



## **ESRI Demographic Update Methodology: 2009/2014**

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# ESRI Demographic Update Methodology: 2009/2014

## An ESRI White Paper

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# ESRI Demographic Update Methodology: 2009/2014

## Current Trends

In the past year, changes in the nation's economy have become extremely personal. The failure of the subprime mortgage market in 2007 extended its impact in 2008, shaking the foundations of the U.S. economy and touching every household in the country. In the past year, 1 in 25 jobs was lost to the economic crisis, and 1 in 42 homes was threatened with foreclosure. Households not touched directly by loss of home or employment are experiencing low or no income growth, lower home values, loss in savings or retirement funds, higher credit costs, cutbacks in services from struggling state and local governments, or the closing of a favorite local business.

How did we get here? The warning signs appeared in 2005. ESRI's trend analysis emphasized the widening gap between home value and household income. Appreciation in home value had outpaced income growth. Affordable housing was becoming an issue and not only among lower-income households. Homeownership rates were increasing, but the strength of the real estate market included the purchase of second homes and investment property. Favorable interest rates also facilitated an increase in home equity loans and refinancing activity, which boosted the cash available for spending. However, interest rates were also increasing.<sup>1</sup>

By 2006, the construction industry added more than 10 million new housing units to the national inventory and provided one of the few growth sectors in the economy. However, rising interest rates and higher inventories began to slow both demand and home value appreciation. New home sales declined, and the potential for loan defaults in the subprime mortgage market grew.<sup>2</sup> The downward spiral continued in 2007. Mortgage rates increased, and mortgage defaults and foreclosures spread from the subprime market to Alt-A and prime mortgages. Higher inventories depressed the sales of new and existing homes, prompting builders to offer incentives and lawyers to offer speculating buyers a way out of their contracts. Home value continued to decline, which effectively removed inflated equity as a source of household wealth. In 2007, the decline of the housing market also depressed growth in gross domestic product (GDP).<sup>3</sup>

In the spring of 2008, the predominant trend was not growth, but decline—the fallout from the collapse of the housing market and the ensuing credit crunch. The annual change in home value became negative, and population growth slowed appreciably. Householders needed no announcement to understand the economic downturn, and their decisions were evident in the slowing of migration flows (both out- and in-migration). The decline hit the "hottest" housing markets first and hardest. Home value dropped by an average of 23 percent in one year, and the annual rate of population growth decreased

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<sup>1</sup> *ESRI Demographic Update Methodology: 2005/2010*, ESRI White Paper J-9498, May 2005, p. 6.

<sup>2</sup> *ESRI Demographic Update Methodology: 2006/2011*, ESRI White Paper J-9565, June 2006, pp. 4–5.

<sup>3</sup> *ESRI Demographic Update Methodology: 2007/2012*, ESRI White Paper J-9663, June 2007, pp. 6–7.

by half. The deceleration was not confined to the most popular markets. The slowdown seeped through the 940 U.S. metropolitan and micropolitan areas, shifting home value from appreciation to depreciation in 73 percent of the markets and decreasing population growth in 62 percent. Even nonmetropolitan counties showed the effects of the decline in the housing market.<sup>4</sup> By the fall of 2008, the economy had fallen from flat, 0.6 percent growth in GDP in the first quarter of 2008 to loss, -6.2 percent in the fourth quarter. Economists announced that we had been in a recession since December 2007.<sup>5</sup>

In the second quarter of 2009, the U.S. economy remains in recession and in debt. ESRI estimates the number of jobs lost at 5.6 million by midyear, with an unemployment rate of 10.6 percent.<sup>6</sup> This loss negates more than 80 percent of the job growth since 2000. Nationally, the loss represents 1 in 25 jobs, but the 4 percent decline is not consistent throughout the country. Hardest-hit states, such as Michigan, North Carolina, and Oregon, show a loss of 1 in 15 jobs. By county, the steepest employment declines represent 1 in 8 jobs; by ZIP Code™, 1 in 3 jobs.

Unemployment is a lagging economic indicator. It is not the first sign of recession, but it does have a dampening effect on recovery, especially in an economy that depends on consumer spending for two-thirds of the gross domestic product. With this recession, unemployment has not only increased but also exacerbated the problem that provoked the economic crisis—mortgage defaults. Measured by foreclosure notices, mortgage defaults continued to increase through the first quarter of 2009 to more than 803,000. Foreclosure moratoriums slowed the filings in late 2008 and early 2009; however, employment losses have effectively kept the trend moving. From 2008 through the first quarter of 2009, foreclosure notices affected 3.1 million properties, or 1 in 42 homes nationwide. The national average represents only 2.4 percent of the housing inventory; the effect is more concentrated locally. The most vulnerable counties, in Nevada, California, and Florida, experience rates of foreclosure filings of 1 to 2 percent monthly. In Nevada, foreclosure filings affected 1 in 10 homes through 2008 and the first quarter of 2009; in California and Florida, 1 in 18 homes received a foreclosure notice in 2008–2009. At the ZIP Code level, these rates can equal 10 percent *monthly*.<sup>7</sup>

Three years of significant growth in foreclosure filings have left quite a wake in the housing market:

- The 2009 median home value, at \$162,000, is down 11.3 percent from 2008.
- Median home value declined in 2008–2009 in more than two-thirds of counties.
- Vacant units have increased by more than 8 percent; the vacancy rate is now 11.2 percent.
- The 2009 rate of homeownership (66.2%) is now slightly less than in 2000.

Vacancy rates are still increasing. Homeownership has dropped below the 2000 levels, and home value remains in decline for most areas. States with the highest rates of foreclosure filings, such as Nevada, Arizona, Florida, and California, also have the

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<sup>4</sup> *ESRI Trend Analysis: 2008/2013*, ESRI White Paper J-9732, June 2008, pp. 5–6.

<sup>5</sup> National Bureau of Economic Research, "Determination of the December 2007 Peak in Economic Activity," <http://www.nber.org/cycles/dec2008.html>.

<sup>6</sup> ESRI's employment data is not seasonally adjusted. Refer to the Labor Force section for definitions.

<sup>7</sup> RealtyTrac Inc., "National Real Estate Trend," <http://www.realtytrac.com/TrendCenter/default.aspx>.

largest declines in home value and population growth. These states were also home to the most popular housing markets in the country. However, the reversal of fortune is no longer limited to the hottest markets.

The depreciation of home value and the collapse of the housing market slowed growth for two-thirds of U.S. counties last year. In 2009, rising unemployment has augmented the deceleration and spread the trend to 80 percent of counties and 82 percent of metropolitan markets. The comparative rate change is less dramatic in 2009; however, after 16 months of recession, the rates hardly require more drama.

**Table 1**  
**Change in Population and Median Home Value by Metropolitan Status**

Counties by Metropolitan Status	N	Annual Population Change		Average Annual Change: Median Home Value	
		2000–2008 %	2008–2009 %	2000–2008 %	2008–2009 %
Metropolitan	1,089	1.3	0.2	6.3	-12.8
Micropolitan	697	0.7	-0.1	5.2	-2.0
Nonmetropolitan	1,355	0.4	-0.6	4.9	-1.1
<b>Total Counties</b>	<b>3,141</b>	<b>1.15</b>	<b>0.14</b>	<b>6.15</b>	<b>-11.3</b>

Fueled by housing depreciation, tightened credit, and unemployment, the current climate is more insidious than it was a year ago. Estimates of "underwater" homeowners (those who face a mortgage that exceeds the current market value of the home) run as high as one in five or one in six.<sup>8</sup> Negative equity precludes sale of the home unless the homeowner is prepared to cash out the difference. Any financial trouble, such as unemployment or divorce, makes foreclosure likely because the homeowner lacks the equity necessary to refinance or get a second loan.

Similarly, unemployment is only one aspect of the economic distress that consumers are feeling. The Great Recession has eroded savings and retirement plans and prompted 86 percent of U.S. industries to cut production since November 2008.<sup>9</sup> Private and public retirement accounts alone lost an astounding \$3.8 trillion in stock holdings between the financial market's peak in October 2007 and its meltdown a year later, according to the Boston College Retirement Research Center.<sup>10</sup> Diversification, the universally accepted portfolio strategy to reduce downside risk, provided no safety net when the stock market began to crumble. Workers approaching retirement have suffered losses that they may never recoup in time to retire. Surviving businesses that have not resorted to layoffs are

<sup>8</sup> Estimates of underwater homes were made by Zillow.com (1 in 5) and Moody's Economy.com (1 in 6).

<sup>9</sup> Isidore, Chris, "The Great Recession," [http://money.cnn.com/2009/03/25/news/economy/depression\\_comparisons/index.htm](http://money.cnn.com/2009/03/25/news/economy/depression_comparisons/index.htm).

<sup>10</sup> Munnell, Alicia H., Jean-Pierre Aubrey, and Dan Muldoon, "The Financial Crisis and Private Defined Benefit Plans," Center for Retirement Research at Boston College, [http://crr.bc.edu/images/stories/Briefs/ib\\_8-18.pdf](http://crr.bc.edu/images/stories/Briefs/ib_8-18.pdf).

cutting hours, wages, raises, and bonuses—all of which discourage consumer spending in an economy that depends on consumer spending.

### ***The Personal Effect of Current Trends***

A household's income is the most basic measure of its economic well-being. With the country now more than 16 months into a recession, the impact of this downturn is taking a toll on the earnings of every U.S. householder. ESRI's 2009 income estimates capture income for the 2008 calendar year, the first calendar year after the start of the Great Recession. Median household income for the 2008 calendar year stood at \$54,700, an increase of 2.9 percent annually since 2000, a slight decrease of 0.1 percent from 2007.

Average and per capita incomes show even less stability from 2008 to 2009. Average household income declined from \$73,800 to \$71,400, and per capita income declined more than 3 percent to \$27,300. The downturn has even affected traditional variants in income. Between 2000 and 2008, the growth of metropolitan areas and the addition of new micropolitan areas spurred income growth in metropolitan areas over nonmetropolitan areas. Today, median household income in metropolitan and micropolitan areas is more than \$17,000 higher than the median income of \$38,700 in nonmetropolitan areas. However, the impact of this recession has been more pronounced in metropolitan areas, reversing this trend. This factor is reflected in ESRI's income change between 2008 and 2009. Median household income has shown a decline of -0.2 percent in metropolitan areas, while nonmetropolitan areas maintained a growth in median household income of 0.7 percent.

Douglas County, Colorado, continues to rank first in median household income in the country, but the rate of appreciation has slowed. Between 2008 and 2009, median household income grew by only 0.9 percent, or \$1,000. Loudoun County, Fairfax County, and Falls Church City in Virginia; Hunterdon, Somerset, and Morris counties in New Jersey; Los Alamos County in New Mexico; Nassau and Putnam counties in New York; Howard County in Maryland; and Santa Clara County in California have maintained median household incomes higher than \$100,000.

Current income is only one component of a household's financial security. The savings rate determines how much accumulated wealth is available for rough times such as these or for future retirement. Between 2008 and 2009, the U.S. median net worth fell by 7.6 percent to \$97,700. Average net worth dropped by -11.7 percent to almost \$449,000 at the same time. Two major economic factors have impacted household net worth: (1) the record depreciation in home value since 2007 and (2) the dramatic decline in the value of stocks, bonds, and retirement accounts since fall 2008. The two largest components of household net worth—equity in real estate and stock holdings—have been subjected to brutal cuts that will take many years to recover.

Just how much do these macro-level forces affect the individual household? The 2007 Survey of Consumer Finance (SCF) estimates that 50 percent of households had direct or indirect stock holdings, and 60 percent of households were invested in primary or secondary real estate. The average household had more than 60 percent of its assets tied up in real estate or stocks.<sup>11</sup> Almost every household has experienced major asset losses.

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<sup>11</sup> The Federal Reserve Board, "2007 Survey of Consumer Finances," <http://www.federalreserve.gov/Pubs/OSS/oss2/2007/scf2007home.html>, Tables Based on the Public Data, Estimates in nominal dollars.

Given the average household debt of \$126,000, the road to recovery is expected to be slow and prolonged.

The cumulative effect of the Great Recession is a cutback in discretionary spending and an increase in saving. This is reflected in the personal consumption expenditures from the Bureau of Economic Analysis, which began to show a year-by-year decline by the third quarter of 2008. By the fourth quarter of 2008, the year-by-year decline was 1.5 percent.

For most households, disposable income is the bottom line to making ends meet; for others, it determines how much money can be saved. Median disposable income is \$43,400 in 2009; the average disposable income declined -1.4 percent to \$57,400. Changes vary by age. The average household's disposable income is 80 percent of pretax income. The youngest (less than 25 years) and oldest (65 years or older) householders have median disposable incomes that are more than 85 percent of their pretax incomes. The 45- to 54-year-olds, the tail end of the baby boom, earn the highest average disposable income—more than \$10,000 higher than all U.S. householders—but they have also experienced a larger drop in average disposable income in the last year (-2 percent). Combined with its net worth loss of more than 21 percent, this affluent age cohort has also been forced to rethink its spending habits.

## **The Economic Outlook**

The economic change and the reaction of the American consumer are evident in macroeconomic indicators. Real gross domestic product, which measures the final, inflation-adjusted value of all goods and services produced in the economy, shrank for three consecutive quarters. In the third quarter of 2008, the GDP declined 0.5 percent. Then the GDP plummeted 6.3 percent in the fourth quarter of 2008 and 6.1 percent in the first quarter of 2009. The last reading this low was -6.4 percent in the second quarter of 1982, and that recession lasted for 16 months. Decreases in the GDP for three consecutive quarters have not occurred since the mid-1970s.

Consumer spending is driving some of the decline in the GDP. Spending dropped by 3.8 percent and 4.3 percent in the final two quarters of 2008, respectively. Facing an uncertain future, many households have switched from spending to saving, which is evidenced by an 8 percent drop in retail sales according to the Census Bureau's Monthly Retail Trade Survey. The current climate has taken a toll on many iconic retailers. Circuit City, Linens 'n Things, and Steve & Barry's are among the notables forced to close their doors for good. Other well-known retailers, such as Macy's, Gap Inc., and Home Depot, are restructuring themselves to better weather the downturn by closing underperforming locations and curtailing expansion plans.

The outlook remains bleak for businesses across all industries. The change in consumer spending preferences and the lack of available credit have also impacted the business investment component of the GDP. Domestic investment plunged -10.4 percent by the fourth quarter of 2008 and fell another -24.2 percent in the first quarter of 2009.

In response to the meltdown in the financial markets in September 2008, the federal government took a number of historic steps to slow or stop the downward spiral in economic activity. Several financial institutions were on the brink of collapse when the U.S. Treasury Department and the Federal Reserve stepped in to perform triage. Troubled financial institutions were separated into too-big-to-fail versus unsalvageable categories. Lehman Brothers fell in the latter category due to its large volume of toxic assets. The



government also orchestrated key mergers, such as Bank of America's purchase of Merrill Lynch, and established credit facilities to rescue companies such as AIG (formerly American International Group). The two remaining Wall Street investment firms, Morgan Stanley and Goldman Sachs, agreed to increased government oversight by switching their status to bank holding companies, which now requires them to register with the Federal Reserve.

As part of the Emergency Economic Stabilization Act of 2008, the federal government created the Troubled Asset Relief Program, or TARP. This program gives the U.S. Treasury \$700 billion to inject into the financial system, including the purchase of distressed mortgage assets that are overwhelming many banks and financial institutions.<sup>12</sup> The program's scope has extended beyond the financial industry to include domestic automakers and life insurers. The magnitude of the federal response to stimulate the economy has not been seen since the Great Depression.

The Federal Reserve has also coordinated an aggressive multipronged approach to thaw credit markets. First, short-term interest rates were lowered to a range of 0 to 0.25 percent. Then the Federal Reserve began to inject billions of dollars into the financial system via its Term Asset-Backed Securities Loan Facility (TALF) program to purchase more debt from Fannie Mae and Freddie Mac. The Federal Reserve also plans to purchase up to \$300 billion in long-term Treasury securities, including billions more in mortgage-backed securities, to reduce interest rates on consumer loans and corporate bonds.

In addition to the Emergency Economic Stabilization Act of 2008, the executive and legislative branches of government passed the American Recovery and Reinvestment Act of 2009. The bill includes an unprecedented \$787 billion in new spending that provides tax relief, infrastructure spending, aid to state governments, and additional spending for education and health care.<sup>13</sup> Can the government's fiscal policy pick up the slack in the private sector and inspire consumer confidence to move the economy toward recovery?

What is the economic outlook for the country? There are positive signs among the daily gloom reports. The financial markets have posted gains. Housing has become more affordable. Inflation is not an issue yet; in fact, consumer prices posted the first year-by-year decline in more than 50 years in March 2009. Consumer spending showed some improvement in the first quarter of 2009, up 2.2 percent. Interest rates are near rock bottom, at levels that will eventually spur more growth via consumer spending. More importantly, the fear factor induced by the recession has been allayed by the government's actions.

However, progress is slow. Until banks begin to lend again on a larger scale, only households and individuals with stellar credit histories can benefit from current interest rates. The economy is still bleeding jobs, and the precipitous decline of the housing market has not abated. Home value is still declining; foreclosures are not. The last time the United States faced a widespread decline in home prices was in the early 1990s. That

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<sup>12</sup> HR 1424, 110th Cong., 2nd sess., [http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110\\_cong\\_bills&docid=f:h1424enr.txt.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h1424enr.txt.pdf).

<sup>13</sup> HR 1, 111th Cong., 1st sess., [http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111\\_cong\\_bills&docid=f:h1enr.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h1enr.pdf).

recovery started in the mid-1990s, with homeownership surging at the same time. The current housing recession is unmatched in history. Given the rise in unemployment, subsequent loss of income, and the scheduled reset of adjustable rate mortgages in the near future, it is clear that foreclosures have not yet hit their peak. ESRI's five-year forecasts are conservative.

ESRI expects the recession to bottom out by the end of 2009. Labor market indicators such as unemployment insurance claims are already beginning to slow. Developing 2014 civilian labor force characteristics requires not only an assumed end to the Great Recession but also an assumption about the pace of recovery. ESRI analyzed historical labor force trends during business cycle expansions and contractions from the Current Population Survey back to the late 1940s. Taking historical behavior into account, ESRI's employment forecast shows growth by 2014. The five-year outlook for jobs shows an improvement of 1.7 percent annually, to reach 149 million workers by 2014. Similarly, the rate of unemployment is expected to improve steadily, to decline by 3.5 percentage points to 7.1 percent in 2014.

Analysis of historical income data dating back to 1969 suggests that incomes do decline during a recession; however, the full impact is not always evident in the first year after the recession begins. Income declines in subsequent years are often greater than in the first year of a recession. Because the downward pressure on income lags behind unemployment growth, it is clear that the brunt of the downturn in personal income is yet to come. ESRI estimates that the recovery of median household income in the 2009–2014 period will occur at a rate of only 0.8 percent annually.

The five-year forecast of home value is predicated on both short- and long-term trends in the House Price Index (HPI) from the Office of Federal Housing Enterprise Oversight (OFHEO). ESRI estimates that home prices will grow at a rate of 2.7 percent per year between 2009 and 2014.

The confluence of events that provoked this recession took years to develop. The demand was fueled by demographic change; the means were provided by government actions (banking deregulation, lowered interest rates, etc.) and inactions (lack of oversight), in addition to the grand goals of Fannie Mae and Freddie Mac to promote homeownership. The enticement of fast profits is endemic. Analysis of the long-term consequences of short-term actions is generally eschewed. Even now, most data users stick to the current estimates and leave the long-range forecasts to footnotes and appendixes. However, if the Great Recession leaves only one lesson in its wake, it should be the folly of taking shortcuts. There are no quick fixes for this recession; recovery will happen in the long run.

## **Geography Changes in 2009**

Change is inevitable with any geographic area—political or statistical. Identifying changes in the areas for which data is tabulated and reported is critical to the analysis of trends. In the past year, there have been minor changes to metropolitan areas by the Office of Management and Budget, boundary revisions for designated market areas (DMAs) by Nielsen Media Research, and the usual adjustment of ZIP Codes by the U.S. Postal Service (USPS).

Metropolitan changes include the latest revisions to core-based statistical areas (CBSAs), released in November 2008. Changes include three micropolitan areas that have been

redefined as metropolitan areas: Cape Girardeau-Jackson, Missouri-Illinois (CBSA Code 16020); Manhattan, Kansas (CBSA Code 31740); and Mankato-North Mankato, Minnesota (CBSA Code 31860). There is also one name change that includes a code revision, The Dalles, Oregon, micropolitan statistical area (CBSA Code 45520, formerly 17180), as well as five other name changes. There are still 940 CBSAs, 366 metropolitan areas, and 574 micropolitan areas.

DMAs represent the 2008–2009 markets as defined by Nielsen Media Research. Most DMAs correspond to whole counties, but there are a few exceptions where counties are split into different DMAs. Finally, ZIP Codes, which are defined solely to expedite mail delivery, are updated to reflect the November 2008 inventory from the U.S. Postal Service.

ESRI presents the 2009/2014 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, marital status, educational attainment, and income (including household and family income distributions, household income by age of householder, and per capita income).<sup>14</sup> Updates of household income are also extended to provide after-tax (disposable) income and a measure of household wealth—net worth. Changes in the update base from the Census Bureau's Count Question Resolution (CQR) revisions, updated boundaries, and improvements to forecasting techniques may obfuscate comparison with 2008 or earlier updates.

## **2009 Demographic Updates**

Forecasts are prepared initially for counties and block groups. From the county database, forecasts are aggregated to CBSAs, states, or higher levels. From the block group database, forecasts can be retrieved for census tracts; places; county subdivisions; ZIP Codes; congressional districts for the 111th Congress; DMAs; or any user-defined site, circle, or polygon.

### ***County 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. A military base closing effects an immediate decrease in the household population with the reduction of not only military personnel but also their families and civilian personnel; however, this drop is unlikely to continue. To address local changes specifically in the military, ESRI has analyzed the 2005 Defense Base Realignment and Closure (BRAC) plan. The Department of Defense (DoD) has undergone four BRAC rounds since 1988 and is currently implementing its fifth round—the 2005 round. The recommendations became effective on November 9, 2005, and DoD has until September 15, 2011, to complete the implementation of all BRAC recommendations. To summarize, the plans include more than 800 closures or realignments, with the relocation of approximately 123,000 personnel.<sup>15</sup> The disparity of trends in household versus group quarters' population is best accommodated by separate

<sup>14</sup> Forecasts represent the midyear population as of July 1, unless otherwise specified.

<sup>15</sup> United States Government Accountability Office, "Military Base Realignments and Closures: DoD Faces Challenges in Implementing Recommendations on Time and Is Not Consistently Updating Savings Estimates," <http://www.gao.gov/new.items/d09217.pdf>.

projections. The group quarters' population is the Census 2000 count of group quarters, with CQR revisions and 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 a time series from the U.S. Census Bureau that includes county estimates through 2007.<sup>16</sup> 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, and residential postal delivery counts. Finally, local data sources that tested well against Census 2000 are reviewed.

### ***Block Group Totals***

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 is current. To measure current population change by block group, ESRI models the change in households from three primary sources: the InfoBase-X™ database from Acxiom Corporation, residential delivery statistics from the U.S. Postal Service, and residential construction data from Hanley Wood Market Intelligence, 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. The USPS establishes carrier routes to enable efficient mail delivery. Carrier routes are a fluid geographic construct and are redefined continually to incorporate real changes in the housing inventory and occupancy along with administrative changes in staffing and budgets of local post offices. These frequent changes in the 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 also 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.

One way to distribute delivery statistics among component block groups is to create a correspondence using boundary files. Changes in postal carrier routes can be tracked through quarterly updates of carrier route boundaries, and delivery statistics can be assigned to block groups with Census 2000 block data. There is another way that also employs boundary files but assumes a uniform distribution of households within the area. Using standard geodemographic tools, it is possible to estimate the change in households from carrier route delivery statistics and apply that change to any block group(s) in the area. However, the estimated change is simply being redistributed from one summary area to another.

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<sup>16</sup> U.S. Bureau of the Census, Population Division, Table CO-EST2007-ALLDATA.

ESRI has developed another way to link a carrier route to the correct block group(s)—using the *actual* locations of mail deliveries. Its proprietary Address-Based Allocation (ABA) solves the complex challenge of converting delivery counts from carrier routes to block groups.<sup>17</sup> This allocation method uses the addresses from Acxiom's InfoBase-X household database. Addresses in the database are geocoded with carrier route and block group codes, using an enhanced geocoding technique and locator database, and serve as the foundation for the conversion. This approach is unbounded by geographic borders or arbitrary assumptions about the distribution of households or postal deliveries.

ABA results have been tested extensively. The tests include benchmarking against the 2000 Census. Manual reviews confirm the capability of the method to identify areas with high growth. The ABA allocation method reveals sprawls and new developments across the country since Census 2000. Assessments based on other data sources verify the efficacy and precision of ABA. For the small portion of block groups where addresses are not available from the InfoBase-X database, delivery statistics are allocated from a correspondence file. The correspondence between census block groups and postal carrier routes is developed using quarterly updated data from Tele Atlas®.

The effectiveness of ABA relies on the precision of block group assignment to InfoBase-X addresses. ESRI improved the geocoding accuracy of the InfoBase-X file by applying ArcGIS® 9.3 with the Dynamap®/Address Points database from Tele Atlas, which provides coordinates that are accurate *to the building*. It offers a new development in large-scale geographic databases, where addresses are represented as points rather than approximations estimated from address ranges or street segments. The database currently covers the most densely populated areas in the United States, with continually increasing geographic coverage. Addresses that fall outside the coverage were geocoded with the conventional approach, based on address ranges.

Post office delivery counts or address counts provide less coverage in rural areas. Sparsely populated areas tend to have post office box ZIP Codes because there are few rural addressing systems and little comparability to urban street delivery. The same problems characterize rural addresses in the InfoBase-X database. To track new housing developments—especially in previously unpopulated areas—in 2006, ESRI licensed a new data source from Hanley Wood Market Intelligence: new and planned residential construction in the top 75 U.S. housing markets, including new markets added through 2008.

The residential construction database from Hanley Wood Market Intelligence adds a unique component to ESRI's strategy for producing accurate demographic forecasts. This database identifies individual construction projects—for instance, a complex of single-family homes or townhomes or a condominium building with their exact location by latitude and longitude. It also pinpoints conversions of apartments into condominiums. The construction information includes

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

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<sup>17</sup> Patent pending.

The use of this type of information in demographic forecasts has traditionally been confined to small-scale implementation, such as producing forecasts for a specific county. ESRI partners with Hanley Wood Market Intelligence to introduce this information in a large-scale forecasting effort. The construction database complements and corroborates the postal delivery statistics. More importantly, it tabulates planned construction to be completed in upcoming years. This information is incorporated in ESRI's five-year forecasts. Tracking residential development since 2000 with enhanced demographic and spatial analysis tools provides better information for the five-year forecasts than past trends.

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 by 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.

### ***Blocks***

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 assess block totals. Blocks have attracted virtually no interest among data users. As the lowest common denominator in the geographic hierarchy that progresses to block groups, tracts, counties, and states, blocks are too small for the tabulation of most census variables. Only complete-count totals are reported for blocks from the decennial census.

However, blocks are useful in the estimation of data for polygons, which can be any area outside the geographic hierarchy, from ZIP Codes to user-defined polygons. All these areas *do* attract the interest of data users. The most common technique overlays blocks within the polygon and apportions data from the ratio of the aggregated blocks to the component block groups. To date, this technique has applied the relationship between the blocks and the block groups from the most recent census. 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 2000, the estimate cannot incorporate that change unless both blocks and block groups are updated.

ESRI has developed a current database of the block weights used to retrieve information for polygons by extending the application of its Address-Based Allocation technique to the block level. Updating the relationship between blocks and block groups for areas that are experiencing change is critical to capturing current trends in polygons. Enhanced site analysis precludes comparisons with previous updates.

### ***Quarterly Updates***

To enable comparison with the previous update, ESRI introduces quarterly updates of population and households. Totals are provided for eight quarters (January, April, July, October) for the preceding and current years (2008–2009). Quarterly updates for July 1 (Q3) of each year equal ESRI's annual update totals. Data for intervening quarters represent an application of ABA to postal delivery statistics for that time. Because the annual updates incorporate not only a time series analysis of postal delivery counts but also several annual data series, the change shown by quarter is not a seamless trend line. Quarterly updates are designed to show periodic fluctuations in the data, especially in

areas that are subject to seasonal population shifts, rather than the smooth trend lines commonly provided by interpolation.

### **Population and Household Characteristics**

ESRI's population and household characteristics include population by sex and age, race and Hispanic origin, sex by age by race and Hispanic origin, marital status, educational attainment, 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 2000 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. An influx of college students can offset the loss of youthful outmigrants.

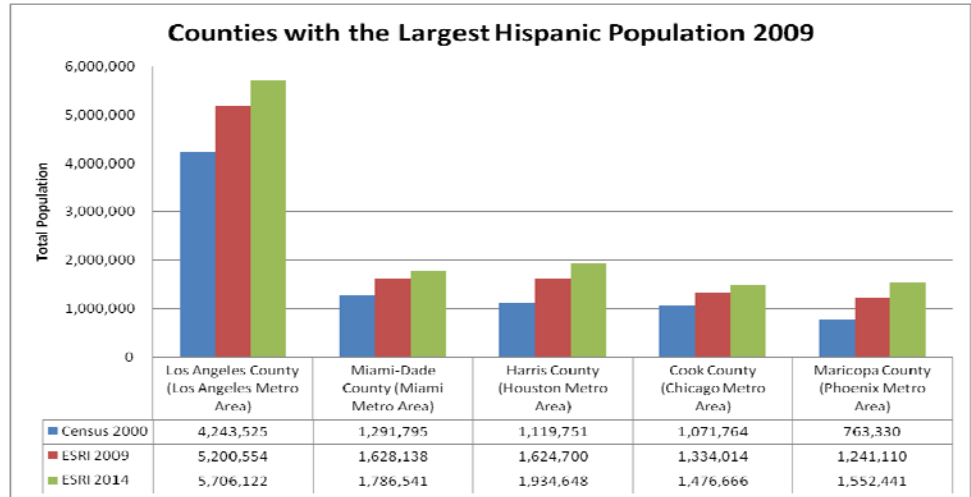
To capture these variations, ESRI's model first separates the group quarters' population from the household population then keys the calculations to the size and characteristics of the population. This stratification identifies several different patterns of change by age and sex that are applied in the cohort survival model. Births are projected from area-specific, child-woman ratios. Migration is computed as a residual, the difference between the survived household population and independent projections of the total household population.

The changing profile of the U.S. population would be incomplete without measuring the growth of population by race and Hispanic origin. Immigration to the United States has diversified the U.S. population. ESRI's database includes a Diversity Index to summarize racial and ethnic diversity. 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).

The U.S. Diversity Index currently stands at 60.5, an increase of 1.1 percent annually since 2000. Led primarily by the growth of the Hispanic population, California, New Mexico, and Texas are the most diverse mainland states, with 2009 diversity indexes higher than 74. The process of diversification in these states is advanced; therefore, these areas are among the states with slow rates of change in diversification. Although immigration is still rising in these states, it has a smaller impact on the diversity level. Traditionally nondiverse states, such as Maine, Vermont, and Connecticut, are experiencing some of the highest rates of diversification. Pockets of diversity are evident in less diverse states. For example, the Liberal, Garden City, and Dodge City micropolitan statistical areas in Kansas have diversity indexes of 82, 80, and 76, respectively, although the state's index is 41.6.

The Hispanic population now stands at 48.7 million, or 15.7 percent of the total U.S. population. The influence of this ethnic group on American culture is on the rise due to growth rates of 3.5 percent per year since 2000 and a projected total of 56.8 million by 2014 (17.5 percent of the U.S. population).

**Chart 1**  
**2009/2014 Forecasts of Hispanic Origin for Select Counties**



Asian and non-Hispanic multiracial populations are following Hispanic trends closely with growth rates of 3.4 percent and 3 percent, respectively, from 2000 to 2009, although they are smaller population groups. The proportion of the non-Hispanic white population in the country has declined from 69 percent in 2000 to 64.5 percent in 2009. By 2014, the ratio is forecast to drop to 61.9 percent. At this rate of decline, the proportion of non-Hispanic whites will be less than 50 percent by 2040.

Historical trends in race and Hispanic origin play an important role in the analysis and forecasting process. Tracking intercensal population change by race was encumbered by the new reporting method in Census 2000. Race was reported as a multiple-choice item—not "one person—one race," as reported in past censuses or estimates. The Census 2000 data is not directly comparable to 1990 Census data or to any earlier estimates or projections.

Comparisons made between single-race reporters in 2000 and 1990 underestimate the change by race. Excluding the rapid growth of the multiracial population minimizes the change by race from 1990 to 2000. Alternatively, combining single-race reporters with races reported in any combination can cut down the 63 racial groups reported in Census 2000. For example, a person who reports "White and Asian" is counted as both "White" and "Asian." This combination of single-race and multiracial reporters overcounts multiracial reporters and overestimates the change by race from 1990 to 2000. To achieve a true picture of population change by race, it is important to account for the change in multiracial reporting.

ESRI takes an innovative approach in analyzing this data to make effective use of the additional information from Census 2000.<sup>18</sup> The Census Bureau released most race-related data for six single-race groups and one multiple-race group. ESRI's data preserves

<sup>18</sup> A more detailed discussion of ESRI's 1990–2000 race analysis is available from Sangita Vashi's paper, *Trends in the U.S. Multiracial Population 1990–2000*, presented at the 2001 Southern Demographic Association's annual meeting.



this format and enables a comparison of 1990 and 2000 data for six single races and one multiracial group. Assuming that the probability of reporting more than one race varies by race group and geographic area as shown in Census 2000, ESRI estimates the number of likely multiple race reporters from 1990 Census data. The same approach is adopted for the population of Hispanic origin by race.

The most current data sources by race and Hispanic origin are 2007 data available by county and state from the Census Bureau's estimates. Survey data is analyzed in conjunction with ESRI's estimate of change from 1990 to 2000 by race and Hispanic origin 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 projections.

The composition of the American household continues the slow change from married-couple families to nontraditional families and single-person households. Between 1990 and 2000, the dominant share of households remained married-couple families in most states but decreased from 55 percent of all households to 52 percent in 2000. Increased shares of single-parent and single-person units comprise the difference. The attendant change in average household size is the decline from 2.63 in 1990 to 2.59 in 2000. Through 2009, these changes continue but even more gradually than in the 1990s.

The gradual change in household size makes it uniquely suitable to forecasting the change in households from the change in household population. Average household size is one of the most stable and predictable components of the forecasts. Household forecasts are predicated upon local patterns of change, which are controlled by the more constant trends for states and counties. Nationally, household change stabilized in the 1990s and remains at 2.59 in 2009.

Local change, however, is affected more by the singular composition of the population, and trends often vary from the national norm. Nationally, average household size decreased by less than 0.4 percent annually from 1990 to 2000. By county, the change varied from a low of -2.1 percent to a high of 1.3 percent. An increase in household size can result from higher rates of fertility locally or from an increase in multigenerational households. Census 2000 has documented the increase in multigenerational households in areas where there is high immigration or areas with housing shortages and higher costs. From 2000 through 2009, the annual change in household size by county ranges from -1.1 to a high of 0.6 percent.

Few block groups represent a cross-section of U.S. households. In areas that gained population from immigration in the 1990s, the trend in average household size actually reversed and increased. 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 2009/2014 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 the American Community Survey (ACS) from the Census Bureau, then applied as controls.

In 2008, ESRI added two new characteristics—marital status and educational attainment. Four marital status categories are updated for the population 15 years and older: never married, married (includes the separated population), divorced, and widowed. Seven categories of educational attainment are reported for the population 25 years and older. Educational attainment levels are categorized as less than a ninth-grade level of education, some high school, high school graduate (including GED equivalent), some college, associate degree, bachelor degree, and graduate degree.

Data from the 2000–2007 American Community Surveys is evaluated against long-term trends in census data. Intercensal trends identify the progress of important social factors such as the labor force participation among women, later age at first marriage, and delayed childbearing. Generational changes in the U.S. population from the baby boomers to their children, Generation Y, are key factors in ESRI's analysis of change in marital status and educational attainment. Once regional profiles for marital status and education are established, local area estimates link expected regional change to local changes in the distributions.

## **Housing**

ESRI's housing updates include total housing units, occupancy, tenure, and home value. With the mortgage crisis extending beyond the subprime market and credit tightening, the housing market represents a major concern for not only homeowners and Wall Street but also all levels of government. Many local governments have stepped up their efforts to deal with the rising incidences of foreclosures.

Home prices have dropped from a historical high in recent years, with a median of \$162,000 for the United States in 2009 compared with \$183,000 in 2008. The last time the United States faced a widespread decline in home prices occurred in the early 1990s. That recovery started around the mid-1990s, with homeownership surging at the same time.

In 2009, the U.S. homeownership rate fell to 66.2 percent. The rate hovered around 64 percent throughout the first half of the 1990s. From the mid-1990s, the rate climbed rapidly until 2004, then leveled off for the next few years before declining. Although the housing market crisis contributes to the recent decline in the homeownership rate, demographics play a key role. Due to the changing composition of the age cohorts in the United States, the homeownership rate is unlikely to climb back up to its historic high over the next few years. The echo boomers, or Generation Y, represent a sizable share of the population that is more likely to rent than own as they begin to form households. In contrast, the baby boomers are primarily homeowners because of their financial position, desire to own a home, or both.

Current data on change in the housing inventory encumbers the application of past trends. From 1990 to 2000, the housing stock increased by less than 1.4 million annually. From 2000 to 2008, the annual increment was more than 1.7 million units; however, the collapse of the housing market has slowed construction significantly in the past year. Total housing units are updated from the Census 2000 base by recorded changes in the housing inventory and estimated changes in occupancy rates since April 2000. Recorded change in the housing inventory is culled from several data sources, including construction data from Hanley Wood Market Intelligence, building permits for permit-issuing places and counties, and data for new manufactured homes placed by state from the Census Bureau. Dozens of independent sources were consulted to retrieve detailed

information on housing development data where no building permits existed. Fewer than half the counties have complete coverage with building permits. Independent estimates of change in occupancy were calculated from U.S. Postal Service residential lists, vacancy durations from the Department of Housing and Urban Development, and data from the Current Population Survey and the Housing Vacancy Survey from the Census Bureau.

The data for tenure represents owner- and renter-occupied housing units. Together, the two components add up 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 and the latest census 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 controlled to the total households.

ESRI tracks the change in home value using the HPI from the OFHEO. 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 secured by Fannie Mae or Freddie Mac. The OFHEO 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, the survey data will give the misleading impression over time that home prices have fallen.

The OFHEO index series is released quarterly for states, metropolitan areas, and nonmetropolitan areas within states and with county or county group data for larger metropolitan areas. In 2008, ESRI began to incorporate trends in the purchase-only House Price Index series for states and the United States from the OFHEO. Traditionally, the OFHEO has combined loan data from purchases and refinancing to compute the index. For refinanced loans, the appraised value of a home is used in lieu of the sales value to estimate the change in home prices. ESRI has applied time series' analysis to extrapolate both short-term (2009) and long-range (2014) trends in home value from states and metropolitan areas to block groups. The 2008 update introduced sophisticated new techniques to capture the local relationship between the House Price Index and home value of all owner-occupied units. Local estimates of home value incorporate supply-demand characteristics, the socioeconomic traits of householders in the area, and HPI trends assessed for larger markets.

ESRI's 2009 estimates incorporate a new series from the OFHEO. Since Census 2000, ESRI has employed its State and Metropolitan Area series as a primary data source. The OFHEO has provided the Rural HPI series that tracks change in home prices for all nonmetropolitan counties in a state (including micropolitan counties). ESRI's 2009 estimates target growth or decline in home value to counties and smaller areas more accurately.

This has resulted in a realignment of growth between metropolitan and rural counties. Because ESRI's 2008 estimates did not benefit from information on rural trends, the 2008–2009 change in median home value is emphasized in some areas. States with the

largest difference between the rural HPI trend line and the state HPI trend line will show this. Long-term trends between 2000 and 2009 are more reliable than short-term trends in these states.

Based on the OFHEO data, the majority of states show higher growth in rural counties compared to the parent state. In other words, metropolitan areas are experiencing the brunt of the downturn. Major metropolitan areas that have seen new homeownership increase rapidly since 2000 are the very areas that are now the heart of the housing crisis. The following table highlights states with the largest positive differences in the OFHEO's rural HPI series and its state HPI series.

**Table 2**  
**Trends in the OFHEO's Rural and State HPI Series**

<b>State</b>	<b>Rural Area of State: Annual HPI % Change 2000– 2008/Q2</b>	<b>Entire State: Annual HPI % Change 2000– 2008/Q2</b>	<b>Percent Difference: Rural to State</b>
Michigan	3.6	1.9	89.5
Colorado	7.4	4.4	68.2
Georgia	6.0	4.6	30.4
Massachusetts	8.6	6.6	30.3
Delaware	10.6	8.2	29.3
Texas	5.6	4.6	21.7
North Carolina	5.8	5.0	16.0
Ohio	3.1	2.7	14.8
Alabama	5.8	5.1	13.7
New Hampshire	8.4	7.4	13.5
South Dakota	5.9	5.2	13.5
California	9.8	8.7	12.6
Kentucky	4.5	4.0	12.5
Nebraska	3.8	3.4	11.8
Oklahoma	5.2	4.7	10.6
Iowa	4.3	3.9	10.3

The 2009 update employs sophisticated new techniques to capture the local relationship between the House Price Index and home value. Local estimates of home value incorporate supply-demand characteristics, the socioeconomic traits of householders in the area, and HPI trends assessed for larger markets. Given the rise in unemployment and loss of income and the resetting of adjustable rate mortgages in the near future, it is clear that foreclosures have not yet hit their peak. According to Mark Zandi of Economy.com, foreclosures will peak around the fourth quarter of 2009, and growth in housing prices will only resume in the second half of 2010. ESRI's five-year recovery estimate is predicated on both short- and long-term trends in the OFHEO's House Price Index. ESRI

estimates that home prices will grow at a rate of 2.7 percent per year between 2009 and 2014.

## Labor Force

ESRI forecasts the civilian labor force and employed population by industry and occupation for 2009 and 2014.<sup>19</sup> The employment picture is grim this year. ESRI measured the slower employment gains between 2007 and 2008, but the deepening financial crisis in the second half of 2008 caused the labor market to deteriorate rapidly. Labor costs represent a substantial portion of a business' operating expense. When sales slump and inventories rise during downturns, cutbacks follow, including trimming fixed costs, such as the reduction or elimination of benefits, and cutting personnel.

Unfortunately, layoffs are becoming more widespread. The U.S. workforce has shrunk by almost 4 percent to 136.6 million people, representing a loss of 5.6 million jobs between July 2008 and July 2009. The ranks of the unemployed swelled by almost six million to a rate of 10.6 percent over the same period.

Regionally, the southern states suffered the largest decline—nearly two million workers—followed by 1.4 million jobs lost in the West. But the news was almost as bad for states in the Midwest and northeastern regions, which each lost more than one million workers. Individually, the more populous states experienced the larger declines in payrolls. Moreover, states that grew the fastest during the real estate boom are suffering most during this recession. For example, the two states experiencing the largest employment declines are California and Florida. California's employment base shrunk by almost 861,000 people, while Florida's payrolls contracted by nearly 446,000, each state losing 5.3 percent of its workforce.

Layoffs are widespread, and employment is dwindling in many industries. Fifteen of ESRI's twenty broad industries sustained employment losses. Construction, which flourished during the real estate boom, slimmed down by almost 1.5 million workers, or a change of -13.7 percent from a year ago. Manufacturing employment continued its downward trend with another 1.9 million jobs lost, or down by -12.6 percent. Correspondingly, occupations contracting the most are found in construction, extraction, and production.

However, some industries, such as health care and educational services, are still hiring. As the health care needs of older Americans increase, the demand for workers in the industry grows. ESRI is forecasting a robust 547,000 new hires by July 2009 in the health care and social assistance industries. Demand for educational services is increasing among unemployed workers that are opting to leave the labor force to pursue training in a new field of study. As a result, some college towns are actually hiring additional staff to accommodate the increased demand for educational services.<sup>20</sup> ESRI has forecast growth of an additional 424,000 workers by July 2009 in this industry.

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<sup>19</sup> It is important to remind data users that ESRI's civilian labor force estimates represent seasonally *unadjusted* totals as of July 1 in order to stay consistent with Census 2000, which is used as 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. For more information on estimation differences, refer to the Dissimilarities in Sources of Labor Force Information section.

<sup>20</sup> Evans, Kelly, "Why College Towns Are Looking Smart." *Wall Street Journal*, 24 March 2009: D1.

While labor markets have severely deteriorated in 2009, ESRI's five-year forecast shows an improved outlook. ESRI believes the recession will bottom out by the end of 2009. As a result, employment will grow again, at an annualized pace of 1.7 percent, to 148.7 million workers by 2014. The rate of unemployment will decrease to 7.1 percent.

## **Data Sources**

Estimates of the civilian labor force integrate recent change in the supply and demand for labor from the Local Area Unemployment Statistics (LAUS), Employment Projections (EP), Occupational Employment Statistics (OES), and Current Employment Statistics (CES) programs of the Bureau of Labor Statistics (BLS), as well as the ACS and CPS from the U.S. Census Bureau. Federal statistical surveys are the principal sources for labor force trends. Furthermore, the LAUS program is the premier resource for current and local economic conditions utilized by state and local governments, media outlets, the private sector, and academic researchers.

## **Methods**

Employment and unemployment forecasts are developed from the Census 2000 base.<sup>21</sup> Trends are adapted from an LAUS monthly time series projected to July 2009. LAUS state estimates are based on the concepts and definitions from the program's main input source, the monthly CPS, as well as the CES program from the BLS and state unemployment insurance systems. Additionally, LAUS substate models incorporate data from the decennial census. Change between Census 2000 and ESRI's civilian labor force trends are tied to historical and seasonal patterns in the LAUS state and county (not seasonally adjusted) monthly time series.

ESRI's industry and occupation updates capture temporal change from the aforementioned federal statistical sources. For 2009, ESRI's national and state industry distributions were updated using trends from the CES. Because CES measures nonfarm employment trends, CPS and ACS were used to update agricultural employment. Moreover, a new data source was introduced this year to estimate the national and state occupation distributions. ESRI used OES' latest industry-occupation matrix to allocate 2008–2009 industry employment change to the related occupations. The updated national and state industry and occupation employment targets were then used to model substate areas.

## **Concepts**

The civilian labor force includes members of the population aged 16 years and older who are classified as either employed or unemployed and excludes active duty Armed Forces personnel. The employed population includes persons who were

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<sup>21</sup> In July 2002, the Census Bureau reported a processing error affecting its 2000 labor force estimates for areas surrounding college towns. The error apparently overstated the number of unemployed persons and the unemployment rate while underestimating the employed population and persons classified as not in the labor force. Further research by the Census Bureau uncovered a response pattern to the employment questions that extends beyond the population living in college towns. The Census Bureau estimates that employment responses for approximately 15 percent (or 500,000 people) of the working-age, civilian, noninstitutional GQ population were affected. Furthermore, it surmises that the positive bias in the number of unemployed appeared to artificially increase the 2000 U.S. unemployment rate of 5.8 percent by 0.4 percentage points. ESRI addressed the apparent bias at the block group level and realigned the affected Census 2000 labor force estimates before any forecasts were calculated. For more information, refer to Appendix 3 in *U.S. Census Bureau, Housing and Household Economic Statistics Division, "Comparing Employment, Income, and Poverty: Census 2000 and the Current Population Survey,"* September 2003, [http://www.census.gov/hhes/www/laborfor/final2\\_b8\\_nov6.pdf](http://www.census.gov/hhes/www/laborfor/final2_b8_nov6.pdf).

- Working during the reference week as paid employees, self-employed, working on a farm, or working as unpaid workers for 15 hours or more on a family farm or business
- Temporarily absent from their jobs due to vacation, illness, bad weather, labor disputes, or other personal reasons, excluding layoffs

Total employment excludes volunteer workers and caretakers of home or family. The unemployed population includes persons who were

- Neither at work nor temporarily absent from a job
- Seeking employment during the previous four weeks
- Available to accept employment
- Waiting to return from a layoff

### ***Dissimilarities in Sources of Labor Force Information***

It is important for data users to recognize differences that exist across surveys of labor markets. To illustrate, the U.S. unemployment rate reported in the 2000 decennial census is 5.8 percent, while the CPS estimate for the same time period is 3.7 percent (seasonally unadjusted). This gap stems from differences in survey methodology. Census 2000 labor force data is composed of sample estimates produced from responses reported in the long-form questionnaire mailed to approximately 17 percent of all households. The CPS produces more timely monthly data, but from a much smaller sample size. Definitions of employment status are similar, but methods of data collection are not. The decennial census is self-reported, while the CPS employs experienced interviewers to ask more probing questions to minimize survey nonresponses or data misclassification. Due to the differences between the decennial census and the CPS, ESRI focuses on rates of change to capture current trends and seasonal patterns to produce accurate civilian labor force forecasts.

### **Income**

The recent slowdown in economic activity did not affect the job market until early 2008. This year, the labor force surplus is expected to cause downward pressure on wages and salaries. With the country now more than 16 months into a recession, the impact of this downturn is taking a toll on the earnings of every U.S. worker. ESRI's 2009 income estimates capture the 2008 calendar year income, the first year after the start of the current recession. Income declines during a recession for a number of reasons. Job cuts, reduced overtime hours, minimal wage growth, and even pay cuts are implemented as businesses try to cut costs.

### ***Data Sources***

ESRI's projection base is the income reported in Census 2000. Technically, 2000 income data represents income from 1999, because the Census Bureau tabulated income received in the last year before the decennial census. Similarly, ESRI's 2009 income updates represent income received in 2008, expressed in 2008 dollars. Projections for 2014 are shown in 2013 dollars, assuming a continuation of the current rate of inflation, 2.9 percent.

ESRI uses the definition of money income used by the Census Bureau, which enables the direct comparison of income updates and decennial census data. For each person 15 years of age or older, money income received in the preceding calendar year is tallied from each of the following sources: 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 forth. Therefore, money income does not reflect the fact that some families receive part of their income in the form of noncash benefits, such as food stamps, health benefits, rent-free housing, or goods produced and consumed on a farm. In addition, money income does not include noncash benefits, such as the use of business transportation and facilities; full or partial payments by business for retirement, medical, and educational expenses; and so forth.

### ***Income Methods***

To estimate income for all households including family households, ESRI evaluated several federal data sources, including the CPS and ACS, and the personal and per capita income data and the Census of Employment and Wages from the Bureau of Labor Statistics.

After Census 2000, ESRI conducted a detailed evaluation of data sources employed in past income forecasts and an analysis of more recent data from the Supplementary and American Community Surveys. Data for 2000 from each source varied from the income that was reported in Census 2000. It was concluded that one point in time is not a good measure of a data series. For any given year, any estimate of income is likely to vary from the true population value. However, the sources that ESRI employed throughout the 1990s proved to be effective measures of change in income. Testing revealed the power of time series' data in tracking income. ESRI's postcensal updates emphasize the use of time series' data from household surveys to establish a base trend line. Annual updates evaluate current trends in wage inflation and other economic shocks that impact income growth. For the 2009 and 2014 forecasts, an evaluation of recessionary income trends that focused on dates, duration, and recovery periods was necessary.

After forecasting state income distributions, household income is estimated for counties, 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 geography level with changes in income. This stratification identifies several different patterns of change by household type that are applied to forecast trends in income. The annual change in income is derived from national surveys. Modeling links the current income change to all households with similar socioeconomic characteristics. Separate forecasts of the change in income by strata are aggregated to compose the income distributions.

Once the base 2000 income tabulations are updated, the distributions are extended to provide additional data for the wealthiest households. The Pareto function is employed to extend the upper interval of the income distributions from \$200,000 or more to include the intervals \$200,000–\$249,999, \$250,000–\$499,999, and \$500,000 or more. Finally, the models are calibrated to distinguish the change in average household income, for example, from the change in median income.



Average and median income for 2009 and 2014 are calculated in the same way that the Census 2000 average and median income were computed. Medians are calculated from the distributions using linear or Pareto interpolation, and averages are from aggregate household income.<sup>22</sup> Differences arise from the distributions. The 2000 income base from the Census Bureau is different from the income tables that are reported to the public. ESRI's 2009/2014 income base is also different from the Census 2000 reported tables. Medians and averages for 2009/2014 represent the extended income distributions to \$500,000 or more. It is the extended income distributions that provide the base for updating aggregate income. Using the midpoints of income intervals in the extended distribution, aggregate household income is calculated to be consistent with the distribution of household income and the aggregate incomes that are estimated for the extended distributions of income by age of householder.

Household income reported by age of householder is updated to be consistent with the 2009/2014 distributions of household income and age of householder. To update the age distribution of householders, the ratio of householders by age to population by age in 2000 is extrapolated to 2009/2014 and applied to the current age distributions. After the targets are set, the 2000 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.

### ***Disposable Income***

Disposable income represents an estimate of a household's purchasing power or, simply, after-tax income. The proportion of household income left after taxes is estimated from special studies conducted by the Census Bureau to simulate household taxes. With the release of the 2004 Annual Social and Economic Supplement (ASEC) to the Current Population Survey, a new tax model was implemented. The new model performs a statistical match of tax variables not collected in the ASEC with the 2000 Statistics of Income (SOI) file from the Internal Revenue Service. Post-2005 ASEC tax data implements the 2001 SOI file.<sup>23</sup> The tax model in the ASEC is updated continually to reflect changes in tax code. Additional improvements have focused on improving the match of CPS records with the SOI file. These changes impact the time series of tax variables available and are reflected in this release of disposable income. ESRI's 2009 disposable income incorporates data from the 2008 ASEC. Four types of taxes are deducted: federal individual income taxes, state individual income taxes, FICA (Social Security) and federal retirement payroll taxes, and property taxes for owner-occupied housing.

Sophisticated modeling techniques are employed to improve the handling of top-coded earnings and tax data from the CPS. 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.

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<sup>22</sup> For more information on calculations used with Census 2000 data, see *Census 2000 Summary File 3 Technical Documentation* prepared by the U.S. Bureau of the Census, 2002.

<sup>23</sup> More information on changes to tax variables in the latest Current Population Survey is available at <http://www.census.gov/hhes/www/income/cpsasec2005taxmodeldoc.pdf>. A detailed review of the tax model is available at <http://www.census.gov/hhes/www/income/oharataxmodel.pdf> and <http://www.irs.gov/pub/irs-soi/06ohara.pdf>.

### ***Net Worth***

Net worth is estimated from data on household wealth collected from the SCF from the Federal Reserve Board from 1992 through 2007. From 2004 to 2007, inflation-adjusted average and median net worth grew annually at 4.1 percent and 5.6 percent, respectively. This growth rate is significantly faster than the growth reported in previous surveys. Most of the recent growth is attributable to the appreciation in residential real estate, a rise in the number of new and second homeowners, and the growth in speculative investment properties.

The size of the triennial surveys used in estimating net worth is approximately 25,000 households. The major strengths of the SCF surveys lie in their enhanced representation of wealthy households and in the comprehensive measurement of net worth components. By definition, net worth equals total household assets less any debts, secured or unsecured. Assets include owned home, rental property, owned business, 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.

The first step in calculating net worth is to measure the relationship of net worth to household income by age of householder. The relationship is further differentiated by tenure because homeownership represents a major factor in household wealth. The next step is to model the relationship statistically to enhance the reliability of the estimates. ESRI's 2009 effort represents a model to incorporate the recent downturn in both the housing and financial markets and their impact on net worth.

The extension of the 2000 household income distribution from an upper interval of \$200,000 or more to \$500,000 or more also enhances the calculation of net worth for the wealthiest households. The 2009 estimates of net worth reflect current income and homeownership with adjustments for inflation and updates based on economic growth since the 2007 SCF survey.

### ***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 as 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 projections 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 projections annually to draw on the most recent estimates and projections of local trends. However, this data can be complemented with personal knowledge of an area to provide the qualitative, anecdotal detail that is not captured in a national database. It is incumbent upon 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.

## **ZIP Code Updates**

Data for residential ZIP Codes is estimated by ESRI. Census 2000 geographic areas are the building blocks for ESRI's ZIP Codes. Because ZIP Code boundaries change frequently, census geography provides a comparatively stable base for the development of ZIP Code data. ZIP Code data has been estimated from block groups. Block groups are assigned to residential ZIP Codes by overlaying the centroids of component blocks onto ZIP Code boundaries. Expressed as latitude/longitude coordinates, centroids approximate the geographic centers of blocks. If the centroid of a block falls within a ZIP Code, it is included in the residential inventory; otherwise, it is classified as nonresidential. Block data is then aggregated, and the ratio of block totals to block group data is used to apportion demographic characteristics to a ZIP Code.

The 2009/2014 updates include data for 30,094 residential ZIP Codes. This geodemographic method does not provide data for ZIP Codes with no assigned boundary. If a polygon is not defined for a ZIP Code, or no blocks are assigned to a ZIP Code polygon, data cannot be retrieved. In most cases, information about post office box ZIP Codes or single address ZIP Codes is incorporated with the data for the enclosing residential ZIP Code.

### ***Data Source for Boundaries***

Tele Atlas creates boundary files for ZIP Codes. The complete ZIP Code inventory includes both point and boundary ZIP Codes. ZIP Code boundaries are current as of November 2008.

### ***Comparisons over Time***

ZIP Codes are not amenable to time series' analysis, a fact which prevents a direct comparison with ZIP Codes from earlier updates. Changes typically include new residential ZIP Codes (40), dropped ZIP Codes (13), and boundary revisions. The 2009 inventory of residential ZIP Codes includes 5,315 ZIP Codes that have the same geocode as the 2008 inventory but a different population base as a result of boundary changes or slightly different block allocations. These changes reflect revisions of ZIP Codes by the U.S. Postal Service in addition to any changes in the techniques used by Tele Atlas to define ZIP Code boundaries.

### ***ESRI's Data Development Team***

Led by chief demographer Lynn Wombold, ESRI's data development team has a 30-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, the Diversity Index, and the Retail MarketPlace database, that are now industry benchmarks.



## About ESRI

For four decades, ESRI has been helping people make better decisions through management and analysis of geographic information. Our culturally diverse staff work with our business partners and hundreds of thousands of people who use GIS to make a difference in our world.

A full-service GIS company, ESRI offers support for implementing GIS technology from the desktop to enterprise-wide servers, online services, and mobile devices. GIS solutions are flexible and customizable to meet the needs of all our users.

## Our Focus

At ESRI, we focus on promoting the value of GIS and its applications throughout the world and pay close attention to our users' needs. Our software development and services respond to our customers with products that are easy to use, flexible, and integrated. Our technology is multidisciplinary, productive, and valuable to our users.

We have a strong commitment to educating our customers through ESRI's various training programs. ESRI is a socially conscious business and invests heavily in issues regarding education, conservation, sustainable development, and humanitarian affairs.

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