



## **POLICY BRIEF: USING THE AMERICAN COMMUNITY SURVEY TO MEASURE CHANGE**

Since January, we have seen an increasing number of reports on recent census results describing how the nation, states, regions, municipalities, and census tracts have changed since 2000. Some of these reports compare 2000 figures with those from the 2010 Census, but others compare 2000 with data from what is called the American Community Survey (ACS) of 2005-2009. In this report, we explain why we are seeing two recent sources of data. The answer lies in a fundamental shift in the design of the 2010 Census and the substitution of information gathered in the ACS for data that had previously been collected in the decennial censuses. In the future, everyone will increasingly rely on the ACS for information about how American society is changing.

The 2000 Census used two different questionnaires, a short form and a long form. Every American provided the short form data, recording basic information such as age, sex, race/ethnicity, household and family type, persons in group quarters, and a few housing characteristics. But only 1 in 6 households completed the more burdensome long form, which collected data on income, education, occupation, industry, commuting, migration, health insurance, and a wide variety of other topics.

These data are critical to the functioning of American society. Governments at all levels use the data to redraw legislative districts, distribute funds, design programs to fulfill legislative initiatives, distribute services and locations, and plan for the future. Businesses and nonprofits use the data to develop products and services, plan marketing, select locations, recruit workers, and create strategic plans. But many census users have long felt the need for more frequent updates than once every 10 years. There has long been a consensus among both governmental and nongovernmental users that our rapidly changing society required more timely information.

The ACS is the Census Bureau's response to that consensus. It has replaced the long form of the decennial census, leaving the 2010 Census equivalent to the short form of earlier decades. Fully implemented in 2005, the ACS is a monthly survey which over the course of a year collects data from approximately three million independent addresses. However, as a sample of three million is far smaller than the 1 in 6 households completing the long form in 2000, the data collected by the ACS in any given year are inadequate to describe small geographic areas such as zip codes, census tracts, and block groups. Accordingly, the Census Bureau issues ACS data in three forms. An annual data file, aggregating 12 months of surveys, describes geographies with populations of 65,000 or more. A file which aggregates three successive years depicts geographies of at least 20,000. And a file aggregating five years of the ACS describes the smallest geographies: zip codes, census tracts, and block groups. Census tracts average 4,000 in population, and block groups 2,500.

The first of these five year aggregations appeared in December 2010 and covered 2005-2009. In late 2011, the Census will issue ACS data covering 2006-2010. Each year from now on, the Census will issue a new five year aggregation. The chief benefit of the ACS is that users will be able at any time to see conditions in small geographies during the most recent five year period, rather than waiting for the next decennial census. A second important benefit is that the ACS interviews are conducted by a staff of permanent professional interviewers, producing improvements to the quality of the data. However, these benefits come with several costs, including:

### **TIMING:**

- Comparing a 2005-2009 ACS figure to a 2000 Census figure is to compare an average of 60 months of data to a figure essentially representing a single point in time.
- If an area has seen significant change over the five year period, the change will be understated because figures from the most recent year will be averaged with earlier years. For example, an

area which gentrified over a five year period would show less income growth than had actually occurred by the end of the five year period. Similarly, an area which lost population over the five year period would show less loss than actually occurred by the end of that period.

- The reference period for the ACS is the month in which the survey takes place. The reference period for the 2000 Census was April 1. The difference can affect a variety of measures such as school enrollment, employment status, household size, and family size.

#### **SAMPLE SIZE:**

- The five year aggregation of the 2005-2009 ACS amounts to a sample of roughly 15 million households. A sample comparable to the 2000 long form would total approximately 19.4 million. As the population grows, the ACS sample will become a diminishing fraction of the total population. The diminishing ACS sample will affect statistical inference, making it progressively more difficult to infer change. Recognizing the problem, The Census Bureau last month expanded the sample size by approximately half a million addresses and increased the sampling rates for small census tracts. However, the benefits of these changes will not be fully realized until the release of the 2012-2016 ACS.
- The meaning of the smaller sample for inference also varies depending upon the variable in question. For some variables and geographies the sample sizes may preclude inference.
- The ACS introduces the concept of the margin of error for every estimate. The margin of error is the range of values within which the true population value would fall 90 percent of the time. Most people are familiar with margins of error from political polls which, for example, may report a percentage favoring a candidate plus or minus a percentage. The margin of error is the plus or minus percentage, and its size depends upon the size of the sample that is drawn. Although margins of error can be computed for the 2000 Census long form estimates, they were not provided in the published data. Because of the smaller sample, the ACS margins of error can be quite large in absolute terms and relative to their 2000 Census counterparts.

#### **OTHER ISSUES:**

- Income is measured differently in the ACS than in the 2000 Census, making comparisons difficult. The 2000 Census asked about income in the prior calendar year. The ACS asks about the prior 12 months. Since the ACS spreads its interviewing across all months of the year, individual respondents are reporting incomes for different periods of time. That makes a difference in the results. Although the Census adjusts for inflation, Census Bureau analyses suggest that the ACS version of the question produces income results about 4.4 percent lower (nationwide) than the 2000 Census question.
- While users may rely on the ACS to portray percentages, medians, and other computed numbers, the Census Bureau says that users should not rely upon it for absolute population numbers. That is, if one wants to know the number of children under the age of 18 in a census tract, the ACS may or may not provide a good estimate. The reason lies in how the Census Bureau weights ACS sample data. In the 2000 Census, the long form numbers—from the sample—were weighted to sum to the totals found from questions asked of everyone, the short form. But the ACS is weighted based on the annual estimates of county populations the Census produces. While these estimates generally are the most accurate available, they can be flawed. For example, until the city of Philadelphia asked the Bureau to reassess its data, the Census Bureau had estimated the city's population to continually fall during the past decade. The reassessment estimated a growing population from 2007—which was confirmed in the 2010 Census.
- Shifts in boundaries of user-defined areas may be missed. For example, if a user defines a poverty area as a group of contiguous census tracts having at least 40 percent of its families in poverty, the particular tracts included may vary over the five years covered by the ACS because of changes in where poor families live. In this situation, the ACS will average data for a set of tracts which lack a consistent boundary over time.




These are some of more significant differences between the ACS and the 2000 Census rather than an exhaustive list. We also note that the 2010 ACS will introduce changes to the boundaries of small geographic areas such as zip codes, census tracts, and block groups, further complicating comparisons to 2000.

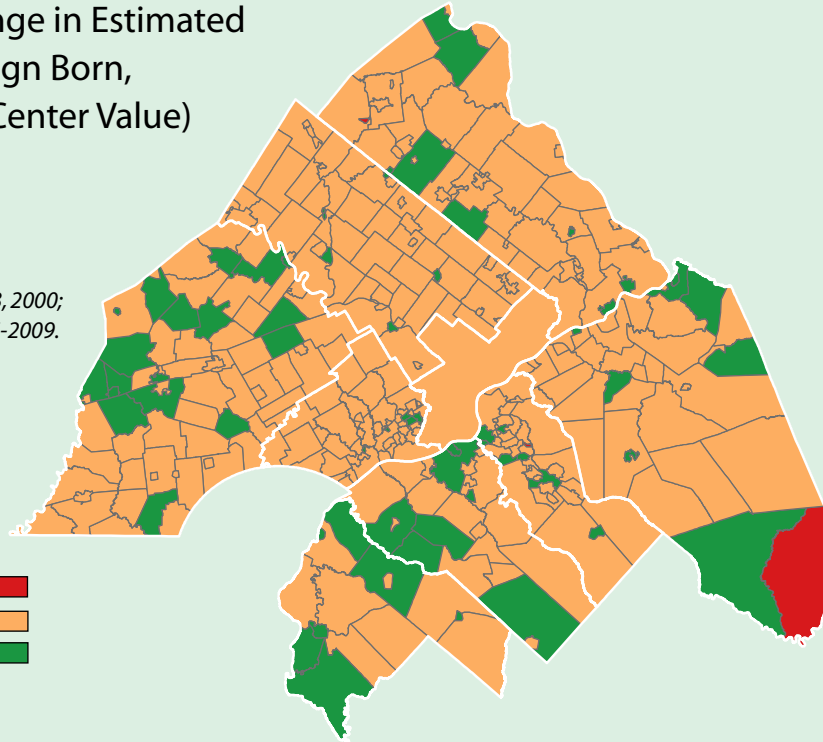
### LOOKING MORE CLOSELY AT WHAT A MARGIN OF ERROR MEANS

In the past, most census users simply took census results—whether from the short or long form—as the “true” values. Although the long form was a sample survey, most users felt protected from erroneous inference by its large sample. The ACS is a smaller sample, and understanding its margins of error is

Map 1: Percentage Change in Estimated Percentage Foreign Born, 2000 to 2005-2009 (Center Value)




Sources: U.S. Census, Summary File 3, 2000; American Community Survey, 2005-2009.

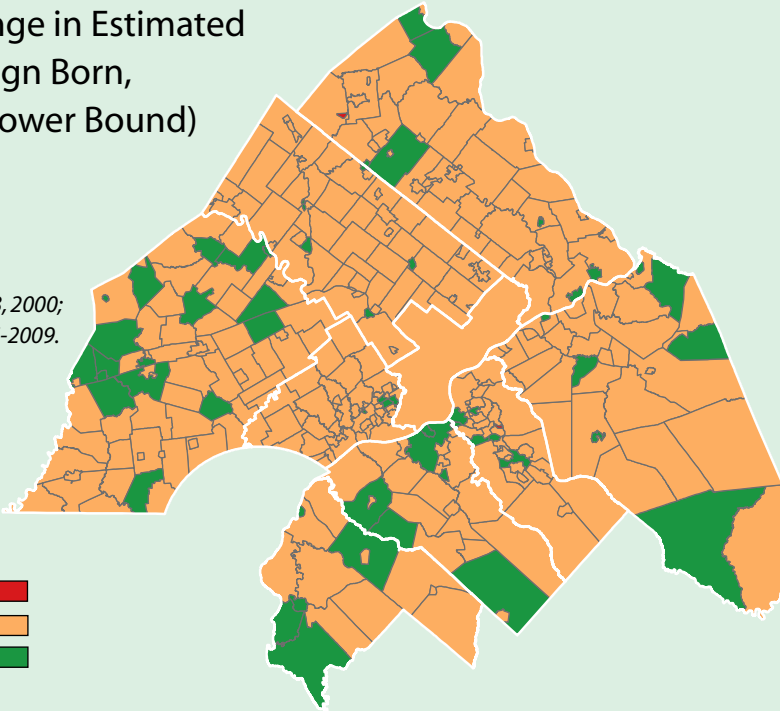
Loss (Less than 1.1)   
Stable (-1.0 to 1.0)   
Gain (1.1 or More) 



Map 2: Percentage Change in Estimated Percentage Foreign Born, 2000 to 2005-2009 (Lower Bound)

Sources: U.S. Census, Summary File 3, 2000; American Community Survey, 2005-2009.

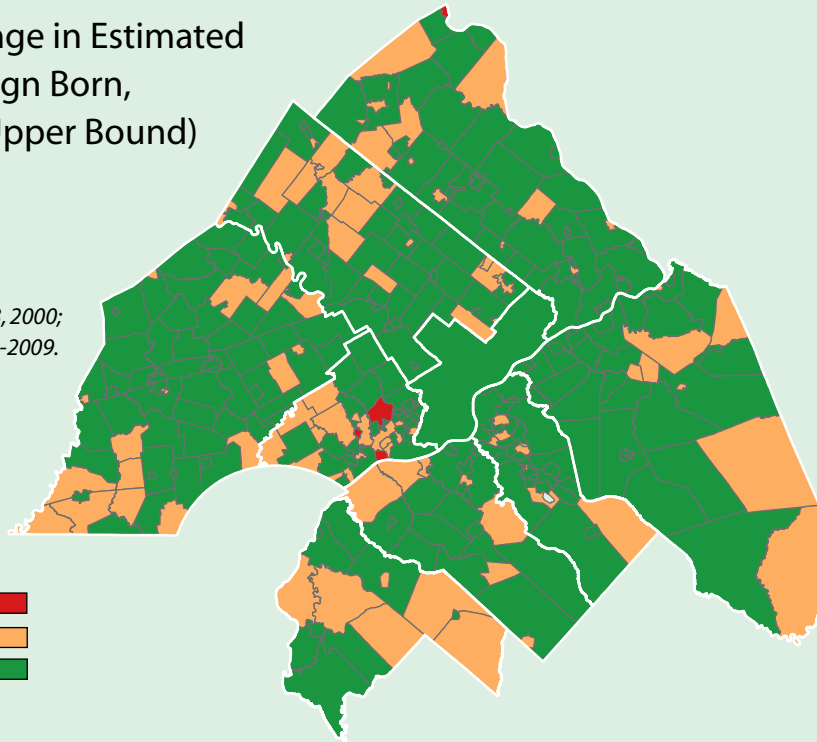
Loss (Less than 1.1)   
Stable (-1.0 to 1.0)   
Gain (1.1 or More) 



### Map 3: Percentage Change in Estimated Percentage Foreign Born, 2000 to 2005-2009 (Upper Bound)

Sources: U.S. Census, Summary File 3, 2000; American Community Survey, 2005-2009.

Loss (Less than 1.1) ■  
Stable (-1.0 to 1.0) ■  
Gain (1.1 or More) ■



critical to avoiding drawing false conclusions. As stated above, a margin of error in the ACS is the range of values within which the true population value will fall 90 percent of the time. Margins of error grow as the size of the sample on which an estimate is based diminishes. In other words, margins of error for estimates for the small borough of Media, PA will be larger than for the city of Philadelphia, PA.

To put the issue in terms of the entire Philadelphia metropolitan region, we present data measuring change in the percentage of the population which is foreign born from 2000 to 2007 (the midpoint of the 2005-2007 ACS) for all of the region's 253 municipalities. **Map 1** displays the change in the percentage foreign born measured as the difference between 2000 and 2007 percentages relative to the 2000 percentage. With respect to the margin of error, one must think of the percentages in the map as representing the center of the range of values within which the true population value falls with a probability of 90 percent. For present purposes, we define a change of plus or minus one percent as inconsequential. Not surprisingly, given the region's relatively modest growth, Map 1 shows that the vast majority of the municipalities as falling into the stable category. Those communities with the highest percentage change are—again, not surprisingly, often in Chester county, southern Gloucester county, and the metropolitan fringes generally. **Map 2** shows the change using the lower bound of the 2007 margin of error as the percentage for 2007. While some places moved from the growth to the stable category, there is substantial consistency between Map 2 and Map 1. But a very different picture appears when the upper bound of the margin of error is used for the percentage change as in **Map 3**. Where Map 1 and Map 2 portrayed stable communities, we now find most municipalities falling into the growth category. To reiterate, 90 percent of the time, the true value of the percentage change in the foreign born population will lie in the range bounded by Map 2 and Map 3. Ten percent of the time, it will lie outside that range. Clearly, failure to consider margins of error can lead to inappropriate conclusions. The large differences we see between Map 2 and Map 3 do not occur for all statistical measures. If, for example, the maps depicted the difference in the percentage foreign born between 2000 and 2007, we would see significantly greater stability in the maps. The impact of the margin of error on our ability to infer change depends on the measure chosen.

For all of these reasons, using the ACS to measure change from 2000 will require care, time, and skill well beyond those required for the 2000 Census.

[CLICK HERE](#) for a more extensive extrapolation of ACS issues, including technical and statistical details.

[CLICK HERE](#) for frequently asked questions regarding the ACS.