Esri® Demographic Updates: 2012/2017

An Esri® White Paper
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Introduction

Two years after the decennial census have not clarified the progress of postrecession recovery for neighborhoods across the country. There are two good reasons for the lack of measurable progress over the past two years: First, the sheer magnitude of the Great Recession abnegated any hope for a quick recovery. Second, it takes many data sources two to three years to recalibrate current databases to a new population base *and* a new geographic base. Although the Great Recession officially lasted from late 2007 through mid-2009, signs of recovery at the national level postdate the 2010 Census. At the local level, the data is slower in coming. However, there are nascent signs of growth and recovery included in Esri's 2012/2017 demographic updates.

Change

Measures of change for the previous decade averaged the highs (2001–2006) that the housing boom incited with the lows (2006–2010) that heralded the Great Recession. Change from 2000 through 2010 appears more moderate than expected from these catalytic events. The US population increased by 9.3 percent in 10 years. Households increased by 9.9 percent. Housing units increased by 14 percent. Vacant housing units grew more rapidly, by 44 percent, from 2000 to 2010. The increase in households exceeds population growth due to the overall decline in the population per household. Higher growth in the housing inventory relative to household demand effected the increase in the inventory of vacant housing units. Some of the new housing units were built as second homes or seasonal units, which are enumerated as vacant housing. But occasional homes represent only 23 percent of the increase in vacancies.

Putting some numbers to these 2000–2010 trends shows the following:

- Population grew by 2.7 million annually.
- Households grew by 1.1 million annually.
- Housing units grew by almost 2 million annually at the peak of the housing boom.
- Vacant housing units grew by more than 456,000 annually.

Since 2010, housing growth has been sluggish—less than 900,000 units annually. Many markets are still coping with an excess of vacant, for sale, and foreclosed properties left over from the collapse of the housing market and the Great Recession. Recovery is taking place at different rates across the nation. In many areas, no new housing units are being built; however, in other areas, new construction is back in full swing, and demand is high.

The top 10 metropolitan statistical areas (MSAs) for housing growth since 2010 include 7 areas that are new to the top 10 list. These areas are growing for diverse reasons: Jacksonville, NC; Killeen-Temple-Fort Hood, TX; and Manhattan, KS for the military presence and Morgantown, WV; Auburn-Opelika, AL; Logan, UT-ID; and Manhattan as large college towns with good climates and growing economies. Kennewick-Pasco-Richland, WA is a retirement hot spot—especially for Californians. Rounding out the top

10 list are 3 MSAs that are continuing to grow: Austin, TX; Raleigh-Cary, NC; and Myrtle Beach, SC.

Housing growth is generally keeping pace with population change in the fastest-growing areas, although there are a couple of exceptions. Fairbanks, AK and Hinesville-Fort Stewart, GA are among the 10 top metro areas for population growth only. Housing change is lagging a bit in these areas. Each of these MSAs also benefits from military presence.

What is driving the population and housing growth among these areas? Metropolitan areas have been impacted differently by the anemic economic recovery. Among the top 10 metros for population or housing growth, civilian unemployment averages 8.5 percent: better than the average for all metropolitan areas—9.6 percent—but not stellar. The average masks a range of unemployment rates, from a low of 6.4 percent to a high of 16 percent—as diverse as the locales on the top 10 lists. What these local economies appear to have in common is the benefit of exogenous revenue sources from seasonal populations (including college students), military bases, or retirees. Their spending contributes to local economies without competing with the local labor force.

Conversely, a review of the 10 MSAs with the lowest unemployment rates does not reveal distinctive population or housing growth. The average annual rate of population growth for these metros was 1.3 percent from 2010 to 2012, up from 1.2 percent for 2000–2010. Housing growth declined from an annual average of 1.5 percent in the past decade to 1.1 percent since 2010. Demographic change is moderate for most of the areas with the lowest unemployment rates. These metros are economically and geographically diverse, with smaller population bases of less than 250,000 in 2012. The list covers every region—ranging from Midland, TX and Odessa, TX, which benefit from the oil in the Permian Basin, to Barnstable Town, MA, another beneficiary of tourism—but features smaller metropolitan areas in the Midwest and mountain states of the West. Although these areas were affected by the Great Recession, they were less impacted by the boom/bust of the housing market and quicker to recover after the recession.

The same variability in recovery affects county trends since 2010. Counties experiencing the most rapid growth in housing inventories—at least 2.5 percent annually—were also growing rapidly in the previous decade. However, their current growth rates are much lower, and they do not have the lowest unemployment rates in 2012. Compared to the previous decade, housing growth rates have improved for one in four counties. The fastest-growing areas, with oil/natural gas booms, offer high paying jobs—and housing shortages. Workers flock to areas like the Bakken shale in North Dakota but quickly deplete the available housing stock. Housing construction for new workers cannot keep pace with the influx.

Almost one in four counties shows no growth or a loss of housing from Census 2010 to 2012. There were also some significant housing losses due to natural disasters in the past year. Over 1,500 housing units were destroyed in the Bastrop County wildfire in Texas in September 2011. Housing loss from the Indiana tornadoes in March was also factored into the 2012 updates. Rebuilding the housing lost to the destructive May 2011 tornado season is reflected in the Joplin, MO MSA.

Population change reflects the boom/bust in housing. Since 2010, the number of counties losing population has dropped dramatically. The rate of growth among counties with an

increasing population has not improved, but the stabilization of population decline has increased the average county growth rate to 0.5 percent for 2010–2012.

Growth is evident but not widespread. Where are we in the recovery process? Esri warned in the summer of 2010 that "uncertainty is the best outlook in the face of weak job growth, growing debt, and persistent concern over a double-dip recession."[1] More than two years have passed, but this statement remains, regrettably, prescient today. The economy is still struggling to gain traction:

- The gross domestic product (GDP) increased by 1.8 percent in 2011. In the first quarter of 2012, the GDP increased by 2 percent, and in the second quarter by only 1.3 percent (annualized rates). The GDP will increase, but an annual rate of 3 percent is necessary for a more robust recovery.

- Jobs lost from the beginning of the recession (December 2007) through 2010 have not been wholly recovered. About half of the jobs have been replaced. To return to the level of employment in December 2007, job creation needs to increase to 187,000 per month for the next two years (from a monthly average of 152,000 for the past 2.5 years). Currently, there are seven applicants for every two jobs.[2]

- National debt is growing faster than the economy. The current public debt is almost 73 percent of the GDP.

- Consumer spending increased by 1.5 percent in the second quarter of 2012, down from 2.4 percent in the first quarter. Like the GDP, there has been modest growth, but the outlook must remain conservative while job growth and wage increases are nominal.

New home sales are showing better gains, but credit remains tight for most home buyers. Uncertainty pervades the economy. Banks and corporations are sitting on their cash. Consumers are paying down their debt. Until banks and corporations stop sitting on their assets and start spending, the pace of economic recovery is unlikely to improve.

Sample Data, Then and Now

Gauging economic change in small areas is more challenging in this decade. Census 2010 was a game changer in the development of small area data because it collected no sample data—variables like income, education, employment, and home value. The American Community Survey (ACS) is the replacement for sample data, although differences from the census version are significant. Single-year ACS data is reported only for areas with a population of 65,000 or more. Data for all levels of geography, down to block groups, is available only as a 5-year average.

Unlike census sample data, the American Community Survey represents a series of monthly sample surveys that yield different measures of familiar variables. The differences in measurement include continuous data collection and smaller sample sizes. Naturally, ACS sample sizes are much smaller than a census survey taken once every 10 years. To represent the smallest sample areas—block groups—data must be collected

[1] Esri. *Esri Trend Analysis: 2010–2015*.
[2] Center on Budget and Policy Priorities: Economic Recovery Series.

over 60 months. One-year ACS data is actually a 12-month average rather than a single point in time, April 1.

How does this difference affect the annual demographic updates? Change must be estimated differently now. Esri estimates change from April 1, 2010 (the census base), to July 1, 2012—point estimates. ACS data are period estimates, which include at least 12 months. The differences are pronounced in areas with a seasonal population. The best example of seasonal effects is unemployment rates. ACS does not report *monthly* survey data, but the Bureau of Labor Statistics (BLS) does—both seasonally adjusted and not. For the metro unemployment rate in Barnstable Town, MA, the 2010 monthly estimates reveal the impact of seasonal population flows and the effects on period estimates (annual averages) versus point estimates (monthly):

- Unemployment rates were highest in January 2010, at 12.0 percent, and lowest in August, at 6.7 percent.
- The estimate for April (same time as the census) was 9.1 percent.
- BLS's annual average was estimated at 8.8 percent, unadjusted, and 8.3 percent, seasonally adjusted.
- ACS's annual estimate for 2010 was 9.8 percent.

The time frame clearly impacts the size of the estimate in areas with seasonal populations. Twelve-month averages smooth the highs and lows; 60-month averages for small areas smooth out all trend lines. There are also methodological differences between ACS and BLS in unemployment estimation. ACS's unemployment estimates tend to be higher.[3]

Reconciling differences in source data is another challenge of applying ACS data to point estimation. Unfortunately, the ACS base is also affected by sample size. In fact, some estimates are simply not reported due to small sample sizes or missing responses. There are gaps in the ACS data. For example, civilian employment is reported for block groups, but labor force participation (including unemployment) is not.

Now there is an ACS base, albeit with some holes, but no comparable measures of change. Does this represent the future of data updates? Yes and no. ACS retains the appearance of past sample data but represents the changing future of data collection. Although there will be annual releases of ACS data, only five-year data will be reported for small areas. And there will still be missing data. ACS cannot be the sole measure of the population for the next decade any more than a single decennial survey could. There will always be a need for alternative data sources to measure the facets of change—demographic and economic.

The good news is the proliferation of data sources, from administrative records to private data sources. Government agencies continue to provide their data in convenient, digital time series, while the private sector has been pioneering the indirect collection of data from a host of sources, including Internet use and social media. Esri has been using a

[3] See more information on differences between ACS and BLS estimates.

variety of data sources for years to update small areas like block groups, beginning with the latest census base, then adding a mixture of administrative records, like delivery counts from the US Postal Service, and various private sources, like a comprehensive address file, to capture change to the census base.

This approach has been effective in past updates, but it requires a solid census base and a variety of sources and statistical models to capture change. Demographic updates must incorporate both traditional and new data sources to remain current. The challenge now is to retool forecast models to integrate changing traditional sources and exploit new data sources.

2012/2017 Demographic Updates

Esri's 2012/2017 demographic updates continue the new era in data development, retaining the best from the past while adapting to changes in source data. Esri has incorporated Census 2010 counts and geography and evaluated and revised its models. The demographic updates are still point estimates, representing July 1 of the current and forecast years. Esri presents the 2012/2017 demographic forecasts, including population; age by sex; race by Hispanic origin; age by sex by race and by Hispanic origin; households and families; housing by occupancy; tenure and home value; labor force and employment by industry and occupation; and income—including household income distributions, household income by age of householder, and per capita income. Updates of household income are also extended to provide after-tax (disposable) income and a measure of household wealth, net worth.

Forecasts are prepared initially for counties and block groups. From the county database, forecasts are aggregated to Core Based Statistical Areas (CBSAs), states, or higher levels. From the block group database, forecasts can be retrieved for census tracts; places; county subdivisions; ZIP codes; congressional districts (currently, the 112th Congress); Designated Market Areas (DMAs); or any user-defined site, circle, or polygon.

Summary Totals

The change in total population is a function of changes in household population and the population in group quarters, which are subject to different trends. The addition of a prison, for example, produces a sudden increase in the group quarters population that is unlikely to yield an attendant change in the household population or the projected population growth of a county. The group quarters population is the Census 2010 count of group quarters, with updates culled from a variety of federal, state, and local sources.

Forecasting change in the size and distribution of the household population begins at the county level with several sources of data. Esri begins with county estimates from the US Census Bureau. Because testing has revealed improvement in accuracy by using a variety of different sources to track county population trends, Esri also employs a time series of county-to-county migration data from the Internal Revenue Service, building permits and housing starts, plus residential postal delivery counts. Finally, local data sources that tested well against Census 2010 are reviewed. The result balances the measures of growth from a variety of different data series.

Measuring the change in population or households at the county level is facilitated by the array of data reported for counties. Unfortunately, there is no current data reported specifically for block groups. Past trends can be calculated from previous census counts, but nothing that is current. To measure current population change by block group, Esri models the change in households from three primary sources—Experian, the US Postal

Service (USPS), and Hanley Wood Market Intelligence—in addition to several ancillary sources.

The USPS publishes monthly counts of residential deliveries for every US postal carrier route. This represents the most comprehensive and current information available for small, subcounty geographic areas. The USPS establishes carrier routes to enable efficient mail delivery. 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. These frequent changes in carrier routes are not the only difficulty.

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 different 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 a carrier route to the correct block group(s) using the actual locations of mail deliveries. Its proprietary Address Based Allocation (ABA) was developed in 2005 to solve the complex challenge of converting delivery counts from carrier routes to block groups. This allocation method uses household addresses that are geocoded with carrier route and block group codes 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 Census 2010 counts, including an independent evaluation that encompassed data from four other vendors. This test confirmed the accuracy of Esri's ABA method.[4]

To track new housing developments, especially in previously unpopulated areas, Esri licensed a new data source in 2006, from Hanley Wood Market Intelligence—new and planned residential construction in the top US housing markets. This database identifies individual construction projects by location. The construction information includes the following:

- Total number of units planned
- Inventory of units under construction, sold, and/or closed
- Type of housing—detached homes, townhomes, condominiums, and so forth
- Target markets—families, seniors, empty nesters, and so forth

Tracking residential development since 2010 with Esri's enhanced demographic and spatial analysis tools also provides better information for the five-year forecasts than past trends.

[4] *Vendor Accuracy Study: 2010 Estimates versus Census 2010*.

A revised housing unit methodology applies the change in households estimated from address counts, delivery counts, and new housing construction to update household population by block group. The best techniques are derived from a combination of models and data sources. Discrepant trends are checked extensively against independent sources. Finally, totals for block groups are controlled to the county totals. Despite the appeal of microforecasting, there is simply more information available to track population change by county than by household. Ignoring the advantage of county-level data is throwing away information.

The integration of demographic and spatial analysis has not only enabled the development of more accurate block group totals but also provided the opportunity to update block totals. Blocks are the lowest common denominator in the geographic hierarchy that progresses 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 places to ZIP codes 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 blocks and the block group has changed significantly since 2010, the estimate cannot incorporate that change unless both blocks and block groups are updated.

Population and Household Characteristics

Esri's population and household characteristics include the population by sex and age, race and Hispanic origin, sex by age by race and Hispanic origin, and household type. Population by sex and age includes estimates by five-year age groups and by single years from less than 1 year to 84 years.

The population by age and sex is projected via a cohort survival model that calculates the components of population change separately, by age and sex. Applying survival rates specific to the cohort carries the 2010 population 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, second, keys the calculations to the size and characteristics of the population. This stratification identifies several different patterns of change by age and sex that can be applied in a cohort survival model.

The changing profile of the US 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 US 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. This measure shows the likelihood that two persons,

chosen at random from the same area, belong to different races or ethnic groups. The index ranges from 0 (no diversity) to 100 (complete diversity). Esri's Diversity Index for the United States has risen from 60.6 in 2010 to 61.4 in 2012, with a forecast of 63.8 in five years.

Diversity describes the composition of American households, too. Husband-wife families remain the dominant household type, but their share of all households continues to slip—from 52 percent in 2000 to 48 percent in 2010. From 2000 to 2010, the real increase in family households was in single-parent families, up by 22 percent, and multigenerational households, up by 30 percent. Husband-wife families increased by less than 4 percent in 10 years, and husband-wife families with children declined.

All family households increased by 8 percent during 2000–2010 and nonfamily households by 16 percent. The fastest-growing nonfamily households, however, are unmarried partners—opposite-sex partners by 40 percent and same-sex partners by 52 percent from 2000 to 2010. Single-person households retain the highest proportion of nonfamily households (80 percent), but the increase was less than 15 percent in the past decade. Nontraditional family types are the growing segments of households.

The attendant change in average household size is nominal from 2000 to 2010—2.59 to 2.58—with no obvious change in 2012. The gradual change in household size has made it uniquely suitable to forecasting the change in household population from the change in households. Average household size is traditionally one of the most stable and predictable components of the forecasts. Household forecasts are predicated on local patterns of change, which are controlled to the more constant trends for states and counties.

Few block groups represent a cross section of US households. For example, in areas that gain population from immigration, the trend in average household size is increase. To distinguish local variation, Esri's model is keyed to the characteristics of households at the block group level. This stratification identifies several different 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 2012/2017 forecasts of households and families for counties and block groups. National and state trends are monitored with sources such as the Current Population Survey (CPS) and American Community Survey from the Census Bureau and then applied as controls.

Housing

Esri's housing updates include total housing units, occupancy, tenure, and home value. Total housing unit updates are created from recorded changes in the housing inventory and estimated changes in occupancy rates since April 2010, applied to Census 2010 base data. Recorded change in the housing inventory is culled from several data sources, including multiple construction data inputs from Hanley Wood Market Intelligence, data for new manufactured homes placed by state from the Census Bureau, and building permits for permit-issuing places and counties. As of 2010, only half of the counties have complete coverage with building permits. Numerous independent sources are leveraged 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. Additionally, data from the Current Population Survey and the Housing Vacancy Survey from the Census Bureau are used to model trends in occupancy.

The data for tenure represents owner- and renter-occupied housing units. Together, the two components sum to total households, or total occupied housing units. A time series model based on data from the Housing Vacancy Survey, combined with changes in the Current Population Survey, the American Community Survey, and intercensal data guide 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 data from the lower levels of geography are controlled to the higher levels to produce the tenure updates. Changes in owner-versus-renter occupancy are forecast independently and then controlled to the total households.

Esri tracks change in home value using several different sources, including the House Price Index (HPI) from the Federal Housing Finance Agency (FHFA) and annual estimates from ACS. 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 Fannie Mae or Freddie Mac. FHFA affirms the "significant advantages" of the HPI over Commerce Department surveys or other data collections based on snapshots of sales figures. Employing the repeat-sales methodology renders the index less susceptible to compositional effects, especially with data for smaller geographic areas. If a higher proportion of lower-end homes are sold in the current period than in an earlier period, survey data can underestimate home prices.

Local estimates of home value incorporate supply-demand characteristics, the socioeconomic traits of householders in the area, and trends assessed for larger markets. This approach to modeling small areas efficiently predicts home value for areas with small housing bases or missing base data. The 2012 update implements sophisticated techniques designed to target change in home value accurately and to address the outliers that are expected in small area modeling.

Labor Force

Esri forecasts the civilian labor force (employment and unemployment) and employment by industry and occupation for 2012.[5] The US labor market is emerging from the most severe contraction since World War II. Since 2010, the economy added nearly three million jobs, raising the total work force to 142 million. This growth has been geographically broad, with every region and division adding people to payrolls. Only four states (Alabama, Arizona, Hawaii, and Rhode Island) registered a net reduction in workers.

Most of the 20 industrial sectors expanded over the past two years. The annualized rate of change in employment was highest in Mining (10.3 percent); Arts, Entertainment, and Recreation (7.2 percent); and Administrative and Support and Waste Management Services (4.5 percent). Only three sectors contracted: Public Administration (-5.1 percent), Educational Services (-4.2 percent), and Information (-1.5 percent).

The total number of unemployed shrank from 16.7 million to 14.9 million people. Accordingly, the US rate of unemployment (the percentage of the unemployed within the

[5] It is important to remind data users that Esri's civilian labor force estimates represent seasonally unadjusted totals as of July 1 to stay consistent with the forecast base. While press releases of labor force statistics produced by the Bureau of Labor Statistics report seasonally adjusted change each month, removing such calendar influences, Esri's totals reflect actual estimated levels. As a result, Esri estimates and measures of change can yield differences when compared to these official government statistics.

civilian labor force) fell 1.2 percentage points to 9.5 percent. While the US unemployment rate declined, so too did the US labor force participation rate (civilian employed plus unemployed as a percentage of the population 16 years and older). This rate fell by seven-tenths of a percentage point to 63.4 percent. Some of the reduction in unemployment results from increasing employment; some of the decline is due to workers leaving the labor force. Focusing on the unemployment rate to ascertain the health of the labor market is misleading if the labor force base is contracting.

Estimates of the civilian labor force integrate recent change in the supply and demand for labor from the Local Area Unemployment Statistics (LAUS), Occupational Employment Statistics (OES), and Current Employment Statistics (CES) programs of BLS, as well as the American Community Survey and Current Population Survey. Federal statistical surveys are the principal sources for labor force trends. The LAUS program is the premier resource for current and local economic conditions.

Last decade, Esri leveraged the Census 2000 sample data on employment status as the forecast base for all areas from block groups to states. The ACS is the replacement source for small area sample data; however, employment status is only reported for tracts and larger areas. Esri is restricted to using tracts as the base geography. The 2012 employment and unemployment estimates are developed from a modified version of the 2006–2010 ACS tract base, using more current one-year totals from the 2010 ACS labor force profile and current sources.

Esri's updated employment by industry and occupation captures temporal change from the federal statistical sources: the ACS and CPS from the Census Bureau and the CES and OES programs from BLS. National and state industry distributions are updated using trends from the CES. The latest industry-occupation matrix from the OES is applied to allocate 2010–2012 employment change by industry to the related occupations.

Income

Esri's forecast base is the income that was reported in the 2006–2010 ACS. To estimate income for households, Esri evaluates an extensive list of sources for household income trends that includes both federal and proprietary sources. The review of national surveys includes the Bureau of Economic Analysis's local personal income series, the Current Population Survey, and the Bureau of Labor Statistics' Consumer Price Index. Esri's updates emphasize the use of time series data from household surveys to establish a base trend line.

After forecasting the state income distributions, household income is estimated for counties and then 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 different 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. Median income for 2012 and 2017 is calculated from the distributions using linear or Pareto interpolation. Average income is computed from aggregate household income.

Household income reported by age of householder is updated to be consistent with the 2012/2017 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 2010 is updated to 2012/2017 and applied to the current age distributions. After the targets are set, the base distributions of household income by age of householder by block group are fitted to current distributions of households by income and by age of householder.

Esri uses 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.

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.

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 2012 disposable income incorporates data from the 2011 Annual Social and Economic (ASEC) Supplement to the Current Population Survey. Starting with the 2011 ASEC release, the Census Bureau has introduced a new technique to accommodate disclosure avoidance. Previously, high dollar values were capped or top-coded; now, rank proximity swapping is employed. Esri's analysis revealed that these changes have impacted the time series of tax variables available, which is reflected in this release of disposable income.

Four types of taxes are deducted: federal individual income taxes; state individual income taxes; Federal Insurance Contributions Act (FICA) contributions, or Social Security, and federal retirement payroll taxes; and property taxes for owner-occupied housing. 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.

Current income is only one component of a household's financial security. A householder's net worth or accumulated wealth reflects the ability to stay afloat during a financial shock as well as savings for future retirement. Net worth is estimated from household wealth data collected from the Surveys of Consumer Finance (SCF) from the Federal Reserve Board from 1992 through 2010. 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, 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 card and other bills or certain bank loans.

2012 Geography

Changes in the areas for which data is tabulated and reported are critical to the analysis of trends. Esri reports data for political and statistical areas that include states, counties, census tracts, block groups, places, county subdivisions, CBSAs, and congressional districts, plus special use areas like ZIP codes and DMAs. Of course, the provision of small area data in Esri® software enables users to define their own areas of interest, too.

Data is reported in 2010 geography for the standard political and statistical areas. Statistical areas, like block groups and census tracts, are defined by the Census Bureau (with help from local officials) to collect and report data for neighborhoods. These areas change every 10 years with each new census. Political areas like counties, cities, or townships are subject to change by local governments. Larger political areas like counties change less often than places, but boundary revisions were common with Census 2010.

Metropolitan areas are usually revised annually; however, the Office of Management and Budget revises the definitions decennially with data from the census. The next revision of metropolitan areas is expected in 2013. The 2012/2017 updates reflect the latest definitions available, which have remained unchanged since December 2009. CBSAs include 366 metropolitan and 576 micropolitan areas. Congressional districts still represent the 112th Congress. The new congressional districts allotted by Census 2010 debut in January 2013.

ZIP codes, which are defined solely by the US Postal Service to expedite mail delivery, can change monthly or whenever the US Postal Service 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 group data using a correspondence created by assigning Census 2010 block points to ZIP code boundaries from NAVTEQ. The vintage of the ZIP code boundaries is fourth quarter 2011; the total residential ZIP codes in this release is 31,698.

Use of Projections

Projections are necessarily derived from current events and past trends. The past and the present are known; the future must be extrapolated from this knowledge base. Even though projections represent the unknown, they are not uninformed. 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 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.

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

Esri Data Development Team

Led by chief demographer Lynn Wombold, the Esri data development team has a 35-year history of excellence in market intelligence. The combined expertise of the team's economists, statisticians, demographers, geographers, and analysts totals nearly a century of data and segmentation development experience. The team has crafted data methodologies such as the demographic update, segmentation, diversity index, and Retail MarketPlace that are now industry benchmarks. The accuracy of Esri's methodologies was proved in a blind, independent study, *Vendor Accuracy Study—2010 Estimates versus Census 2010*, in which Esri demographics were deemed to be most accurate.

Vendor Accuracy Study—2010 Estimates versus Census 2010.

Esri inspires and enables people to positively impact their future through a deeper, geographic understanding of the changing world around them.

Governments, industry leaders, academics, and nongovernmental organizations trust us to connect them with the analytic knowledge they need to make the critical decisions that shape the planet. For more than 40 years, Esri has cultivated collaborative relationships with partners who share our commitment to solving earth's most pressing challenges with geographic expertise and rational resolve. Today, we believe that geography is at the heart of a more resilient and sustainable future. Creating responsible products and solutions drives our passion for improving quality of life everywhere.

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