APPENDIX 2: METHODOLOGY FOR INCOME AND WEALTH ANALYSIS

Data Sources

The demographic and income data in this report are derived from the Current Population Survey, Annual Social and Economic Supplements (ASEC) conducted in March of every year. The specific files used in this report are from March 1971 to March 2011, the latest year for which ASEC data are available. Conducted jointly by the U.S. Census Bureau and the Bureau of Labor Statistics, the CPS is a monthly survey of approximately 55,000 households and is the source of the nation's official statistics on unemployment. The ASEC survey in March typically features a larger sample size and updates the nation's social and economic portrait in between decennial censuses. Data on income and poverty from the ASEC survey serves as the basis for the well-known Census Bureau report on income, poverty and health insurance in the United States (DeNavas-Walt, Proctor and Smith, 2011). The ASEC surveys also collect data on the income of a household in the preceding calendar year. Thus, the 1971 to 2011 files used in this report contain data on income from 1970 to 2010.

Methodological revisions in the CPS may have an impact on the trends in household income. Burkhauser, Larrimore and Simon (2011) point to the 1993 revisions as having an impact on the comparability of income data before and after that date. A complete listing of the revisions made to the CPS methods is available at http://www.census.gov/cps/about/history.html.

The CPS microdata used in this report are the Integrated Public Use Microdata Series (IPUMS) provided by the University of Minnesota. The IPUMS assigns uniform codes, to the extent possible, to data collected in the CPS over the years. More information about the IPUMS, including variable definition and sampling error, is available at http://cps.ipums.org/cps/documentation.shtml.

The Survey of Consumer Finances (SCF) is sponsored by the Federal Reserve Board of Governors and the Department of Treasury. It has been conducted every three years since 1983 and is designed to provide detailed information on the finances of U.S. families. The SCF sample typically consists of approximately 4,500 families, but the 2010 survey included about 6,500 families. Unlike the decennial censuses and the ACS, the sampling unit in the SCF is the "primary economic unit" (PEU), not the household. As stated by the Federal Reserve Board, "the PEU consists of an economically dominant single individual or couple (married or living as partners) in a household and all other individuals in the household who are financially interdependent with that individual or couple."

There are notable differences between the SCF data the Federal Reserve Board releases for public use and the data it uses to publish estimates of family income and wealth. One difference is that estimates published by the Federal Reserve Board are often based on preliminary data, while the public-use files represent edited versions of the data. Also, prior to public release, the Federal Reserve Board alters the data using statistical procedures that may affect the estimates, albeit not significantly. That is done for reasons of confidentiality.

Income and Wealth

Household income is the sum of incomes earned by all members of the household in the calendar year preceding the date of the survey. The CPS collects data on money income received (exclusive of certain money receipts, such as capital gains) before payments for such things as personal income taxes, Social Security, union dues and Medicare deductions. Non-cash transfers, such as food stamps, health benefits, subsidized housing and energy assistance, are not included. The Census Bureau also states that "… there is a tendency in household surveys for respondents to under report their income. From an analysis of independently derived income estimates, it has been determined that wages and salaries tend to be much better reported than such income types as public assistance, Social Security, and net income from interest, dividends, rents, etc." More detail on the definition of income in the CPS is available in the documentation of the data (http://www.census.gov/apsd/techdoc/cps/cpsmar11.pdf). It should be noted that income data in the CPS public-use microdata files are top coded to prevent the identification of a few individuals who might report very high levels of income.

Wealth, or net worth, is the difference between the value of assets owned by households and the value of the liabilities (or debt) held by the household. Assets include items such as the value of an owned home, value of a business, accounts in financial institutions, stocks and bonds, 401(k) and thrift accounts, individual retirement accounts and Keogh accounts, rental properties, motor vehicles and other personal property. Liabilities include home mortgages, credit card debt, student loans, vehicle loans and business debt. The SCF does not account for the discounted values of Social Security benefits or defined benefit pension plans.

The data on income and wealth are adjusted for inflation with the Bureau of Labor Statistics' Consumer Price Index Research Series (CPI-U-RS) as published in DeNavas-Walt, Proctor and Smith (2011). This is the price index series used by the U.S. Census Bureau to deflate the data it publishes on household income. Since 1978, this is the CPI-U-RS index as published by the BLS. For years prior to 1978, the Census Bureau made its own adjustment to the CPI-U to approximate the trend in the CPI-U-RS.

The choice of a price index does not affect the allocation of households into lower-, middle- or upper-income categories at a point in time. That is because the same price index applies to the incomes of all households and does not affect their income-based rank. However, the choice of a price index does affect measures of absolute progress over time. For example, from 1970 to 2010, the price level rose either 462% (CPI-U) or 401% (CPI-U-RS). This means that someone earning $10,000 per year in 1970 would be just as well off in 2010 earning either $56,200 (using the CPI-U) or $50,110 (using the CPI-U-RS).

The Choice of Time Periods

When examining trends in economic indicators over time, it is generally desirable to avoid comparisons across different points of the business cycle. The income comparisons in this study are based on data pertaining to 1970, 1980, 1990, 2000, and 2010. The first three dates encompass periods of recessions (December 1969 to November 1970, January to July 1980, and July 1990 to March 1991). However, 2000 represents the peak of a business cycle and 2010 follows on the heels of the Great Recession (December 2007 to June 2009).[49] Thus, changes in income from 1990 to 2000 and from 2000 to 2010 reflect, in part, the shorter-run effects of business cycles.

With regard to the wealth analysis, the dates of reference are 1983, 1992, 2001, 2007 and 2010. The first three dates represent the tail ends of recessions, 2007 is in the midst of an expansion, and 2010 is again at the tail end of a recession. Data for 2007 are included to capture the impact of the Great Recession.

Households and Families in Census Data

The Census Bureau defines a household as the entire group of persons who live in a single dwelling unit. A household may consist of several persons living together or one person living alone. It includes the household head and all of his or her relatives living in the dwelling unit and also any lodgers, live-in housekeepers, nannies and other residents not related to the head of the household.

A family by contrast is composed of all related individuals in the same housing units. Single people living alone or two or more adult roommates are not considered families according to the Census Bureau approach. In the vast majority of cases, each housing unit contains either a single family or single person living alone. In the case of roommates, one person is designated

[49] Business cycle dates are from the National Bureau of Economic Research (NBER).

the “householder” (usually whoever owns the unit or in whose name the lease is held), and the other person or persons are designated secondary individuals. In a few cases, there are households with families in which neither adult is the householder. These families are designated as either related or unrelated subfamilies, depending on whether one of the adults is related to the householder.

Adjusting Income for Household Size

Household income data reported in this study are adjusted for the number of people in a household. That is done because a four-person household with an income of, say, $50,000 faces a tighter budget constraint than a two-person household with the same income. In addition to comparisons across households at a given point in time, this adjustment is useful for measuring changes in the income of households over time. That is because average household size in the United States has decreased from 3.2 persons in 1970 to 2.5 persons in 2010, a drop of 20%. Ignoring this demographic change would mean ignoring a commensurate loosening of the household budget constraint.

At its simplest, adjusting for household size could mean converting household income into per capita income. Thus, a two-person household with an income of $50,000 would have a per capita income of $25,000, double the per capita income of a four-person household with the same total income.

A more sophisticated framework for household size adjustment recognizes that there are economies of scale in consumer expenditures. For example, a two-bedroom apartment may not cost twice as much to rent as a one-bedroom apartment. Two household members could carpool to work for the same cost as a single household member, and so on. For that reason, most researchers make adjustments for household size using the method of “equivalence scales” (Garner, Ruiz-Castillo and Sastre, 2003, and Short, Garner, Johnson and Doyle, 1999).

A common equivalence-scale adjustment is defined as follows:

$$\text{Adjusted household income} = \text{Household income} / (\text{Household size})^{N}$$

By this method, household income is divided by household size exponentiated by “N,” where N is a number between 0 and 1.

Note that if N = 0, the denominator equals 1. In that case, no adjustment is made for household size. If N = 1, the denominator equals household size, and that is the same as

converting household income into per capita income. The usual approach is to let N be some number between 0 and 1. Following other researchers, this study uses N = 0.5 (for example, see Johnson, Smeeding and Torrey, 2005). In practical terms, this means that household income is divided by the square root of household size—1.41 for a two-person household, 1.73 for a three-person household, 2.00 for a four-person household, and so on.[50]

Once household incomes have been converted to a "uniform" household size, they can be scaled to reflect any household size. The income data reported in this study are computed for three-person households, the closest whole number to the average size of a U.S. household since 1970. That is done as follows:

$$\text{Three-person household income} = \text{Adjusted household income} * [(3)^{0.5}]$$

As discussed in the main body of the report, adjusting for household size has an effect on trends in income since 1970. However, it is important to note that once the adjustment has been made, it is immaterial whether one scales incomes to one-, two-, three- or four-person households. Regardless of the choice of household size, the same results would emerge with respect to the trends in the well-being of lower-, middle- and upper-income groups.

[50] One issue with adjusting for household size is that while demographic data on household composition pertain to the survey date, income data typically pertain to the preceding year. Because household composition can change over time, for example, through marriage, divorce or death, the household size that is measured at the survey date may not be the same as that at the time the income was earned and spent (Debels and Vandecasteele, 2008).

APPENDIX 3: SURVEY METHODOLOGY

2012 Middle-Class Update Survey

Prepared by Princeton Survey Research Associates International
for the Pew Research Center's Social & Demographic Trends project

SUMMARY

The 2012 Middle-Class Update Survey, sponsored by the Pew Research Center's Social & Demographic Trends project, obtained telephone interviews with a nationally representative sample of 2,508 adults living in the United States. The survey was conducted by Princeton Survey Research Associates International. Interviews were done in English and Spanish by Princeton Data Source and Universal Survey Center from July 16 to 26, 2012. Statistical results are weighted to correct known demographic discrepancies. The margin of sampling error for the complete set of weighted data is ±2.8 percentage points.

Details on the design, execution and analysis of the survey are discussed below.

Sample Design

A combination of landline and cell random digit dial (RDD) samples was used to reach a representative sample of all adults the United States who have access to either a landline or cellular telephone. Both samples were disproportionately-stratified to increase the incidence of African-American and Hispanic respondents. Within strata, phone numbers were drawn with equal probabilities. The landline samples were list-assisted and drawn from active blocks containing three or more residential listing while the cell samples were not list-assisted, but were drawn through a systematic sampling from dedicated wireless 100-blocks and shared service 100-blocks with no directory-listed landline numbers.

Questionnaire Development and Testing

The questionnaire was developed by the Social Trends & Demographics project. To improve the quality of the data, the questionnaire was pre-tested with a small number of respondents using RDD landline telephone numbers. The monitored pre-test interviews were conducted using experienced interviewers who could best judge the quality of the answers given and the degree to which respondents understood the questions. Some final changes were made to the questionnaire based on the monitored pre-test interviews.

Contact Procedures

Interviews were conducted from July 16 to 26, 2012. As many as seven attempts were made to contact every sampled telephone number. Sample was released for interviewing in replicates, which are representative subsamples of the larger sample. Using replicates to control the release of sample ensures that complete call procedures are followed for the entire sample.

Calls were staggered over times of day and days of the week to maximize the chance of making contact with potential respondents. Each phone number received at least one daytime call.

For the landline sample, interviewers asked to speak with either the youngest adult male or female currently at home based on a random rotation. If no male/female was available at the time of the call, interviewers asked to speak with the youngest adult of the opposite sex. This systematic respondent selection technique has been shown to produce samples that closely mirror the population in terms of age and gender when combined with cell sample.

For the cell sample, interviews were attempted with the person who answered the phone. Interviewers first verified that the person was an adult and in a safe place before continuing with the interview.

Weighting and Analysis

Weighting is generally used in survey analysis to adjust for effects of the sample design and to compensate for patterns of non-response that might bias results. The weighting was accomplished in multiple stages to account for the disproportionately stratified sample, the overlapping landline and cell sample frames, and differential non-response associated with sample demographics.

The first stage of weighting compensated for the disproportionate sample design. This adjustment (called SAMPWT in the dataset) was computed by dividing the proportion of the population from each stratum by the proportion of sample drawn from the stratum.

The landline and cell samples were drawn using the same relative sampling fractions within strata. Table 1 shows the SAMPWT values by strata.

The second stage of weighting corrected for different probabilities of selection based on the number of adults in each household and each respondent's telephone use (i.e., whether the respondent has access to a landline, to a cell phone or to both types of phone).

Table 1. SAMPWT by Stratum

Strata	Population Dist'n	Sample Dist'n	SAMPWT
1	10.8%	1.8%	5.96
2	9.0%	3.0%	2.98
3	9.8%	3.3%	2.98
4	9.5%	3.2%	2.98
5	10.6%	7.1%	1.49
6	9.0%	12.0%	0.75
7	9.7%	13.1%	0.75
8	11.4%	19.2%	0.60
9	9.3%	15.7%	0.60
10	10.7%	21.6%	0.50

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The second-stage weight can be expressed as:

$$\frac{1}{LL_i\left(\frac{S_{LL}}{S_{CP}} \times \frac{1}{AD_i}\right) + (CP_i \times R)}$$

LL_i	=1 if respondent has a landline phone and =0 if respondent has no landline phone
CP	=1 if respondent has a cell phone and =0 if respondent has no cell phone
S_{LL}	the size of the landline sample
S_{CP}	the size of the cell sample
R	the estimated ratio of the size of the landline sample frame to the size of the cell sample frame. For this survey, R=0.67.

Both adjustments were incorporated into a first-stage weight that was used as an input weight for post-stratification. The data were raked to match sample distributions to population parameters. The black and white/other samples were raked to match parameters for sex by

age, sex by education, age by education and region. Hispanics were raked to match population parameters for sex by age, sex by education, age by education and region. In addition, the

Hispanic group was raked to a nativity parameter. The combined data were then raked to match population parameters for sex by age, sex by education, age by education, region, household phone use and population density. The white, non-Hispanic subgroup was also balanced by age, education and region. The telephone usage parameter was derived from an analysis of recently available National Health Interview Survey data.[51] The population density parameter is county-based and was derived from Census 2000 data. All other weighting parameters were derived from the Census Bureau's 2011 Annual Social and Economic Supplement (ASEC).

Table 2. Sample Demographics

%

	Parameter	Unweighted	Weighted
Gender			
Male	48.6	45.7	48.8
Female	51.4	54.3	51.2
Age			
18-24	12.8	9.4	12.5
25-34	18.0	12.9	17.7
35-44	17.2	12.8	17.0
45-54	19.0	18.8	19.7
55-64	16.0	20.4	16.0
65+	17.0	25.6	17.1
Educational Attainment			
Less than H.S.	13.3	9.4	11.7
H.S. grad	30.4	26.0	30.0
Some college	28.5	25.1	28.6
College grad	27.8	39.5	29.7
Race/Ethnicity			
White/not Hispanic	67.8	61.6	67.9
Black/not Hispanic	11.5	16.6	11.6
Hispanic - US born	6.6	8.6	6.8
Hispanic - born outside US	7.4	6.7	7.2
Other/not Hispanic	6.7	6.5	6.4
Region			
Northeast	18.3	16.8	19.0
Midwest	21.7	16.1	22.0
South	36.8	43.1	36.6
West	23.2	24.0	22.4
County Pop. Density			
1 - Lowest	20.1	16.8	20.6
2	20.0	18.9	20.3
3	20.1	18.7	19.9
4	20.2	20.0	19.7
5 – Highest	19.6	25.7	19.5
Household Phone Use			
LLO	7.0	7.3	7.2
Dual - few, some cell	39.0	51.8	40.2
Dual - most cell	18.8	19.5	19.0
CPO	35.2	21.4	33.6

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[51] Blumberg Stephen J., and Julian V. Luke. 2012. "Wireless substitution: Early release of estimates from the National Health Interview Survey, July-December, 2011." National Center for Health Statistics, June.

This stage of weighting, which incorporated each respondent's first-stage weight, was accomplished using Sample Balancing, a special iterative sample weighting program that simultaneously balances the distributions of all variables using a statistical technique called the *Deming Algorithm*. The raking corrects for differential non-response that is related to particular demographic characteristics of the sample. This weight ensures that the demographic characteristics of the sample closely approximate the demographic characteristics of the population. Table 2 compares full sample weighted and unweighted sample demographics to population parameters.

Effects of Sample Design on Statistical Inference

Post-data collection statistical adjustments require analysis procedures that reflect departures from simple random sampling. PSRAI calculates the effects of these design features so that an appropriate adjustment can be incorporated into tests of statistical significance when using these data.

The so-called design effect, or *deff*, represents the loss in statistical efficiency that results from a disproportionate sample design and systematic non-response. The total sample design effect for this survey is 2.05.

PSRAI calculates the composite design effect for a sample of size n, with each case having a weight, w_i as:

$$deff = \frac{n\sum_{i=1}^{n} w_i^2}{\left(\sum_{i=1}^{n} w_i\right)^2} \qquad \textit{formula 1}$$

In a wide range of situations, the adjusted *standard error* of a statistic should be calculated by multiplying the usual formula by the square root of the design effect ($\sqrt{deff}$). Thus, the formula for computing the 95% confidence interval around a percentage is:

$$\hat{p} \pm \left(\sqrt{deff} \times 1.96 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \right) \qquad \textit{formula 2}$$

where $\hat{p}$ is the sample estimate and n is the unweighted number of sample cases in the group being considered.

The survey's *margin of error* is the largest 95% confidence interval for any estimated proportion based on the total sample—the one around 50%. For example, the margin of error for the entire sample is ±2.8 percentage points. This means that in 95 out of every 100 samples drawn using the same methodology, estimated proportions based on the entire sample will be no more than 2.8 percentage points away from their true values in the population. It is important to remember that sampling fluctuations are only one possible source of error in a survey estimate. Other sources, such as respondent selection bias, question wording and reporting inaccuracy may contribute additional error of greater or lesser magnitude. Table 3 shows design effects and margins of error for key subgroups.

Table 3. Design Effects and Margins of Sampling Error

Subhead

	Sample Size	Design Effect	Margin of Error
Total Sample	2,508	2.05	2.8 percentage points
White, not Hispanic	1,514	2.20	3.7 percentage points
Black, not Hispanic	407	1.37	5.7 percentage points
Hispanic	377	1.20	5.5 percentage points

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