicity universes. This year, information from the Census 2020 DHC file was used in full, which now allows rebasing to the more current age, tenure, and family decennial table universes. As such, Esri's 2024/2029 age-, tenure-, and family-related data tables may show a demographic shift due to the incorporation of the new census base profiles.

This release of Updated Demographics includes two new data tables. First, estimates and projections are now available for Contract Rent. This table includes counts of renter-occupied households binned by a 13-interval distribution that also includes median and average summary statistics. The 2024 Labor Force table expands its dimensionality with the inclusion of a new race distribution. These new variables describe the civilian population age 16 years and older that are employed or unemployed allocated across Esri's seven primary race categories.

The 2024/2029 Updated Demographics geography has been updated to include the spatial, name, and code changes for Connecticut's nine new county-equivalent boundaries. For users who rely on custom trade areas, the 2024/2029 Updated Demographics release includes methodological improvements in apportionment that use sub-block information for more accurate allocation of attributes.

The demographic updates are point estimates representing July 1 of the current and forecast years. The following table summarizes the updated demographic variables. Also included are select averages, medians, aggregates, and per capita values.

	Updated Demographics	2024	2029
Totals	Total Population	✓	✓
	Daytime Population	✓	
	Time Series	✓	
	Households	✓	✓
	Household Population	✓	✓
	Family Population	✓	✓
	Family Households	✓	✓
	Group Quarters Population	✓	✓
	Housing Units	✓	✓
	Owner-Occupied Housing Units	✓	✓
	Renter-Occupied Housing Units	✓	✓
	Vacant Housing Units	✓	✓
Population Characteristics	Population by Five-Year Age and Sex	✓	✓
	Population by Single-Year Age and Sex	✓	✓
	Population by Age, Sex, and Race	✓	✓
	Population by Age, Sex, and Hispanic Origin	✓	✓
	Employed & Unemployed Population 16+	✓	
	Employed & Unemployed Population 16+ by Age Group	✓	
	Employed & Unemployed Population 16+ by Sex Group	✓	
	Employed & Unemployed Population 16+ by Race Group	✓	
	Employed Population 16+ by Industry	✓	
	Employed Population 16+ by Occupation	✓	
	Population 25+ by Educational Attainment	✓	
	Population 15+ by Marital Status	✓	
	Population by Generation	✓	✓
Housing Characteristics	Households by Income	✓	✓
	Households by Income and Age of Householder	✓	✓
	Households by Disposable Income	✓	
	Households by Disposable Income and Age of Householder	✓	
	Households by Net Worth	✓	
	Households by Net Worth and Age of Householder	✓	
	Owner-Occupied Housing Units by Home Value	✓	✓
	Renter-Occupied Housing Units by Contract Rent	✓	✓
	Households by Income Tier	✓	✓

	Updated Demographics	2024	2029
Indexes and Measures	Diversity Index	✓	✓
	Housing Affordability Index	✓	
	Socioeconomic Status Index	✓	
	Percent of Income for Mortgage	✓	
	Gini Index of Income Inequality	✓	✓
	Interdecile Ratios of Income Inequality	✓	✓
	Share Ratios of Income Inequality	✓	✓
	Wealth Index	✓	
	Age Dependency Ratio	✓	✓
	Child Dependency Ratio	✓	✓
	Senior Dependency Ratio	✓	✓
	Economic Dependency Ratio	✓	
	Child Economic Dependency Ratio	✓	
	Working-Age Economic Dependency Ratio	✓	
	Senior Economic Dependency Ratio	✓	

Census 2020

Esri Updated Demographics incorporates the data from Census 2020 as it becomes available. Esri's 2023/2028 release of Updated Demographics used Census 2020 Redistricting Data (P.L. 94-171) to update the base universes for tables covering race, ethnicity, population above and below 18 years of age, housing, and group quarters. The U.S. Census Bureau released the Census 2020 Demographic and Housing Characteristic (DHC) file in May 2023. DHC is the successor to Summary File 1 from Census 2010 and provides rich, detailed data from the 2020 Census count.[1] Information from the 2020 DHC file is used to update age-, tenure-, and family-related tables in Esri's 2024/2029 release of Updated Demographics.

Note that the following tables have been adjusted to reflect a new Census 2020 base:

- Population by Five-Year Age and Sex
- Population by Single-Year Age and Sex
- Population by Age, Sex, and Race
- Population by Age, Sex, and Hispanic Origin
- Employed and Unemployed Population 16+
- Employed and Unemployed Population 16+ by Age Group
- Employed and Unemployed Population 16+ by Sex Group
- Employed Population 16+ by Industry
- Employed Population 16+ by Occupation
- Population 25+ by Educational Attainment
- Population 15+ by Marital Status
- Population by Generation
- Households by Income and Age of Householder
- Households by Disposable Income and Age of Householder
- Households by Net Worth and Age of Householder
- Age Dependency Ratio, Child Dependency Ratio, and Senior Dependency Ratio

[1] Information on the Census 2020 data products and Esri's value add.

- Economic Dependency Ratio, Child Economic Dependency Ratio, Working-Age Economic Dependency Ratio, and Senior Economic Dependency Ratio
- Owner-Occupied Housing Units and Renter-Occupied Housing Units
- Owner-Occupied Housing Units by Home Value
- Family Population
- Family Households

U.S. trends

The U.S. population increased at an annual rate of 0.71 percent from 2010 to 2020, a growth of about 2.3 million people per year. This is the slowest rate of population growth since the 1930s and the second slowest in the nation's history. This deceleration is, in part, a reflection of declining fertility rates and an aging population. From 2020 to 2024, the U.S. population continued this reduced annualized pace at 0.49 percent due again to lower fertility rates and excess deaths associated with the COVID-19 pandemic.[2]

Following the Great Recession, the housing market experienced a slow and steady recovery, resulting in an occupancy rate increase from 88.6 percent in 2010 to 90.3 percent in 2020 and a decline of more than 130,000 vacant units annually. This rate remained relatively stable at 90.0 percent for 2024. Unlike the trends seen from 2000 to 2010, household (occupied housing unit) growth outpaced total housing unit growth from 2010 to 2020. Housing units grew at an annual rate of 0.65 percent (approximately 879,000 annually) while households increased by 0.83 percent per year (1 million annually). From 2020 to 2024, the annual rate of change for housing units and households was 0.78 and 0.72 percent, respectively. This amounts to approximate annual increases of 1.1 million housing units and 920,000 households.

The larger 2010–2020 growth rate increase for households compared to total population corresponds with the overall decline in the average persons per household, which dropped to 2.55 in 2020 from 2.58 in 2010. This is an acceleration of the declining trend from the previous decade's measurement of 2.59 persons per household in 2000. This decline continues in 2024 with an estimated 2.53 average persons per household. Contributing factors to this current trend include delayed childbearing and increases in the share of both individuals living alone and single-parent households.

[2] CDC National Center for Health Statistics - Excess Deaths Associated with COVID-19.

Summary totals

Forecasting change in the size and distribution of the household population begins at the county level with several sources of data. Esri incorporates intercensal time series and vintage-based county estimates from the U.S. Census Bureau. Because testing has revealed improvement in accuracy by using a variety of sources to track county population trends, Esri uses building permits, housing starts, and residential postal delivery counts. Beginning with this decade, Esri has modeled housing demolitions using data from the American Housing Survey (AHS). This view of housing is paired with a cohort survival approach to model changes to the population based on demographic composition. The end result balances the measures of growth or decline from a variety of data series.

Measuring change in population or households at the county level is facilitated by the array of data reported for counties. Unfortunately, current data is not reported at the block group level. Past trends can be calculated from previous census counts. The American Community Survey (ACS) provides five-year averages. However, these sources are not recent. To measure current population change by block group, Esri models the change in households from multiple sources: Experian; the U.S. Postal Service (USPS); Zonda, a Hanley Wood company; and RealPage, in addition to several ancillary sources.

The USPS publishes monthly counts of residential deliveries for every U.S. postal carrier route. This represents the most comprehensive and current information available for small, subcounty geographic areas. Carrier routes are a fluid geographic construct that is redefined continuously to incorporate real changes in the housing inventory and occupancy plus administrative changes in staffing and budgets of local post offices.

Converting delivery statistics from postal carrier routes to census block groups is a complex challenge. Carrier routes are defined to deliver the mail, while block groups are constructed to collect and report census data. Comparing two areas that are defined for wholly different purposes provides one significant conversion issue. Carrier routes commonly overlap multiple block groups. In many cases, a carrier route encompasses disjointed areas that can be distant from each other, but block groups are rarely divided into multiple polygons. These overlaps require an effective method of allocating the postal delivery counts across multiple block groups.

Esri has developed a technique to link carrier routes to the correct block groups—using the actual locations of mail deliveries. Esri's proprietary Address Based Allocation (ABA) methodology was developed to solve the complex challenge of converting delivery counts from carrier routes to block groups. This allocation method assigns carrier routes using household addresses that are geocoded at the block level to serve as the foundation for the conversion. The approach is unbounded by geographic borders or arbitrary assumptions about the distribution of households or postal deliveries. ABA results have been tested extensively against decennial census counts, including an independent evaluation that involved data from four other vendors. This test confirmed the accuracy of Esri's ABA allocation method.[3] Another accuracy evaluation was conducted after the release of Census 2020 counts,

[3] Esri Vendor Accuracy Study: 2010 Estimates versus Census 2010

highlighting improvements over the past decade and further validating the ABA technique.[4]

For more than a decade, Esri has licensed data from Zonda to track new residential construction for owned dwellings such as single-family homes and condominiums in the top U.S. housing markets. This database identifies the location and characteristics of individual construction projects, including total units planned, under construction, and closed by type of housing. This data is especially critical in tracking growth in previously unpopulated areas. Beginning with the 2016 updates, Esri has used an additional database from Zonda that more than doubles Esri's geographic coverage and the number of units planned and completed. The addition of this database gives the household and housing unit update a finer level of granularity and insight into smaller housing markets across the nation.

RealPage housing data is incorporated to capture the growing multifamily rental market. RealPage collects and maintains data on planned, new, and existing rental properties of multifamily and student apartments nationwide. This data source provides property-level characteristics such as the total number of units or beds, building type, number of stories, and occupancy, as well as asking rent.

The best techniques are derived from a combination of models and data sources. Discrepant trends are checked extensively against independent sources and premium imagery data from Esri's ArcGIS Living Atlas of the World. Finally, totals for block groups are controlled to the county totals.

Five-year projections

Projections are necessarily derived from current events and past trends. The past and present are known; the future must be extrapolated from this knowledge base. Even though projections represent the unknown, they are not uninformed. Pipeline projects slated for the future, as well as developments currently under construction, give Esri a unique view of the future landscape. Future residential construction information is integrated with a cohort component approach to model expected population change based on demographic characteristics. Guidelines for the development of projections also inform the use of those projections.

- The recent past provides a reasonable clue to the course of future events, especially if that information is tempered with a historical perspective.
- A stable rate of growth is easier to anticipate than rapid growth or decline.
- The damaging effects of natural disasters cannot be anticipated. Esri makes every effort to assess the impact of sudden, catastrophic events such as strong storms, flooding, or wildfires.
- The risk inherent in forecasting is inversely related to the size of an area: the smaller the area, the greater the risk.
- The risk increases with the length of the projection interval. Any deviation of the projected trends from actual events is amplified over time.

[4] Esri Census 2020 Accuracy Analysis

Esri revises its forecasts annually to draw on the latest data. Projections can be enhanced with personal knowledge of an area to provide qualitative, anecdotal detail that is not captured in a national database. It is incumbent on the data user and the producers to incorporate as much information as possible when assessing local trends, especially for areas that are subject to boom-bust cycles or natural disasters.

Population and household characteristics

Esri incorporates a variety of data sources to update small areas such as block groups, beginning with the latest base and then adding a mixture of administrative records and private sources to capture change to the base. Shifting the base every year to the latest release of ACS data incorporates real change with sampling error. To establish a more stable base, Esri has built estimate bases for key variables such as income, labor force, and home value. The estimate bases combine the best data from ACS with other sources and allow better measures of change than are possible with ACS data alone. Periodic changes to the estimate bases are necessary to collect current change. Base changes impact comparability of the annual data but provide more reliable estimates. Demographic updates must incorporate both traditional and new data sources to remain current.

The population by age and sex is projected using a cohort survival model that separately calculates the components of population change by age and sex. Applying survival rates specific to the cohort carries a 2020 population base forward. Changes in the population by age and sex diverge at the household level. For example, an area that is losing population can age more rapidly with the loss of population in prime migrant ages, 20–34 years—unless there is a college nearby. Neighborhoods near colleges sustain high turnover from student populations but retain their youthful age distributions.

To capture these variations, Esri's model first separates the group quarters population from the household population and keys the calculations to the size and characteristics of the population. This stratification identifies several patterns of change by age and sex that can be applied in a cohort survival model.

The changing profile of the U.S. population requires measuring population change by race and Hispanic origin. The American identity is shaped by diversity. Tracking the changing patterns of race and ethnicity provides a current portrait of our society. Historical trends in race and ethnicity combined with the most current data sources by race and Hispanic origin, including population estimates by county and state from the Census Bureau and survey data from the ACS, are analyzed to establish county population by race and Hispanic origin. Forecasts by block group combine local changes in the distributions by race and projected change for counties. The last step controls block group distributions to county totals by race and Hispanic origin.

The changing face of our nation is evident in Esri's Diversity Index, which summarizes racial and ethnic diversity in an area. Esri's definition of diversity is two-dimensional and combines racial diversity with ethnic diversity. This measure shows the likelihood that two persons, chosen at random from the same area, belong to different races or ethnic groups. In theory, the index ranges from 0 (no diversity) to 100 (complete diversity). An area's diversity index tends toward 100 when the population is more evenly divided across race and ethnic groups. If an area's entire population is divided evenly into two race groups and one ethnic group, the diversity

index equals 50. As more race groups are evenly represented in the population, the diversity index increases. Race and Hispanic origin data is reported by the Census Bureau and other agencies as grouped summary data; therefore, in practice, the diversity index will not reach the maximum value of 100. Nationally, Esri's Diversity Index has risen from 71 in 2020 to 72.5 in 2024, with a forecast to 74 in five years.

Diversity also describes the composition of American households. Esri uses the Census Bureau's definition of families and family households. Families include a householder and one or more people living in the same household who are related to the householder by birth, marriage, or adoption; therefore, family households are equal to the number of families. Family households can also include unrelated nonfamily members. Family households are modeled from Census 2020, Current Population Survey (CPS), and ACS data. Unlike the previous decennial census, Census 2020 does not include counts of the population in families. Esri's approach to modeling this information has shifted to take increased advantage of available ACS data. Average family size sits at 3.15 for 2024.

The attendant change in average household size has shown a decline from 2.58 in 2010 to 2.55 in 2020 and a continued fall to 2.53 for 2024. Average household size is used when forecasting the change in household population from the change in households. Average household size is traditionally one of the most predictable components of the forecasts and serves as a link between the population and household universes. Household forecasts are predicated on local patterns of change, which are controlled to more constant trends for states and counties.

Few block groups represent a cross section of U.S. households. For example, in areas that gain population from immigration, the trend in average household size is an increase. To distinguish local variation, Esri's model is keyed to the characteristics of households at the block group level. This stratification identifies several patterns of change by household type that are applied to forecast trends in the characteristics of households—both family composition and tenure. Local change is emphasized in the 2024/2029 forecasts of households for counties and block groups. National and state trends are monitored with sources such as the CPS and ACS from the Census Bureau and then applied as controls.

A mixed source model approach is used to forecast 2024 educational attainment and marital status, combining higher-level and timelier single-year ACS data with five-year lower-level ACS data as well as national statistics from the CPS. Adjustments are factored for changes to the base population's characteristics. Forecasted distributions are applied to Esri's 2024 population aged 15 years and older to update marital status. Similarly, educational attainment is updated for the population aged 25 years and older.

Housing data

Esri's housing updates include total housing units, occupancy, tenure, home value, and contract rent. Total housing unit updates are created from recorded changes in the housing inventory and estimated changes in occupancy rates since April 2020, applied to Census 2020 base data. Recorded change in the housing inventory is culled from several data sources, including multiple construction data inputs from Zonda and RealPage, data for new manufactured homes placed by state from the Census Bureau, and building permits for permit-issuing places and counties. Numerous independent sources are used to obtain detailed information on housing development data where no building permits exist. Independent estimates of change in occupancy are calculated from USPS residential lists, the ACS, and various state and local data sources. Additionally, data from the CPS and the Housing Vacancy Survey (HVS) from the Census Bureau is used to model trends in occupancy.

Data for tenure represents owner- and renter-occupied housing units. Together, the two components sum to total households or total occupied housing units. This year, Esri's tenure estimates and projections now incorporate the updated demographic profiles released in the Census Bureau's DHC product. This means the tenure profile for many areas may be readjusted not only due to new residential construction, but also from the incorporation of the decennial census data. Moreover, a time series model based on data from the HVS, combined with changes in the CPS, the ACS, and intercensal data, guides tenure forecasts. With a blend of top-down and bottom-up techniques, the forecasts take advantage of the latest information from survey data at higher levels of geography while employing local characteristics at the lower levels. The small-area models use more geographically granular trends from ACS as well as integrate the Zonda and RealPage housing data to update an area's tenure profile. ACS tenure time series data used in the models was smoothed to further reduce survey noise by tempering outlying data points. Data from lower levels of geography is controlled to higher levels to produce tenure updates. Changes in owner versus renter occupancy are forecasted independently and then controlled to total households.

Esri reports home value for owner-occupied housing units. A total of 13 home value intervals is reported. Summary measures of home value include medians and averages that are calculated from the distributions of home value. Medians represent the middle of the distribution or the point that splits the distribution equally.[5] Medians are calculated using linear interpolation unless the median falls in the highest (>$2,000,000) interval. Following the Census Bureau's convention, this median is reported as $2,000,001 because housing value in the upper interval is top-coded to $2,000,000. Due to limited data availability for these high-valued homes, Esri top-codes average home value to $2,250,000.

Esri tracks the change in home value using several sources, including annual estimates from the ACS, the Home Price Expectations Survey from Pulsenomics, and the House Price Index (HPI) from the Federal Housing Finance Agency (FHFA). The Home Price Expectations Survey relies on a survey of more than 100 industry experts to forecast growth in the housing market. This source is a key input to Esri's forecasts. The HPI is designed to monitor changes in average home prices based on repeat sales or refinancing of the same properties. The index is derived from mortgage loans purchased or securitized by the Federal National Mortgage

[5] Understanding medians.

Association (Fannie Mae) or the Federal Home Loan Mortgage Corporation (Freddie Mac).

Esri's 2024 home value estimates continue to show growth from the previous year, though home values are increasing at a slower rate than they were during the pandemic years. Still, home values are at an all-time high, and the previously expected (by many experts) downturn in the housing market has not yet materialized. There continues to be great uncertainty in the housing market, particularly in terms of where housing supply and mortgage rates will trend toward in the coming years. Esri shows a median home value of $355,577 for 2024 with a projected 3.4 percent annual change between 2024 and 2029.

Esri's model emphasizes the importance of a stable forecast base. Employing both the ACS's historical five-year estimates and household survey data, Esri's 2024 estimates begin with an updated forecast base that uses the growing stability of ACS data. Once every few years and particularly during real estate market cycles, it is prudent to reset the base to capture the current housing landscape. Though this does preclude comparisons to past updates, especially for small areas, the base provides a strong foundation to measure change. Local estimates of home value change incorporate supply-demand characteristics, the socioeconomic traits of householders in the area, and trends assessed for larger markets.

Esri uses current housing and income data to provide a snapshot of affordability. Esri's approach to measuring housing affordability uses an index to quantify the ability of a typical resident to purchase an existing home in an area.[6] Employing information from a variety of sources to estimate the national average contract mortgage rate, an interest rate of 6.8 percent is estimated for Esri's 2024 Housing Affordability Index model. A 30-year mortgage is assumed, with a down payment of 20 percent of the home price. Property tax rates are determined from the latest ACS five-year data, and Esri's model follows the Federal Housing Administration's guidelines for debt service ratios. Additionally, the 2024 Percent of Income for Mortgage (POIFM) quantifies the percentage of median household income dedicated to mortgage payments on a home priced at the median value.

Esri reports contract rent for renter-occupied housing units at 13 intervals as well, using a similar modeling methodology to that of home value. Contract rent is defined as the monthly rent agreed to or contracted for, apart from any utilities, fees, or other services that may be included. With the contract rent distribution, the 13th interval represents an estimate of renter households that do not pay rent. This category may include units that are provided to compensate caretakers, ministers, and others who tend to live at their place of employment. Additionally, this category can include units that are owned by relatives or friends and allow occupancy without charging rent.

Summary measures of contract rent include medians and averages that are calculated from the first 12 intervals of the contract rent distribution. If the median falls in the highest interval (>$3,500), the median is reported as $3,501. Average contract rent is top-coded to $3,750. Esri shows a median contract rent of $1,295 for 2024 with a projected 3.2 percent annual change between 2024 and 2029.

[6] Esri's Housing Affordability in the U.S.

Labor force data

Esri forecasts the 2024 employed and unemployed population aged 16 years and older who are either working or actively looking for work, also known as the civilian labor force. The U.S. gross domestic product (GDP) has displayed positive growth from the preceding quarter for seven straight quarters dating back to Q3 2022. The most recent estimate for Q1 2024 shows the GDP increasing at an annual rate of 1.6 percent. The current economic conditions have the total workforce at more than 166 million people.

The civilian labor force does not include active-duty military, institutionalized individuals, and those not actively looking for work. The employed population 16 years and older is further broken down by industry and occupation. Esri also provides additional labor market detail in estimates of employment and unemployment by four age groups (16 to 24, 25 to 54, 55 to 64, and 65 and older) as well as breakouts by sex (male and female). For 2024, Esri continues to expand the available labor market characteristics with the release of employment and unemployment estimates disaggregated by race.

Estimates of the civilian labor force are modeled using one- and five-year ACS employment and work status tables and CPS information from the U.S. Census Bureau as well as data from the Local Area Unemployment Statistics (LAUS), Occupational Employment Statistics (OES), and Current Employment Statistics (CES) programs of the Bureau of Labor Statistics (BLS). Federal statistical surveys are the principal sources for labor force trends. The 2024 employment and unemployment estimates are developed from a block group base constructed from one- and five-year ACS labor force tables and current sources. Esri's updated employment by industry and occupation estimates capture temporal change from multiple federal statistical sources: the ACS and CPS from the Census Bureau and the CES and OES programs from the BLS.

Esri’s Socioeconomic Status Index (SEI) quantifies disparities in social position of an area’s inhabitants and is built from a broad range of demographic, housing, and socioeconomic inputs. This index ranges from zero (lowest relative status) to 100 (highest relative status). More information on this measure can be found in Esri’s SEI tutorial.[7]

[7] Esri's Socioeconomic Data Tutorial

Household income

Esri's 2024 household income estimates are reported for households as of July 1, 2024. Esri's household income and related estimates reflect the current calendar year. Similarly, forecast year 2029 estimates are reported for forecasted households as of July 1, 2029, and represent household income for 2029. Esri's estimates of household income are benchmarked to the latest American Community Survey data (2022); therefore, change between 2022 and 2024 is gauged in our model. Accounting for current inflation and historical income change, Esri estimates 2.9 percent annualized growth in median household income since 2022. The 2024 median household income stands at $79,100, with average household income at $113,200.

Household income distributions are estimated for areas with 10 or more households only. Esri implements the definition of money income used by the Census Bureau. For each person 15 years of age or older, money income received in the preceding calendar year is summed from earnings, unemployment compensation, Social Security, Supplemental Security Income, public assistance, veterans' payments, survivor benefits, disability benefits, pension or retirement income, interest, dividends, rent, royalties, estates and trusts, educational assistance, alimony, child support, financial assistance from outside the household, and other income.

There are substantial differences between the Bureau of Economic Analysis (BEA) and the Census Bureau in estimates of per capita income. Care should be taken when comparing money estimates with other data sources since many income estimates are based solely on BEA data. Different definitions, methods of data collection, reference areas, and population coverage generate different counts and measures of income.[8] BEA calculates personal income as part of its mission to produce national income accounting estimates such as the gross national product. The Census Bureau collects money income statistics to satisfy its objective to enumerate and describe the population of the United States.

Data for consumer income collected by the Census Bureau covers money income received (exclusive of certain money receipts such as capital gains) before payments for personal income taxes, Social Security, union dues, Medicare deductions, and so on.

Early in the decade, extensive testing concluded that collapsing the ACS's 16 household income intervals into fewer intervals significantly improves statistical reliability. Esri's model estimates household income by nine income intervals.

Estimates for household income are in nominal dollars. In other words, the growth of income attributed to inflation is included in the estimate. Esri models nominal household income directly. With inflation estimates only available at the national and regional levels and selected major cities, and a lack of local area inflation data, estimating local real household income is imprudent. Esri tracks national inflation rates to guide both current-year and forecast-year estimates. Expected national inflation is based on trends from 5- and 10-year break-even rates. These rates are computed from the spread between nominal and inflation-adjusted Treasury securities as of the end of February 2024. Break-even rates represent an estimate of

[8] Comparability of Current Population Survey Income Data with other Data

the average expected inflation premium that market participants are pricing into these securities over the two time horizons. The annual inflation factor is forecasted at 2.3 percent.

To estimate income for households, Esri evaluates an extensive list of sources for household income trends that include both federal and proprietary sources. The review of national surveys includes the ACS (both one-year and five-year estimates), the BEA's local personal income series, the CPS, and the BLS's Consumer Price Index.

Esri's 2024 income estimates build on an annually updated forecast base. The forecast base capitalizes on historical ACS five-year estimates and household surveys. In any sample-based data source, both sampling and nonsampling errors contribute to the instability of time series data for small areas. Esri has designed parameters to quantify and normalize instability in its sources, producing a robust base on which to measure income change.

After forecasting the state income distributions, household income is estimated for block groups. Esri's income forecasts are uniquely designed to distinguish local variation, changes in income inequality, and urbanicity as differentiators of income growth. The model correlates the characteristics of households at the block group level with changes in income. This stratification identifies several patterns of change by household type that are applied to forecast trends in income. Modeling links the current income change to all households with similar socioeconomic characteristics. Areas with small household bases or missing base data, where the model is unable to capture the local variation, are forecast with another level of modeling to capture the change in income by strata (a group of areas classified by their sociodemographic characteristics). Separate forecasts of the change in income by strata are aggregated to compose the income distributions.

Summary measures of household income include medians and averages that are calculated from the distributions of income. A median represents the middle of the income distribution or the point that splits the distribution equally. A median is calculated from the income intervals of the distribution using Pareto interpolation, unless the median falls in the lowest (<$15,000) or highest (>$200,000) interval. For the lowest interval, linear interpolation is used. When the median falls in the upper interval, it is reported as $200,001 because households in the upper interval are top-coded to $200,000.

Beginning in 2023, Esri has made available additional summary measures to quantify income inequality. Computations of the Gini Index, interdecile, and share ratios of income inequality as well as households by income tier are based on the annually updated nine-interval household income. The methodology relies on Pareto interpolation of the ordered categorial income distribution to create a more detailed distribution. This results in refined percentile limit estimates for interdecile ratio measures and a means to distribute households more accurately into income tiers and aggregate income into high and low brackets to compute share ratios. For more

information, refer to Esri's 2024/2029 Income Tiers and Measures of Income Inequality Methodology Statement.[9]

Averages are computed from estimates of aggregate income. Esri's process employs unique sociodemographic methods to model distributions and aggregates simultaneously. This top-down, bottom-up approach not only provides well-grounded small-area estimates but also places emphasis on the relationship between medians and averages.

Household income by age of householder

Household income is reported for seven age of householder groups. The income distribution for these age groups is based on the same nine intervals as household income. Methods for median and average calculations follow those used for household income.

Household income reported by age of householder is updated to be consistent with the 2024 distributions of household income and age of householder. To update the age distribution of householders, the ratio of householders by age to the population by age in 2020 is updated to 2024/2029, taking into account the change in group quarters population applied to the current age distributions. After the targets are set, the base distributions of household income by age of householder at the block group level are fitted to current distributions of households by income and age of householder. Independent estimates of age by income are key inputs to the model.

Disposable income

Similar to household income, disposable income is estimated in nominal dollars for nine intervals. Disposable income is also reported for the seven age of householder groups. Methods for median and average calculations follow those used for household income.

Disposable income represents money income after taxes—an estimate of a household's purchasing power. The proportion of household income left after taxes is estimated from special studies conducted by the Census Bureau to simulate household taxes. Esri's 2024 disposable income estimates incorporate data from the 2023 Annual Social and Economic Supplement of the Current Population Survey (ASEC).

Four types of taxes are deducted: federal individual income taxes, state individual income taxes, FICA (Social Security), and federal retirement payroll taxes. Property taxes for owner-occupied housing are no longer available in the ASEC and therefore dropped from Esri's model. Internal Revenue Service tax rates are used as guidelines for model testing. Esri then applies the proportions of after-tax earnings to income intervals that are cross tabulated by age of householder for each state. State-specific proportions account for the variation in taxes by state. The proportions, or multipliers, are then applied to the age by income forecasts for block groups and counties to calculate disposable income.

[9] Esri's Income Tiers and Measures of Income Inequality Methodology

Net worth

The 2024 update of net worth builds upon the 2022 Survey of Consumer Finances (SCF) and incorporates more recent trends in household net worth from the Federal Reserve's report of the Financial Accounts of the United States. Between 2019 and 2022, the SCF measured an increase in median net worth of 37 percent and an increase in average net worth of 23 percent. Esri's current median net worth estimate is $225,545 and builds in an 8.1 percent annualized growth in the two years since the last SCF data point.

Beginning in 2019, Esri's total net worth estimates are reported for 12 intervals to include an upper interval of greater than $2 million. Net worth is also reported for the seven age of householder groups, by 10 net worth intervals. Summary measures of net worth include medians and averages, which are calculated from the distribution. Similar to household income methods, a median is calculated using Pareto interpolation, unless the median falls in the lowest (<$15,000) or highest interval. For the lowest interval, linear interpolation is used. When the median falls in the upper interval, it is reported as $1,000,001 for net worth by age of householder and $2,000,001 for total net worth.

Current income is only one component of a household's financial security. Householders' net worth or accumulated wealth reflects their ability to stay afloat during a financial downturn as well as save for future retirement. Net worth is estimated from data on household wealth that is collected from the SCF from the Federal Reserve Board from 1992 through 2022. These triennial surveys feature enhanced representation of wealthy households through the comprehensive measurement of net worth components. By definition, net worth equals total household assets less any debts, secured or unsecured. Assets include ownership of homes, rental properties, businesses, individual retirement accounts (IRAs) and Keogh accounts, pension plans, stocks, mutual funds, and motor vehicles. Examples of secured debt include home mortgages and vehicle loans; unsecured debt includes credit cards and other bills or certain bank loans.

Esri's Wealth Index is compiled from a number of indicators of affluence including average household income and average net worth. The concept of wealth is defined by more than above-average household income. Wealth also includes the value of material possessions and resources. Esri captures both income and the accumulation of substantial wealth or the abundance of possessions and resources in its identification of the wealthiest areas in the country. The index represents the wealth of the area relative to the national level. Values exceeding 100 represent above-average wealth.

2024 geography

Current-year estimates and forecasts are prepared initially for counties and block groups. County data is aggregated to Core Based Statistical Areas (CBSAs), states, and higher levels. Block group data is aggregated directly for geographies comprised of block groups.

For geographies that are not aggregations of block groups such as places, county subdivisions, congressional districts, school districts and ZIP codes, block group estimates are allocated to blocks and summarized to these geographies using a block correspondence file. Allocation of block group estimates to blocks maintains demographic consistency across all variables, which allows for data at these block-based geographies to be consistent as well. For all other user-defined boundaries such as rings or drive-time polygons, block weights are applied to block group data to apportion demographics within these areas.

Changes in the geographic areas for which data is tabulated and reported are critical to the analysis of trends. Esri reports data for legal/administrative and statistical areas that include states, counties, census tracts, block groups, places, county subdivisions, CBSAs, congressional districts, and school districts plus special use areas such as ZIP codes and DMAs. Of course, the provision of small-area data in Esri software allows users to define their own areas of interest too.[10]

Data is reported in 2020-based geography (TIGER 2023) for most of the standard legal/administrative and statistical areas. Legal/administrative areas are typically those that involve government officials and the administration of services or representation. These are usually official government boundaries that would exist without the need to present statistical data. In general, the Census Bureau accepts boundaries that are provided by official local entities. Statistical areas do not require official documentation and do not typically involve government officials administering services. Statistical areas are established for purposes of data tabulation and presentation purposes as well as research.

The 2024/2029 updates reflect the metropolitan and micropolitan statistical areas released by the U.S. Office of Management and Budget (OMB) in July 2023. There are 387 metropolitan and 538 micropolitan areas. Congressional districts represent the 118th Congress. The place inventory is from TIGER 2023 and contains 32,037 areas.

The 2024/2029 Updated Demographics release is the first year that Esri is including the nine new Connecticut county equivalents in the geographic inventory. These are Councils of Governments/Planning Regions in the state that the Census Bureau has incorporated as county equivalents since they serve as the main administrative units that coordinate activities and services for their constituent cities and towns.[11] Note that the old eight counties in the state have not functioned as administrative entities since 1960 and are no longer part of the county inventory. This change increases the total number of county or county equivalents by one additional area to 3,144 geographic entities.

[10] Esri's geographic layers and methods used to estimate data for any user-defined polygons.

[11] See https://www.govinfo.gov/content/pkg/FR-2022-06-06/pdf/2022-12063.pdf and https://www2.census.gov/geo/pdfs/reference/ct_county_equiv_change.pdf

ZIP codes, which are defined solely by the USPS to expedite mail delivery, can change monthly or whenever the USPS revises delivery routes. ZIP codes do not represent standard census geographic areas for data reporting. ZIP code boundaries are not contiguous with census geographic areas or stable over time. Data estimated for ZIP codes is also subject to change. Residential ZIP code data is estimated from block data established from block group estimates, using a correspondence created by assigning census block points to ZIP code boundaries from TomTom. The vintage of the ZIP code boundaries is second quarter of 2023; the total number of residential ZIP codes in this release is 32,080.

The integration of demographic and spatial analysis has not only enabled the development of more accurate block group totals, it has also provided the opportunity to update block totals. Blocks are the lowest common denominator in the geographic hierarchy and progress to block groups, tracts, counties, and states. Blocks are most useful in the estimation of data for polygons, which can be any area outside the geographic hierarchy, from retail trade areas to user-defined polygons (including circles and drive-time polygons). For most areas, the application provides a good estimate for the polygon. If the relationship between the underlying blocks and the parent block groups has changed significantly since 2020, the estimate cannot incorporate that change unless both blocks and block groups are updated.

Esri's Data Development team

Led by chief demographer Kyle Cassal and economist Douglas Skuta, Esri's Data Development team uses sophisticated quantitative methods to produce small area demographic and socioeconomic data to support informed decision-making. The team builds on a rich history of market intelligence to produce trusted independent estimates and forecasts for the United States based on innovative methodologies that use public and private data sources with the power of ArcGIS. Esri's Data Development team provides more than 7,000 proprietary data items to better understand the characteristics of people and places across multiple statistical and administrative boundaries and custom trade areas.

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