

**THE SURVEY OF INCOME AND  
PROGRAM PARTICIPATION**

**COMPONENTS OF LONGITUDINAL  
HOUSEHOLD CHANGE FOR 1984-1985:  
AN EVALUATION OF NATIONAL  
ESTIMATES FROM THE SIPP**

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# COMPONENTS OF LONGITUDINAL HOUSEHOLD CHANGE FOR 1984-1985; AN EVALUATION OF NATIONAL ESTIMATES FROM THE SIPP

## INTRODUCTION

This paper presents the first national estimates of the components of longitudinal household change for the U.S. These estimates pertain to the number of households that continued to exist, that dissolved, and that were newly formed between January 1, 1984 and January 1, 1986. Because this is the first time that such estimates have been developed for the U.S., the paper presents several sets of estimates derived using alternative approaches, and it evaluates the accuracy of these estimates.

## HOUSEHOLD CHANGE DATA

The household change estimates developed in this paper represent one component of the research program associated with the implementation of a major new data collection system by the U.S. Bureau of the Census, the Survey of Income and Program Participation (SIPP). This survey collects extremely detailed information about the income and program participation of persons, families, and households, by interviewing the same panel of persons every four months for about two and one-half years. These data can be used to study how the formation and dissolution of households is related to changes in income and program participation.

Households have long been a fundamental unit of analysis for social scientists and policy makers, because the various members of a household often share their economic resources in common to form a single consumption unit, because households constitute a major unit of social organization and social interaction, and because households or their constituent families constitute important recipient units for many public programs such as Aid to Families with Dependent Children (AFDC), Food Stamps, and the Supplemental Food Program for Women, Infants, and Children (WIC).

Most past data collection efforts have provided only cross-sectional data, that is, data pertaining to a single point in time. Hence, the household and family concepts of the Census Bureau have been similarly cross-sectional. But the SIPP data provide an opportunity to follow panels of households (and household members) through time to identify households which form, continue, or dissolve during a specified period of time.<sup>1</sup> This paper presents estimates of these components

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<sup>1</sup>Data from the Panel Study of Income Dynamics (PSID) also could be used to develop estimates of longitudinal household change using households as the unit of analysis. Research using the PSID has, however, focused heretofore on individual persons, rather than households, as the unit of analysis. At least two scholars consider households as a unit of analysis to be inferior to persons as a unit of analysis for any study (see Greg J. Duncan and Martha S. Hill, "Conceptions of Longitudinal Households: Fertile or Futile?" in **Journal of Economic and Social Measurement** 13: 361-375 (1985)). Meanwhile, other scholars are purposely using households as the unit of analysis for a variety of analytical purposes (see Helen Koo, "The Process of Change in Families and

of household change, for various types of households, based on the first (1984) panel of SIPP data. In order to develop these estimates, the Census Bureau has developed and adopted a longitudinal household concept.

## THE LONGITUDINAL HOUSEHOLD CONCEPT

The Census Bureau's longitudinal household concept is defined in terms of households which continue through time, as follows. "A household continues from one month to the next, if it is maintained by the same reference person or married-couple, and if it is the same household type, where household types are: (1) married-couple household, (2) other family household, male householder, (3) other family household, female householder, (4) nonfamily household, male householder, and (5) nonfamily household, female householder.<sup>2</sup> A household which did not exist until a specific month is defined as forming (coming into existence) during this month, while a household which ceases to continue during a specific month is defined as dissolving during this month.

Less formally, a household continues to exist from one month to the next as long as the householder (and spouse in a married couple household) continues to maintain a household of the same type. A household ceases to exist during a specific month when the householder (and spouse in a married-couple household) ceases to maintain a household of the same type. A household is formed during a given month if it exists during that month, but the householder (and spouse in a married-couple household) did not maintain a household of the same type during the preceding month.

This longitudinal household concept was adopted in preference to several others based on criteria which can be classified as theoretical, empirical, and practical.

First, because the Census Bureau's longitudinal household concept is founded upon social science theory, it is directly relevant to current theoretical and policy questions, such as "What consequences does divorce have for family income changes that occur with the dissolution of a married-couple household and the creation of successor households. The Census Bureau's longitudinal household concept meets the criterion of theoretical (and policy) relevance, because it extends through time the cross sectional household concept that has been used with little change for decades by the Census Bureau, by social scientists, and by policy makers. This cross-sectional household concept consists, essentially, of the five basic household types included in the

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Households," in "**Individuals and Families in Transition: Understanding Change through Longitudinal Data,**" **Proceedings of the Social Science Research Council Conference**, March 16-18, 1988 (available December 1989). The present paper adopts the following perspective. The value (or lack of value) of analyses and results using households as the unit of analysis cannot be determined a priori, but will become apparent only over the course of years as researchers, policy-analysts, policy-makers, and other pursue their individual aims.

<sup>2</sup>The essential features of this definition were proposed by Arthur J. Norton in discussion materials prepared for a meeting on 11/18/82 of the Census Bureau's SIPP Household Task Force.

longitudinal concept.<sup>3</sup>

One benefit of the tight link between the longitudinal household concept and the widely-used cross-sectional concept is that the associated longitudinal data can be integrated easily into dynamic analytical models which include data from other data collection systems, such as large-scale computer models used by policy analysts to simulate the consequences of changes in specific public policies. Another benefit is that empirical results using the new concept can be understood relatively easily by policy makers and other users of the household and family data.

Second, it is empirically important that the Census Bureau's longitudinal household concept produces estimates that are not markedly different from estimates based on reasonable alternative longitudinal household definitions. The Census Bureau's concept meets this criterion along important dimensions, as reflected in past research.<sup>4</sup>

Third, it is important that the Census Bureau's longitudinal household concept not involve major practical difficulties in data collection or computer programming. The Census Bureau's concept meets this criterion, since it does not require the introduction of new, complicated field procedures to obtain information about living arrangements of persons before they enter or after they leave the sample, and since the computer programming is not unduly complicated.

One important limitation of estimates produced using the new household concept in conjunction with the SIPP data must be noted, however. The limitation is the result of the way in which the SIPP data collection and weighting procedures are designed. First, the SIPP draws a sample of the civilian noninstitutional population as of a specific point in time. Second, the SIPP follows (interviews) this sample of people (and additional non-original sample persons with whom they subsequently share a household) for a period of about two and one-half years. Third, in conforming to this survey design, longitudinal weights are controlled to the civilian noninstitutional population as of a specific point in time, but persons who enter the civilian noninstitutional population after that point in time are ignored (receive weights with a value of zero).

Consequently, using the SIPP data with the new longitudinal household concept, estimates of household change necessarily exclude households formed by persons who entered the civilian

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<sup>3</sup>For cross-sectional household estimates, see U.S. Bureau of the Census, Current Population Reports, Series P-20, No. 432, **Households, Families, Marital Status, and Living Arrangements: March 1988 (Advance Report)**, U.S. Government Printing Office, Washington, D.C., 1988.

<sup>4</sup>See Constance F. Citro, Donald J. Hernandez, and Jeanne E. Moorman, "Longitudinal Household Concepts in SIPP," **Proceedings of the Social Statistics Section**, American Statistical Association (1986); and Pat Doyle and Sharon K. Long, "**Individuals and Families in Transition: Understanding Change through Longitudinal Data**," **Proceedings of the Social Science Research Council Conference**, March 16-18, 1988 (available December 1989).

noninstitutional household population after the specified 5 (beginning) point in time to which a given weight is controlled.<sup>5</sup>

These excluded persons who form new households may, at the time marking the starting point for an estimates of household change, have been U.S. or foreign citizens living abroad or members of the U.S. military.<sup>6</sup> In short, household change estimates from the SIPP measure only those changes which occurred for households and household members that were part of the civilian noninstitutional household population of the U.S. as of the beginning point of the analysis.<sup>7</sup>

#### FOUR APPROACHES TO ESTIMATING HOUSEHOLD CHANGE

This paper examines four approaches to derive estimates of the components of household change using the 1984 SIPP panel, given the available weights and data. Each approach uses one of the four sets of longitudinal weights included on the 1984 Panel research file, and associated derivation procedures. The four different sets of weights that might be used are the person's panel weight, the person's calendar year weights for 1984 and 1985, and either of two experimental longitudinal household weights, which for convenience have been designated longitudinal household weight 1 and longitudinal household weight.<sup>8</sup>

##### Estimates using the Person's Panel Weight

The person's panel weight is designed for longitudinal analyses of persons over an eight interview period of the SIPP panel. The value of the weight for each sample person is derived using population estimates as of November 1, 1983 for controls. The weight takes on a positive, non-zero value for each original sample person for whom a "complete" set of data was collected or imputed by the Census Bureau for each month of the entire reference period.<sup>9</sup>

Since each household has one householder (reference person), household change estimates can be

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<sup>5</sup>Persons entering the civilian noninstitutional household population after the specified beginning point in time are included in estimated continuing or newly-formed households, however, if the continuing or newly-formed households are maintained by original sample persons, that is, by persons who were part of the civilian noninstitutional population as of the beginning point in time.

<sup>6</sup>They may also have been institutionalized, but the number of such persons is quite small compared to those who lived abroad or who were members of the military.

<sup>7</sup>Persons who were members of noninstitutional group quarters at the time to which the survey is controlled are assumed, in the longitudinal edits, to not enter the household population during subsequent survey months.

<sup>8</sup>The panel and calendar year weights were not specifically designed for performing household analyses.

<sup>9</sup>For a complete description of procedures used in deriving the person's panel weight see Census Bureau memorandum of February, 28, 1989 from Preston Jay Waite to Thomas Walsh regarding "SIPP 1984: Specifications for Panel File Longitudinal Weight of persons."

derived by allowing the person's panel weights of householders to represent that number of households during a specific month, and by treating these households as continuous from one month to the next as long as the person remains a householder and the household type does not change.<sup>10</sup> These procedures can be viewed as implementing a longitudinal household concept in which a household is defined as continuing from one month to the next, if the household is maintained by the same reference person and does not change type. But since this concept is logically equivalent to the Bureau's official definition, the associated estimates represent one approach used in this paper to implement the Census Bureau's official longitudinal household definition.<sup>11</sup>

#### Estimates using the Person's Calendar Year Weights for 1984 and 1985

The person's calendar year weights can be used for longitudinal analyses of persons for the calendar years of 1984 and 1985. The value of each weight for each sample person is derived using population estimates as of January 1, 1984 and January 1, 1985, respectively, for controls. Each weight takes on a positive, non-zero value for each sample person for whom a "complete" set of data was collected by the Census Bureau for each month of the specified year. These sample persons are either original sample persons, or other persons sharing households with original sample persons throughout each specified year.<sup>12</sup>

In other words, the person's calendar year weights are similar in design to person's panel weights, except that they pertain to the twelve months in the specified year, and that they are derived for all sample persons, regardless of whether they are original sample persons, for whom complete twelve-month data are available. Because the calendar year and panel weights are similar in design, the calendar year weights also are used in this paper to derive estimates of household change by allowing the values of weights for householders to represent the number of households during a specific month, and by treating these households as continuous from one month to the next as long as the person remains a householder and the household type does not change. Hence, the associated estimates of household change represent a second approach that is used in this paper to implement the Census Bureau's official longitudinal household definition.

#### Estimates using Longitudinal Household Weights 1 and 2

After the Census Bureau adopted its official longitudinal household definition, Census Bureau

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<sup>10</sup>For decades, it has been Census Bureau's standard procedure to estimate the numbers and characteristics of households in various surveys based on the weights of the householders.

<sup>11</sup>The two concepts are logically equivalent assuming that the householder and spouse status of husbands and wives in married-couple family households does not change as long as these two persons jointly maintain a married-couple household. Actual estimates derived using the "official" and the "same householder and household type" concepts may differ somewhat, however, because of empirical differences in the ways in which the weights are derived and used. Two possible sources of such differences are discussed later in the text of the paper.

<sup>12</sup>For a complete description of procedures used in deriving the person's calendar year weights for 1984 and 1985 see Census Bureau memorandum of February 28, 1989 from Preston Jay Waite to Thomas Walsh regarding "SIPP 1984: Specifications for Panel File Longitudinal Weight of Persons."

statisticians devised two additional, experimental weights specifically to provide the basis for exploratory analyses using the longitudinal household definition. These weights are based on the person's panel weights for householders and spouses as follows. The value of household weight 1 for households which are not married-couple households as of Wave 1 is simply the value of the person's panel weight for the householder.<sup>13</sup> For married-couple households as of Wave 1, however, the value of household weight 1 is the average (mean) of the person's panel weight of the householder and the person's panel weight of the householder's spouse. In contrast, the value of household weight 2 for all households as of Wave 1 is simply the value of the person's panel weight of the householder.

For households formed after Wave 1 that are not married-couple households, the values of household weights 1 and 2 are equal to the values of the corresponding household weights that were assigned to the Wave 1 household that included the person who is the householder of the newly formed household. For married-couple households formed after Wave 1 by an original sample person and a person who was not part of the original sample, the values of household weights 1 and 2 are equal to one-half of the values of the corresponding household weights that were assigned to the Wave 1 household that included the person who is the householder or the householder's spouse (whichever is the original sample person) of the newly formed household. However, if both the householder and the householder's spouse in the newly formed married-couple household are original sample persons, then (1) the value of household weight 1 for the new household is equal to the average of the values of the corresponding household weights that were assigned to the Wave 1 households that included the persons who are the householder and the spouse of the newly formed household, and (2) the value of household weight 2 for the new household is equal to the value of the corresponding household weight that was assigned to the first interview household that included the person who is the householder of the newly formed household.

#### Two Possible Sources of Differences Between Alternative Estimates

The procedures for assigning values to newly formed households for household weights 1 and 2 are clearly more complicated than the procedures for assigning weight values to newly formed households based on the person's panel and calendar year weights. These more complicated procedures give longitudinal household weights 1 and 2 a useful characteristic.

To offer one example, suppose that a married-couple household at Wave 1 has a longitudinal household weight 1 with a value of 1250. Then, if the married couple separates, and each partner forms a new household, neither of which is a married-couple household, then each new household will have a longitudinal household weight with a value of 1250. In other words, on a case-by-case basis, newly formed non-married-couple households will have weight values equal to the values of the original households that spawned them, and most newly formed married couple households will have weight values one-half as large as the values of the original households that spawned

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<sup>13</sup>Wave 1 is the first 4-month interview period. Since household composition data for Wave 1 pertains to the interview month, household change during the Wave 1 cannot be ascertained.

them.

On the other hand, suppose a married-couple household at the first interview has a person's panel or calendar year weight with a value of 1250, and again that each partner in the original married couple forms a new household. Then, based on the panel or calendar year weights, one of the new households will have weight value of 1250, but because householders and their spouses seldom, if ever, have person's panel weights with identical values the second new household will usually have a weight other than 1250.<sup>14</sup> For the person's panel and calendar weights, these differences may average out across cases, but they may not average out precisely.

The same principle applies whether or not the members of an original household are married. When original household members form new households, the new households will have values for longitudinal household weights 1 and 2 which either are equal to the weight of the original household or to one-half the weight of the original household, but this will often not be the case for newly formed households based on the person's panel or calendar year weights.<sup>15</sup>

This non-sampling source of differences across estimates produced by alternative weights is only one of several possible nonsampling sources of differences, however. A second potentially important source of non-sampling differences across estimates based on different weights might arise from attrition, that is, from the fact that by the last interview of the 1984 SIPP panel, 30 percent of original sample persons who should have been interviewed were not interviewed, because they refused to be interviewed, because they were not followed to their new home after a move, or for some other reason.

It may be that this attrition from the sample is differential attrition, that is, persons who should be included in the sample throughout the interview period but who leave the sample for some reason may be different in important ways from persons who remain in the sample for the entire interview period. For example, sample persons who experience certain kinds of events, such as the forming or dissolving of a household, may be more likely than other sample persons to refuse to be interviewed, to not be followed, etc. Insofar as such differential attrition occurs, various sets of

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<sup>14</sup>More generally, since it may not often be the case that any two original sample persons in a specific original sample household will have identical values for their person's panel or for their calendar year weights, longitudinal household estimates based on longitudinal household weights may tend to differ somewhat from corresponding estimates based on the person's panel and calendar year weights. These differences also can be conceived as conceptual, that is, the longitudinal household weights may be conceived as pertaining to a panel of original households and the households spawned by these original households, while the panel and calendar year weights may be conceived as pertaining to a panel of persons, their original households and the households spawned by this panel of persons. Again, the two conceptual approaches are logically equivalent, but they yield somewhat different empirical estimates.

<sup>15</sup>The value of the weight for the successor household will be equal to one-half the weight of the original household, if the successor household is a married-couple household maintained by one original sample person and one non-original sample person, because the weight is derived as the average of the weights of the original and non-original sample persons, but the non-original sample person has a weight with a value of zero.

weights might differ in the extent to which they are effective in reducing or eliminating the bias (error) in estimates that can result from differential household attrition. However, each of the weights considered in this paper use the same person noninterview adjustment procedure. None of them directly account for household attrition beyond the first wave.

## BENCHMARKS FOR EVALUATING ALTERNATIVE HOUSEHOLD CHANGE ESTIMATES

Because the estimates of components of household change presented in this report are the first ever developed for the U.S., it is important that their accuracy be evaluated, insofar as such an evaluation is possible. To conduct this evaluation, it is necessary to specify the time periods for which estimates of household change can and will be derived using each approach with SIPP data, and it is necessary to have available an additional set of estimates of known, and preferably high, accuracy to act as a benchmark for judging the relative accuracy of the various new estimates derived from the SIPP. After each of these are discussed below, estimates of the components of household change are presented and evaluated.

### Time-Periods for Alternative SIPP Estimates of Household Change

The earliest date that can be used as the starting time for estimates of household change using the full sample from 1984 panel is January 1, 1984, and the latest date that can be used as an end point is January 1, 1986.<sup>16</sup> Because the person's panel weights pertain to this entire period, they are used with the Census Bureau's longitudinal household definition to derive estimates of the components of household change for as long as the entire 24-month period. Since the person's calendar year weights pertain to the 12 months within the designated calendar year, the 1984 weights are used to derive household change estimates for January 1, 1984 through December 1, 1984, and the 1985 weights are used to derive household change estimates for January 1, 1985 through December 1, 1985. Finally, since longitudinal household weights 1 and 2 are derived from the person's panel weights, the household weights, like the person's panel weights, are used to estimate household change from January 1, 1984 through January 1, 1986.

Since calendar years often provide the time frame for measuring social and economic change, and since each of the four approaches to estimating household change in the SIPP allows January 1, 1984 to be used as a starting point, this report develops estimates of change for the one-year period from January 1, 1984 to January 1, 1985, and for the two-year period from January 1, 1984 to January 1, 1986, based on the person's panel weight and longitudinal households weights

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<sup>16</sup>One-fourth of the sample (called a rotation group) is interviewed during each month of the four month interview cycle (called a wave), and no data on household composition change was obtained during the first wave. Hence, although the first interview for the first rotation group of the 1984 panel was conducted in October, 1983, and although some kinds of data were obtained for a time as early as June, 1983, the earliest date that can be used as the starting point for household change estimates using the entire sample is January 1, 1984. Similarly, although interviews were conducted as late as July 1986 for the 1984 panel, the latest date that can be used as the end point for household change estimates for the entire sample is January 1, 1986.

1 and 2.<sup>17</sup> Since the calendar year weight for 1984 pertains only to January 1, 1984 through December 1, 1984, household change estimates using this weight pertain to this slightly shorter, 11-month period. These one-year and two-year changes provide a basis for comparisons, pertaining to two nearly identical time periods with results based on each of the four approaches to estimating household change in the SIPP.<sup>18</sup>

#### Current Population Survey Estimates as a Benchmark for the SIPP

The Census Bureau's official intercensal household estimates have been obtained from the Current Population Survey since 1947.<sup>19</sup> These estimates provide the best Available benchmark for evaluating the accuracy of the new SIPP estimates. As a cross sectional survey, the CPS provides official monthly estimates of households by type for the civilian noninstitutional population of the U.S.<sup>20</sup>

With these CPS estimates, change in the total number of households and in the total number of households by type that occurred between an, two (initial and final) months can be calculated, where the Households in the initial and final months pertain to the current civilian noninstitutional population as of each month. Estimates from the SIPP for the initial month of the change period should be fairly similar to the corresponding CPS estimates, because the CPS population estimates for the specified months are used to create the controls used in deriving the SIPP weights.<sup>21</sup> But

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<sup>17</sup>The ideal starting points for estimates of household change using SIPP data are the dates to which population estimates are controlled. When these starting dates and control dates are identical, the estimates of change can, properly, be interpreted as pertaining to the changes that occurred to civilian noninstitutional household population that existed as of that specified time. If the starting dates are later than then control dates, then the changes pertain to the civilian noninstitutional household population that has been depleted, between the control date and the starting date, by the loss of households (and persons) between the two dates. For estimates using the panel and longitudinal household weights in this report the January 1, 1984 starting date is the earlier that can be used, but it is two months later than the control date of November 1, 1983.

<sup>18</sup>Since estimates based on the person's calendar year weight for 1985 are not directly comparable to the other estimates which all used January 1, 1984 as the starting point, results based on the 1985 person's calendar year weight are not presented in this paper.

<sup>19</sup>For example, see U.S. Bureau of the Census, Current Population Reports, Series P-20, No. 432, **Households, Families, Marital Status and Living Arrangements: March 1988 (Advance Report)**, U.S. Government Printing Office, Washington, D.C., 1988.

<sup>20</sup>Since 1956, the Census Bureau has published official annual estimates as of March 1. Unpublished estimates as of the first of each month also are available from the CPS and are used here for purposes of evaluating SIPP estimates in this report. Weighting procedures used in CPS estimates for March are slightly different from weighting procedures used for other months. The main difference is that in March the spouses in a specific husband-wife couple are assigned identical weight values.

<sup>21</sup>Official CPS household estimates for March are based on weights which have been "spouse equalized." On average, this spouse equalization procedure involves (1) reducing husbands' weights to equal wives' weights, (2) reducing weights for other family and nonfamily male householders by the same average proportion, and (3) increasing weights for other men to compensate for these two reductions. In general, spouse equalization is not

for the final month of the change period, the SIPP and the CPS estimates differ in one important respect. The SIPP final month estimates of the number of households should be smaller than the CPS estimates, because the CPS estimates include households formed by persons who were not members of the civilian noninstitutional household population as of the initial month of the change period, but the SIPP estimates do not include these newly formed households.

To take account of this difference between the CPS and the SIPP estimates, this report calculates CPS estimates of change that are adjusted in two major ways to exclude households formed by persons who entered the civilian noninstitutional population between the initial and final months of the change period.

#### Adjusting CPS Estimates for Benchmarking SIPP Estimates

The major adjustments to the CPS estimates needed for benchmarking the SIPP estimates are accomplished here in two stages.<sup>22</sup> The first stage takes account of households formed by persons who were in the civilian noninstitutional population in the final month of the change period, but who were living abroad as of the initial month of the change period. The second stage takes account of households formed by military personnel who were stationed in the U.S. in the initial month, who were not living in a household with a civilian adult in the initial month, and who were discharged between the initial and final month of the change period.

For the first stage of the adjustment procedure, estimates of the number of persons who entered the country from abroad between the initial and final months of the change period are obtained

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implemented in the weighting procedures for other non-March months in the CPS. But the CPS estimates for non-march months for married-couple households that are presented in this paper were calculated using the wife's weight, a procedure equivalent to spouse equalization for these households. All of the SIPP estimates have been derived with weights using CPS estimates that have been spouse equalized as controls. As a consequence, the SIPP and the CPS estimates for married-couple households and for other family and nonfamily households with female householders are conceptually similar, at least with regard to spouse equalization. Since the non-March CPS estimates presented in this paper for other family and nonfamily households with male householders have not been subject to the spouse equalization procedure, there will be a tendency for CPS estimates for these households as of the control date to be somewhat different than SIPP estimates for these households as of the same control date. Any resulting differences between the CPS and the SIPP in the levels of estimates for other family and nonfamily households with male householders at specific beginning points in time should, however, produce little, if any, difference between SIPP and CPS estimates in percent change through time, that is, in changes that occur after the beginning levels are set.

<sup>22</sup>These adjustments do not take account of the small number of persons entering the civilian noninstitutional household population from institutions, that is, inmates who were discharged from jails, mental hospitals, institutions, etc. between the initial and final months of the change period. They also do not take into account the following, which also is likely to pertain to only a small number of persons. In the CPS if a person (and spouse, if present) maintains a household of a specific type at time 1, and if the same persons (and spouse, if present) maintains a household of the same type at time 1+t, then the CPS will effectively count this as the same household, even if the original household at time 1 was dissolved between times 1 and 1+t, and the subsequent household (of the same type) at time 1+t was formed between times 1 and 1+t.

from the-CPS for specified time period.<sup>23</sup> . About one-half of these entrants to the U.S. are documented foreign immigrants, while the remaining one-half were U.S. citizens returning from abroad (including military discharges), Puerto Ricans or other U.S. nationals entering (or returning to) the U.S., or undocumented immigrants. of this total, somewhere between one-third and two-thirds enter existing households, and the 24 remaining one-third to two-thirds enter newly formed households.<sup>24</sup>

Not all of these persons entering newly formed households form separate households, however. Many probably enter the country as part of a group who together form a new household when they enter the country. These groups may often be families who form family households. In 1980, persons who had immigrated to the U.S. during the preceding ten years lived in households with an average size of 3.36 persons, and they lived in families with an average of 3.81 persons. For the U.S. population as a whole the corresponding averages in 1980 were 2.74 for households and 3.27 for families. The averages for immigrants were 0.62 and 0.54 persons larger than the averages for the U.S. 25.<sup>25</sup>

Based on these results, for purposes of developing adjusted CPS estimates, this report assumes that the average size of newly formed households for persons entering the U.S. from abroad was within a range 1.0 person smaller to 1.0 person larger than the estimate for the U.S. population in 1985, that is, in the range of 1.69 to 3.69.<sup>26</sup> This range for average household size is applied to

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<sup>23</sup>The estimates for March-to-March in millions are 1,079 for 1983-1984, 1,427 for 1984-1985, 1,200 for 1985-1986, and 1,142 for 1986-1987. To modify CPS household change estimates for time periods other than March to March, time-period specific estimates are derived by assuming that the annual March-to-March changes were equally distributed through time. The original estimates are reported in U.S. Bureau of the Census, Current Population Reports, Series P-20, No.s 407, 420, 425, and 430, **Geographic Mobility**, U.S. Government Printing Office, Washington, D.C.

<sup>24</sup>Diana DeAre of the Population Division in the U.S. Bureau of the Census estimates for SIPP that about one-third of persons who were abroad a year earlier enter households of original sample persons. Hence, the range bounded by one-third and two-thirds represents a conservative range of the number of persons from abroad who should have been included in existing households, assuming that the number of such not-original sample persons is underestimated in SIPP. In addition, unless the underestimate of persons who were abroad a year earlier and who enter households of original sample persons is extremely severe, such that the upper end of the range is closer to the truth than the lower end of the range, the wide breadth of this range also provides a substantial cushion against other sources of difference between SIPP and CPS estimates that are not explicitly taken into account by the adjustment procedures applied to the CPS estimates of net change. For example, see the discussion in footnote 27.

<sup>25</sup>These estimates are from U.S. Bureau of the Census, **1980 Census of Population, Volume 1. Characteristics of the population**, PC80-1-D1-A, Part 1, United States Summary, Chapter D, Characteristics of the Population, Section A: United States, Issued March 1984, Table 255 (A).

<sup>26</sup>U.S. Bureau of the Census, Current Population Reports, Series, P-20, No. 432, **Households, Families, Marital Status, and Living Arrangements: March 1988 (Advance Report)**, U.S. Government Printing Office, Washington, D.C., 1988. Estimates for 1985 are used here, because March 1, 1985 is the approximate mid-point for all the SIPP estimates calculated in this report.

the range of estimates for persons from abroad entering newly formed households to obtain a range of estimates for the number of households newly formed by persons living abroad for the time periods specified in household change estimates presented in this report. Specifically, for each adjusted CPS estimate, the number of new entrants is divided by the average household size to obtain a range of estimates of newly formed households, and this range is subtracted from the CPS estimate to obtain the first-stage adjusted CPS estimate.

The second stage of the adjustment to the CPS estimates of household change takes account of the persons who were discharged from the military.<sup>27</sup> Since approximately one-fourth of military personnel are stationed abroad, it is assumed that about one-fourth of total military discharges are accounted for in the first stage of the adjustment procedure. The remaining three-fourths are assumed to have entered the U.S. civilian noninstitutional household population. It is assumed further that one-third to two-thirds of these military discharges entered newly formed households with an average size of 1.0 to 2.0 persons. The resulting range of estimates is subtracted from the first-stage adjusted CPS estimates to obtain a range of final adjusted CPS estimates. The ranges for the adjusted CPS estimates developed here are purposely quite wide to insure that accurate values, as derived from the SIPP, should lie within the corresponding adjusted CPS ranges.

Finally, to develop adjusted CPS estimates for change in households by type, the ratios of (1) the adjusted values for percent increase in the total number of households to (2) the unadjusted values for the percent increase in the total number of households are calculated. These ratios range from 0.29 to 0.89 for various sets of CPS estimates. In other words, the proportionate increases in the total number of households based on the adjusted values were at least 29 percent as large but no

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<sup>27</sup>The annual number of military discharges in 1984 and 1985 was about 330,000. The adjustment procedures used here do not explicitly take into account household dissolutions that occur when military discharges (or persons entering the country from abroad) move into an existing household but simultaneously become a householder, thereby creating a new household. However, as discussed in footnote 24, the range bounded by one-third and two-thirds represents a conservative range of the number of persons from abroad who should have been included in existing households, assuming that the number of such not-original sample persons is underestimated in SIPP. However, unless the SIPP underestimate of persons who were abroad a year earlier and who enter households of original sample persons is extremely severe, such that the upper end of the range is closer to the truth than the lower end of the range, the wide breadth of this range also provides a substantial cushion against other sources of difference between SIPP and CPS estimates that are not explicitly taken into account by the adjustment procedures applied to the CPS estimates of net change.

Hence, unless a very large proportion of households formed by military discharges (or persons entering from abroad) involve the simultaneous dissolutions of existing households, the range of adjusted CPS estimates of household change should encompass the actual value as measured by SIPP, if the SIPP estimates are accurate. The most likely circumstance in which a household formed by a military dischargee would involve a simultaneous household dissolution may be when a married male dischargee returns to his civilian family. If this is true, then, as a guess pending the availability of an actual estimate measuring the marital status of dischargees, if 10 percent of dischargees are married men with children, then the effect on other family households with a female householder would be to increase the number of dissolutions by about 33,000 households per year. Since the total number of other family households with a female householder was about 14,000,000 in 1984 and in 1985, these events would increase the dissolution rate for these households by only 0.2 percentage points.

more than 89 percent as large as the unadjusted estimates of proportionate increase in the total number of households.<sup>28</sup>

This very broad range (0.29-0.89) for total households is used to derive adjusted CPS ranges of estimates for the percent increase in the number of households for each of the five basic household types. Specifically, the proportions 0.29 and 0.89 are multiplied by the unadjusted CPS estimates of household change by type, for specified time periods, to obtain adjusted CPS estimates of household change by type. Since entrants to the civilian noninstitutional population during a specific time period are broadly similar in their basic demographic characteristics of age, sex, and race to persons who were already in the civilian noninstitutional population at the beginning of the time period, it is likely that the new entrants form households by type in roughly the same proportions as persons who are already in the civilian noninstitutional population.

In addition, since the range of 0.29 to 0.89 is based on the most extreme values obtained from various sets of CPS estimates, the range will, because of chance variability, tend to be too wide, that is, it will tend to be a conservative estimate of the actual range. Consequently, the adjusted CPS estimates for household change by type of household will be wide enough to insure that accurate values, as derived from the SIPP, should lie within the adjusted CPS ranges.

### THREE BROAD CONCLUSIONS ABOUT THE COMPONENTS OF HOUSEHOLD CHANGE

Estimates of the components of household change derived from the SIPP, for the one-year period spanning January 1, 1984 to January 1, 1985, and for the two-year period spanning January 1, 1984 to January 1, 1986, are presented in Table 1.<sup>29</sup> Corresponding official and adjusted CPS estimates of net household change are presented in Table 2. A brief discussion of three major, but broad, conclusions suggested by these estimates is followed by an evaluation which presents evidence suggesting the direction and minimum and maximum sizes of possible errors in these estimates and the need for caution in drawing more precise conclusions from these estimates.

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<sup>28</sup>The value at the upper end of this range (0.89) is derived from the estimate of change between March 1984 and March 1985, while the value at the lower end of this range (0.29) is derived from the estimate of change between January 1984 and December 1984. For various estimates calculated, the upper values range between 0.67 and 0.89, while the lower values range from 0.29 to 0.67. Estimates were calculated for March to March of 1984 and 1985, for January to January of 1984 to January 1985, for January to January of 1985 to 1986, for January to January of 1984 to 1986, for January to December of 1984, and for January to December of 1985. If the estimated range derived for one of these specific time periods were used to derive adjusted CPS estimates for households by type, the estimates of minimum and maximum errors reported in this paper would be somewhat different in magnitude, but the pattern of errors would be little changed.

<sup>29</sup>Statistical tests pertaining to the SIPP estimates were based on the "SIPP 1984: Source and Accuracy Statement for the Longitudinal Panel file," memorandum from Preston J. Waite to Gerald C. Iannelli dated June 22, 1989 (also available in the 1984 SIPP Panel Technical Documentation, available from Data Users Services Division, Customer Services, 301-763-4100). Tests of differences in response rates assumed a design effect (DE) of 2. Testing was done at the 10 percent significance level.

One broad conclusion suggested by these estimates is that the relatively small net changes in the number of households --is measured in cross-sectional surveys is the result of much larger components of change, that is, much larger changes in the number of households that are dissolved and newly formed during corresponding time periods.

For example, the official CPS estimates of net change indicate that the total number of households increased by 1.5 percent during 1984-1985 and by 3.8 percent during 1984-1986. But the SIPP estimates indicate that, of all households existing at the beginning of 1984, 9-10 percent had dissolved by 1985, and 17 percent had dissolved by 1986. Similar in size, households newly formed during 1984-1985 and during 1984-1986 amounted to 11-13 percent and 18-21 percent, respectively, of the total that existed on January 1, 1984.

The same broad conclusion applies to change in the percent of households by type -- the components of change in households by type for 1984-1985 and for 1984-1986 are quite large compared to the resulting net changes.

A second broad conclusion suggested by these estimates is that a substantial-to-large proportion of households of each type dissolved during 1984-1985 and 1984-1986,, but the households that dissolved were replaced by an approximately equal or larger proportion of newly formed households of the same type. Because policy makers often focus on family households with female householders, estimates for these households are of special interest.

The CPS indicates for family households with female householders that the net increase in these households was 3.7 percent during 1984-1985 and 5.6 percent during 1984-1986.<sup>30</sup> But the SIPP estimates indicate that, of all such households existing on January 1, 1984, about 16-17 percent had dissolved by 1985, and 27 percent had dissolved by the end of 1986. Similarly, the SIPP estimates indicate that households of this type which were newly formed during 1984-1985 and 1984-1986 amounted to 16-18 percent and 27-29 percent, respectively, if the total that existed on January 1, 1984. Hence, the SIPP estimates suggest for family households with female householders which exist at a specific (beginning) point in time that many will remain in existence for only an additional year or two.<sup>31</sup> Over the course of two years, perhaps one-fourth to one-third of all such households dissolve and are replaced by newly formed households of the same type.

A third broad conclusion suggested by these estimates is that rates of household formation and dissolution are quite different, depending on the household type<sup>32</sup> Most likely to dissolve are

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<sup>30</sup>The estimate of 3.7 percent is not significantly different from the estimate of 5.6 percent.

<sup>31</sup>Some of these households may have existed for many years prior to the beginning date of the analysis.

<sup>32</sup>The estimates pertaining to other family households with female householders are not statistically significantly different from other family households with male householders or from nonfamily households with male householders.

other family households with male householders and nonfamily households with male householders, which have estimated dissolution rates of 19-25 percent during 1984-1985 and 34-43 percent during 1984-1986. Least likely to dissolve are married-couple households, with estimated dissolution rates of 5 percent for 1984-1985 and 9 percent for 1984-1986. Other family households with female householders and nonfamily households with female householders were between these two extremes, with estimated dissolution rates of 13-17 percent for 1984-1985 and 23-27 percent for 1984-1986. The SIPP estimates suggest a corresponding pattern of differences between household types with regard to rates of household formation.

## EVALUATING THE ACCURACY OF SIPP HOUSEHOLD CHANGE ESTIMATES

Three types of evidence are presented here to evaluate the accuracy of SIPP estimates of household change. The first involves comparing the SIPP estimates to adjusted CPS estimates of net household change. The second involves comparing the SIPP estimates of marriages and divorces to official estimates from the vital registration system. The third involves an analysis of household attrition rates in the SIPP, especially differential attrition rates across households by type. The first set of evidence is especially pertinent to estimates of net household change, while the second and third are especially pertinent to estimates of the components of household change.

### Possible Errors in Net Household Change Estimates

Table 2 presents the first type of evidence -- two sets of estimates of the net percentage change (increase or decrease) in households by type during 1984-1985 and 1984-1986, as experienced by the civilian noninstitutional household population as of January 1, 1984. One set of estimates is obtained directly from the SIPP, by subtracting the percent dissolved from the percent formed in Table 1.<sup>33</sup> The second set of estimates is the adjusted CPS range described above.

Since the range of the adjusted CPS estimates is purposely derived to be wide enough to encompass the correct value of net household change as estimated with the SIPP, the SIPP estimates that are beyond the range of the adjusted CPS estimates can be analytically judged inaccurate. More specifically, at one extreme, for each SIPP estimate outside of the adjusted CPS range, an estimate of the minimum error in the SIPP estimate of net household change can be derived as the difference between the SIPP estimate and the nearest end of the adjusted CPS range. At the other extreme, for each SIPP estimate, an estimate of the maximum error in the SIPP estimate of net household change can be derived as the difference between the SIPP estimate and the farthest end of the adjusted CPS range.

Error estimates with negative values indicate that the SIPP estimate is smaller than the corresponding adjusted CPS estimate, while error estimates with positive values indicate that the SIPP estimate is larger than the corresponding adjusted CPS estimate. Following these procedures, Table 2 presents estimates of the minimum and the maximum error for the various

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<sup>33</sup>SIPP estimates based on calendar year weights for 1984 are "annualized" to reflect 12 months of change by dividing by 11 (since they are 11-month estimates) and multiplying by 12.

SIPP estimates of net household change.

Regarding estimates of minimum error, 7 of the 24 SIPP estimates for 1984-1985, and 8 of the 18 SIPP estimates for 1984-1986 lie within the ranges of corresponding CPS adjusted estimates. For the remaining SIPP estimates, only one of the estimates of the minimum error is statistically significant, that is, because of chance variability associated with estimates from the SIPP and the CPS samples, only one of the estimates of minimum error can be reliably distinguished from zero.

Estimates of maximum error also are not statistically significant for most (all but two) of the estimates pertaining to net change in 1984-1985. The exceptions are for total households based on the panel and calendar 1984 weights. For the 1984-1986 period, fourteen estimates of maximum error are not statistically significant, while four estimates of maximum error are statistically significant, namely, the three estimates for total households, one estimate for married-couple households, and one estimate for nonfamily households with a female householder.

Overall, these results suggest two sets of tentative conclusions that require further research, because these two sets of conclusions are quite different. The first set of conclusions is obtained by focusing on statistical significance as the major criterion of relevance. By this criterion, only 1 of the 42 estimates of minimum error is statistically significant, and only 6 of the 42 estimates of maximum error is statistically significant. By this criterion the evidence of error in the SIPP estimates is relatively weak.

Yet estimated errors might be statistically insignificant for one of two reasons, either because the size of the estimates is so small as to be unimportant, or because the sample size is so small that even large and important errors cannot be reliably measured. This second possibility leads to a second set of tentative conclusions, as follows.

While only 1 of 7 estimates of minimum error for total households is statistically significant, 4 of 7 estimates of maximum error for total households is statistically significant. In addition, for changes in the numbers of households by type, calculated, but usually statistically insignificant, estimates of minimum and maximum error range from negligible to about one-fifth (20 percent) of the measured proportion of households by type that were dissolved or newly formed during a specific time period. Hence, estimates of errors, especially maximum errors, in the SIPP estimates of net household change may be substantial, though not enormous. Most notable is that 26 of the 28 estimates of minimum and maximum error are non-zero (ignoring statistical significance) for households with female householders. This suggests that possibility of a tendency, across all of the SIPP estimates, to overestimate the increase in nonfamily households with female householders and to underestimate the increase in family households with female householders.

If estimates with female households are, indeed, subject to such is possible that the SIPP may tend, for family female householders, to overestimate their rates to underestimate their rates of formation, or possible that the SIPP may tend, for nonfamily female householders, to underestimate their rates to overestimate their rates of formation, or biases, then it households

with of dissolution, both; and it is households with of dissolution, both.

In short, when the focus is on statistical significance as the criterion of relevance, it appears that the evidence of error in the SIPP estimates is relatively weak, though less so for estimates pertaining to total households; but when the focus is on the relative size of possible errors, it appears that the evidence of error in SIPP estimates for specific types of households is fairly strong.

Because of the differences in these two sets of Conclusions, they both must be viewed as quite tentative at this time. Fortunately, SIPP data collection continues, and within a few months it will become possible to replicate this evaluation with the larger sample sizes afforded by a total of three SIPP panels. When these data become available, we plan to conduct this replication, because the larger sample sizes will increase the reliability with which possible errors can be measured. In other words, larger sample sizes will allow conclusions to be drawn with substantially greater confidence.

It also should be noted it that the evidence reviewed in this section provides little reason to conclude that SIPP estimates based on any one weight are substantially more, or less, accurate than estimates based on the other weights. The replication of this research with larger sample sizes also should provide the basis for stronger conclusions about the relative accuracy of estimates based on different weights.

Despite the potential value of this approach to evaluating the accuracy of the SIPP estimates of net household change, however, such an evaluation does not necessarily have clear-cut implications for the accuracy of the components of household change, that is, for the accuracy of estimates of household dissolution and formation rates. If the SIPP estimates of net household change are inaccurate, then the SIPP estimates of household dissolution and/or formation are at least equally inaccurate. But it also is possible for the estimates of net household change to be correct, and for the estimates of household dissolution and formation to, simultaneously, be quite inaccurate.

For example, an accurately estimated 5 percentage point net increase could be obtained (1) from accurately estimated household dissolution and formation rates, (2) from household dissolution and formation rates that both are underestimated by 10 percentage points, or (3) from household dissolution and formation rates that both are overestimated by 15 percentage points. In other words, if a net household change estimate is accurate, then the associated dissolution and formation rates may or may not be accurate, but if the net household change estimate is inaccurate, then the dissolution rate is inaccurate, the formation rate is inaccurate, or both are inaccurate. To assess directly the accuracy of household dissolution and formation rates, additional evidence is reviewed below.

#### Underestimates of Marriage and Divorce, and Errors in Components of Household Change Estimates

The second type of evidence presented here, to evaluate the accuracy of estimates of the components of household change, pertains to marriages and divorces. Both marriages and divorces appear to be substantially underestimated in the 1984 SIPP panel. Compared to the official estimates of marriage and divorce, based on the vital statistics registration system and prepared by the U.S. National Center for Health Statistics (NCHS), the SIPP estimate of the number of marriages in 1984-1986 is too small by 28 (+/- 6) percent while the SIPP estimate of the number of divorces in 1984-1986 is too small by 34,(+/- 8) percent.<sup>34</sup> These underestimates of marriages and divorces may be associated with attrition from the sample.<sup>35</sup>

What implications follow, for the SIPP estimates of the components of household change, from the fact that weighted SIPP estimates of marriage and divorce are too small? Regarding the marriage underestimate in SIPP, if all of the 1,391,000 (+/285,000) marriages missing from the SIPP estimate led to the formation of married-couple households, then the estimates of married-couple household formation rates presented in Table 1 for 1984-1986 would have been numerically larger by 2.7 percentage points. To be specific, the household formation rates for married-couple households would have been 10.8, 13.3, and 14.4 percent based on longitudinal 1, longitudinal 2, and person's panel weights.

In other words, because of underestimates of marriages, the SIPP may underestimate married couple households newly formed in 1984-1986 by as much as 19-25 percent. If as few as 90 percent of newly-married couples form their own households, then the underestimate of newly-formed married-couple households is nine-tenths as large, or about 17-23 percent. Without an alternative, accurate estimate of household formation rates by type, the magnitude of the SIPP error cannot be known precisely, but if it is plausible to assume that somewhere between 90 percent and 100 percent of newlyweds form new households of their own, then the SIPP underestimate of newly formed married-couple households is in the range of 17-25 percent for

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<sup>34</sup>This marriage estimate assumes that all persons whose marital status changes from separated to married become reconciled to their current spouse, that is, they did not experience a new marriage. This assumption is probably correct in most cases. At the other extreme, if it is assumed that all such persons enter a new marriage, the resulting SIPP estimate would underestimate total marriages by about 17 percent. A small (few percentage points) of the difference between the SIPP estimates and the official estimates might be that the SIPP estimates exclude marriages and divorces experienced by persons who enter the civilian noninstitutional population after January 1, 1984. The official marriage estimates are from National Center for Health Statistics: Advance report of final marriage statistics, 1985. **Monthly Vital Statistics Report**. Vol. 37, No. 1, Supp. DHHS Pub. No. (PHS) 88-1120. Public Health Service, Hyattsville, Md. The official divorce estimates are from National Center for Health Statistics. 1987. Advance report of final divorce statistics, 1985. **Monthly Vital Statistics**. Vol. 36, No. 8, Supp. DHHS Pub No. (PHS) 88-120. Public Health Service, Hyattsville, Md. The official national estimates of marriage and divorce provided by the vital statistics also may be somewhat in error, but the differences between the official estimates and the SIPP estimates probably are due mainly to errors in SIPP.

<sup>35</sup>For early evaluations of SIPP marriage estimates, conducted prior to the availability of full-panel weights, see the memo of February 20, 1987 from Martha Hill to Census Staff regarding "Marital Status and Changes Therein in SIPP," and the Census Bureau memorandum of January 26, 1988, from Louisa F. Miller to Donald J. Hernandez regarding "Possible Problems with the 1984 SIPP Panel File Marital Status Data."

1984-1986.

In addition, many marriages involving newly formed married-couple households also probably involve the dissolution of one or two previously existing households.<sup>36</sup> At one extreme, if each marriage were associated with the dissolution of two households (one for each spouse), then the number of missed dissolutions of non-married-couple households would be twice as large as the number of marriages, that is, 2,782,000 households. More plausibly, if as many as one-half or as few as one-third of newly-married persons dissolved a premarital household upon marriage, then dissolutions of non-married-couple households would be underestimated, respectively, by 1,391,000 households or 927,000 households.

Consequently, if it is plausible to assume that between one-third and one-half of newlyweds dissolve a premarital household, then the SIPP underestimates dissolutions of non-married-couple households by between 927,000 and 1,391,000.<sup>37</sup> In terms of the dissolution rate for these four types of households taken together, if the SIPP error is within this range, then underestimate of marriages leads to an underestimate in the range of 3-4 percentage points for 1984-1986, compared to the SIPP estimates of 27-28 percent.

Again, unfortunately, without an alternative, accurate estimate of household dissolution rates by type, the magnitude of the SIPP error cannot be known precisely. Plausible assumptions from above suggest, however, that the SIPP underestimate of the dissolution rate for non-married-couple households may be in the range of 9-14 percent (3-4 divided by 27-28). If the SIPP underestimate of dissolutions, due to underestimated numbers of marriages, does lie within this range, and if the error is not distributed proportionally across household types, then the underestimate for one or more of the four specific types of non-married-couple households may be larger, that is, larger than 9-14 percent, while the underestimate may be smaller for one or more of the remaining types.

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<sup>36</sup>Newlyweds entering second or higher order marriages may be especially likely to have lived in their own household prior to remarriage, and about one-third of all newlyweds are in second or higher order marriages. For data on remarriages see National Center for Health Statistics, B.F. Wilson, 1989. Remarriages and subsequent divorces: United States. **Vital and Health Statistics**. Series 21, No. 45. DHHS Pub No (PHS) 89-1923. Public Health Service. Washington, D.C.: U.S. Government Printing Office.

<sup>37</sup>Evidence pertaining to the plausibility of this range follows. First 22-36 percent of ever-married persons age 19-39 cohabited before their first marriage (Larry L. Bumpass and James A. Sweet, "Preliminary Evidence on Cohabitation," Center for Demography and Ecology, University of Wisconsin Madison, NSFH Working Paper No. 2). Hence, it seems likely that at least 25 percent of newlyweds were cohabiting immediately prior to marriage, and that they experienced a change of household type with the marriage, that is, a household dissolution and formation. If only 11 percent of the remaining three-fourths of newlyweds dissolved a premarital household, then the total proportion of newlyweds dissolving a premarital household would be 33 percent. At the opposite extreme, if 33 percent of newlyweds were cohabiting immediately prior to marriage, and if 25 percent of the remaining newlyweds dissolved a premarital household when they married, then the total proportion of newlyweds dissolving a premarital household would be 50 percent.

Regarding the SIPP underestimate of divorces, the implications for the SIPP estimates of the components of household change are much less certain, because most legal divorces probably occur after many months or years of separation, that is, the dissolutions and formations of households that are associated with divorces mainly occur several months or years earlier, at the time of marital separation. Unfortunately, independent national estimates of marital separations are not available.

Also not available are independent national estimates of other events that lead to the formation and dissolution of households. For example, if a divorced mother and her children who live together in a household move into the nonfamily household maintained by the mother's boyfriend, then the result is the dissolution of the mother's family household. Similarly, if the mother and her children move out of the boyfriend's household, then the mother and her children may form a new family household of their own. However, in view of the SIPP underestimates of marriage and divorce, it seems likely that other events associated with household formation and dissolution are subject to errors which tend to introduce additional errors into the SIPP estimates of the components of household change.

#### Differential Household Attrition and Errors in Components of Change Estimates

The third type of evidence presented here, to evaluate the accuracy of estimates of the components of household change, pertains to the rates of attrition of households from the sample. Household attrition refers to the fact that some sample households are not interviewed for the entire panel period, because they refuse to be interviewed, because they move to a new location and cannot be found, because they move to a home in a geographic location not included in the interview area, etc. If attrition of households from the sample is differential, that is, if households that leave the sample for these reasons are different from households that remain in the sample, then estimates based on the households that remain in the sample will be in error.

For example, if newly-formed family households with female householders are more likely to refuse to be interviewed than other types of newly-formed households, then the number of newly-formed family households with female householders may be underestimated, compared to the other types of households. of course, if differential attrition does occur, weighting procedures serve to counter-act the problem-with the result that weighted estimates will have less error than unweighted estimates.

Ideally, the amount of differential attrition along relevant dimensions would be measured by comparing the changes for households which remain in the sample to changes for households which leave the sample. For example, household dissolution and formation rates by household type might be calculated for households that attrite and households that do not attrite. Unfortunately, this cannot be done precisely because, for households that attrite from the sample, no data are collected for the time after which the attrition occurs.

An alternative approach is to compare attrition rates across household types. Different types of households no doubt have different rates of dissolution, and newly-formed households of different

types no doubt are formed by persons who differ in their earlier household composition. Consequently, if households of different types experience different attrition rates, then estimates of household dissolution and formation based on the non-attriting households may be biased.

Table 3 presents approximate attrition rates for households by type based on the person's panel and longitudinal household weights.<sup>38</sup> From a substantive point of view, the attrition rates are quite similar across the three types of weights.<sup>39</sup> Of all the households in the SIPP sample as of January 1, 1984, 20-21 percent did not receive positive weights. In other words, 20-21 percent of the households attrited from the sample. Furthermore, attrition is differential across household types, varying from a low of 16-17 percent for nonfamily households with a female householder, to 18-20 percent for married-couple households, to 24-28 percent for other family and nonfamily households with male householders and for other family households with female householders.<sup>40</sup>

In other words, married-couple households have attrition rates that are about average, because they constitute more than one-half of all households. Nonfamily households with female householders have attrition rates that are 3-4 percentage points below average, and the remaining three household types have attrition rates that are 4-7 percentage points greater than average.<sup>41</sup> What are the possible implications of this differential attrition by household type for error in the SIPP estimates of household dissolution and formation by household type?

An additional result is pertinent in answering this question. Table 3 shows for households that do not attrite from the sample that weighted and unweighted estimates of the components of household change are analytically identical. This indicates that, insofar as differential attrition produces errors in estimates of the components of household change, weighting procedures do not act to reduce the error.

What, then, are the implications of differential attrition across the household types for the SIPP estimates of household dissolution and formation by household type? The answer depends,

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<sup>38</sup>Starting in March, 1985, the size of the 1984 SIPP panel was cut by about 17.8 percent, due to budget constraints (see Census Bureau memorandum of February 8, 1985, from Charles D. Jones to Thomas C. Walsh regarding "1984 Panel SIPP Sample Reduction"). Since this sample reduction was essentially random, approximately 17.8 percent of households of each type failed to receive positive weights simply as a result of the sample reduction. In order to account for this sample reduction in the top panel of Table 3, the estimates of households by type that did not receive positive weights are all 17.8 percentage points smaller than the estimates as derived from the raw data. The estimates that are adjusted by 17.8 percentage points should correspond quite closely to actual attrition rates, as attrition is defined here, namely as a failure to receive a positive (non-zero) weight of a specified type. This definition of attrition is, effectively, the definition built into the weighting procedures.

<sup>39</sup>The numerical differences may not be statistically significantly different.

<sup>40</sup>At least some, if not all, of these differences are not statistically significant.

<sup>41</sup>At least some, if not all, of these differences are not statistically significantly different.

partly, upon the ways in which attrition is differential, that is, it depends upon how households that attrite are different from households that do not attrite from the sample.

One plausible supposition is that dissolution rates tend to be underestimated for household types with relatively high attrition rates. Although direct evidence to support this supposition is not available, inferential evidence about persons who move to new locations is consistent with this supposition. In the 1984 SIPP panel, the annual number of migrants that is, persons who moved from one home to another, is underestimated by 13.6 percent, compared to the corresponding CPS estimate for 1985-1986 (April to April).<sup>42</sup>

This underestimate of moving may result, at least in part, from greater attrition among movers than among non-movers.<sup>43</sup> But since moving and dissolving a household probably tend to happen at the same time, it seems plausible, since moves are underestimated, that household dissolutions also are underestimated in the SIPP. In addition, insofar as these underestimates are associated with attrition from the sample, it seems possible that dissolution rates will be underestimated to a greater extent for household types with larger attrition rates than for households with smaller attrition rates.

If this were the case for the 1984 SIPP panel, it appears that the SIPP would tend to underestimate dissolution rates for family and nonfamily households with male householders and for family households with female householders, at least compared to dissolution rates for the two remaining types of households. At the opposite extreme, the SIPP would tend to overestimate dissolution rates for nonfamily households with female householders, again at least compared to dissolution rates for other household types.

But, as a second-order effect, if the dissolution rate for a particular household type tends to be underestimated, then formation rates for the other four types of households also tend to be underestimated, because households that are not dissolved also do not become transformed into newly-formed households of another type. Similarly, if the dissolution rate for a particular household type tends to be overestimated, then formation rates for the other four household types also will tend to be overestimated because the dissolution of additional households tends to lead to the formation of additional households.

However, since not all household dissolutions lead to newly-formed households, these second-order effects may be smaller than the first-order effects that produce them.

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<sup>42</sup>See Census Bureau memorandum of January 17, 1988 from Diana DeAre to Arthur Norton regarding "SIPP Wave 8 Data on Migration."

<sup>43</sup>For example, the proportion of respondents completing five interviews was 81.7 percent for nonmovers compared to only 68.8 percent for movers (see Donald J. Dahmann and Edith K. McArthur, "The Analysis of Geographical Mobility and Life Events with the Survey of Income and Program Participation," **Proceedings of the Social Statistics Section**, American Statistical Association, 1987).

Nevertheless, under the plausible supposition described here, most household types would tend to experience underestimates in dissolution rates and both underestimates and overestimates in formation rates. In fact, under most scenarios of differential attrition, these tendencies would tend to counter-act each other, and even if differential attrition causes substantial errors of the plausible type described here, the resulting errors in net estimates of household change might well be substantially smaller.

#### Possible Errors in Components of Household Change Estimates

One of the new, and potentially quite valuable, uses of SIPP data is-to provide estimates of household formation and dissolution. This paper's analysis of SIPP's underestimate of marriages and this paper's suppositions about differential attrition suggest, overall, that household formation and dissolution rates from SIPP may be underestimated for married-couple households, for family and nonfamily households with male householders, and for family households with female householders. Evidence for nonfamily households with female householders suggests that formations may be underestimated, but evidence regarding dissolutions is more ambiguous, because SIPP's underestimate of marriages may lead to an underestimate of dissolutions, while the first-order effects of differential attrition may lead to an overestimate of dissolutions.

These conclusions must be viewed as quite tentative, however, for two reasons. First, as noted at the end of the section on SIPP's underestimates of marriages, independent national estimates are not available for many events that lead to the formation and dissolution of households. Hence, any errors associated with these events may either augment or counter-act the errors associated with SIPP's underestimate of marriages. Second, whatever plausibility may (or may not) attach to the potential effects of differential attrition, the differentials in and of themselves provide no basis for estimating the direction or magnitude of any resulting errors. Instead and at most, the magnitudes of the household attrition rates in themselves (17-28 percent) suggest that caution should be exercised in interpreting the SIPP estimates as precise estimates of household dissolution and formation rates, and the 2-11 percentage point differences in attrition rates across household types (within any set of alternative SIPP estimates) suggests the possibility of differential errors across household types in the SIPP estimates.<sup>44</sup>

#### CURRENT ESTIMATES AND QUESTIONS FOR THE FUTURE

The SIPP estimates derived in this paper broadly suggest three major conclusions about the components of household change in the U.S. for 1984-1986, while the evaluation suggests, tentatively, that caution should be exercised in treating these estimates as precise estimates, at least until another evaluation can be conducted with the larger sample size that will become available by combining data from three SIPP panels. Both the substantive and the methodological conclusions raise questions that should be addressed. The three major substantive conclusions can be summarized as follows.

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<sup>44</sup>Some of these differences are not statistically significantly different.

First, the relatively small net changes in the number of households as measured in cross-sectional surveys is the result of much larger components of household change. Second, despite the substantial-to-large proportion of households of each type that dissolved during 1984-1986, the dissolved households usually were replaced by approximately equal or larger proportions of newly formed households of the same type. Third, rates of household dissolution and formation are quite different among certain household types.

More specifically, during the two-year period of 1984-1986, married-couple households were most stable, experiencing a net increase of 2 percent which resulted from rates of household dissolution and formation of 8-12 percent. Family and nonfamily households with female householders experienced net increases that were two to three times as large at 4-6 percent, and rates of household dissolution and formation that also were two to three times as large at 23-31 percent.<sup>45</sup> In view of the broad interest among policy makers and the general public in family households with female householders, the large turn-over during a two-year period in these households is quite noteworthy. Finally, the net increases in nonfamily and family households with male householders were 10 and 20 percent, respectively, and these increases were the result of very large dissolution and formation rates of 34-39 percent for these nonfamily households and 42-51 percent for these family households.<sup>46</sup>

The methodological evaluation of the accuracy of these estimates can be summarized as five major, but necessarily tentative, conclusions. These conclusions must be viewed as tentative, because available sample sizes do not provide the basis, in many cases, for statistically reliable conclusions about the "small" differences upon which these conclusions rest, and because only some of the plausible sources of error can be evaluated with available evidence. Despite their tentative nature, however, the following five methodological conclusions merit attention.

First, most of the minimum likely errors in estimates of net household change range in size from negligible to about one-fifth the size of associated dissolution and formation rates. Second, most of the maximum likely errors in net household change range in size from about one-tenth to about one-fifth of the size of the associated dissolution and formation rates. Third, there is a tendency for the SIPP to overestimate, in comparison to the CPS, the net increase in nonfamily households with female householders and to under estimate the net increase in family householders with female householders.<sup>47</sup> Fourth, because the SIPP underestimates marriage, compared to the National Center for Health Statistics, by about 28 percent, the formation rate for married-couple households and the dissolution rates for other types of households may tend to be underestimated by one-tenth to one-fourth. Fifth, possible errors in other events that lead to the formation or

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<sup>45</sup>The net increase of 2 percent for married-couple households is not statistically significantly different from the estimate of 4 percent for nonfamily households with female householders.

<sup>46</sup>The estimates of 34-39 percent are not statistically significantly different from the estimates of 42-51 percent.

<sup>47</sup>The differences between these SIPP and CPS estimates are not statistically significant.

dissolution of households, as well as the substantial overall household attrition rates, and the substantial differential across household types in attrition rates, all suggest that caution be exercised in treating the SIPP household formation and dissolution estimates as precise.

These conclusions are both disappointing and exciting. They are disappointing, because of the tentative nature of the methodological evaluation, and because of the possibility of substantial errors in the SIPP estimates. But they are exciting because of the major substantive conclusions that currently can be drawn from the SIPP about the components of household change, and because of the potential for the SIPP to provide the basis for additional insights into important topics concerned with longitudinal household change.

Prominent questions for future research suggested by these conclusions include the following. First, how large are measurable errors in net household change estimates and the components of household change estimates in the SIPP? For example, are specific estimates in error by as little as one-twentieth or less, or by as much as one-fifth or more? Second, what happens to households of different types (and their members) when households dissolve? For example, to what extent do family households with female householders lead to newly-formed married-couple households where the former householder marries, or to what extent do these households become merged into households maintained by the former householder's parents? Third, how do the social and economic characteristics differ for households which continue to exist through time, compared to households which dissolve, and compared to households which are newly formed?

When longitudinal data files for the 1985 and 1986 panels become available during the next few months, the increased sample size that can be obtained by combining the 1984, 1985, and 1986 panels will provide a much firmer basis for answers to these and other questions. The answers will be of interest to policy makers, because households are, in essence, the reciprocity units for many public programs, and because households are, in fact, the expenditure and consumption units for most persons, regardless of whether they participate in publicly-funded transfer programs. The answers also will be of interest to persons who are concerned with family life in America, because family stability and family change are inextricably tied to household stability and household change.

**Table 1. Alternative Estimates of Household Dissolution and Formation Rates by Household Type for 1984-1985 and 1984-1986\***

ESTIMATE TYPE AND BASIS		Family Households			Nonfamily Households		
		Total	Married Couple	Male householder	Female householder	Male householder	Female householder
<b>Percent dissolved, 1984-1985</b>							
Longitudinal household weight 1	10.4	5.0	24.6	17.4		22.1	15.2
Longitudinal household weight 2	10.4	5.0	24.4	17.3		22.1	15.2
Person's panel -,weight		9.8	4.7	23.4	16.0		20.9
Calendar 1984 weight	9.3	4.7	22.5	16.7		19.3	12.5
<b>Percent formed, 1984-1985</b>							
Longitudinal household weight 1	11.1	4.6	24.6	16.6		25.3	18.8
Longitudinal household weight 2	11.8	5.8	32.0	15.7		25.0	19.0
Person's panel weight	11.7	6.0	30.5	16.0		25.8	17.5
Calendar 1994 weight	12.9	6.4	32.5	18.0		28.9	19.0
<b>Percent dissolved, 1984-1986</b>							
Longitudinal household weight 1	17.1	9.4	42.7	26.7		34.7	22.7
Longitudinal household weight 2	17.0	9.4	42.4	26.7		34.7	22.6
Person's panel weight	16.9	9.4	41.9	26.5		34.0	22.5
<b>Percent formed, 1984-1986</b>							
Longitudinal Household weight 1	18.0	8.1	45.6	28.0		37.8	30.0
Longitudinal household weight 2	19.4	10.6	48.2	26.8		38.0	29.8
Person's panel weight	16.9	9.4	50.8	29.3		39.3	30.9
<b>Weighted household estimate for January 1, 1994 (in thousands)</b>							
Longitudinal household weight 1	86,262	51,290	1,899	9,862		9,860	13,351
Longitudinal household weight 2	86,233	51,304	1,887	9,849		9,860	13,333
Person's panel weight	86,264	51,327	1,871	9,996		9,832	13,338
Calendar 1984 weight	85,544	50,712	1,923	9,867		9,480	13,562
Current Population Survey		85,519	50,236	2,179	9,803		9,760
<b>Unweighted sample sizes for household estimates for January 1, 1984</b>							
Longitudinal household weight 1	12,479	7,563	271	1,318		1,273	2,054
Longitudinal household weight 2	12,256	7,363	268	1,310		1,266	2,049
Person's panel weight	12,235	7,361	265	1,312		1,252	2,045
Calendar 1984 weight	15,007	9,016	345	1,685		1,566	2,395

\*Period 1984-1985 refers to change between January 1, 1994, and January 1, 1985.

Period 1984-1986 refers to change between January 1, 1994, and January 1, 1986.

Percents dissolved and formed calculated with the number of households existing as of January 1, 1984 as the base.

**Table 2. Alternative Estimates of Net Percent Change in Number of Households and Alternative Estimates of Minimum and Maximum Error in SIPP Estimates, by Household Type for 1984-1985 and 1984-1986\*.**

<u>ESTIMATE TYPE AND BASIS</u>	<u>Family Households</u>			<u>Nonfamily Households</u>		
	Total	Married couple	Male householder	Female householder	Male householder	Female householder
<b>Net household change, 1984-1985</b>						
Longitudinal household weight 1	0.7	-0.4	5.0	-0.8	3.2	3.5
Longitudinal household weight 2	1.4	0.9	7.6	-1.7	2.9	3.8
Person's panel weight	1.9	1.2	7.2	0.0	4.9	3.1
Calendar panel weight	3.2	1.7	9.2	1.2	8.8	5.9
Adjusted Current Population Survey	0.7-1.4	0.0-0.1	2.3-7.2	1.1-3.2	1.3-4.0	0.6-1.8
Official Current Population Survey	1.5	0.1	8.0	3.7	4.5	2.1
<b>Minimum error, 1984-1985</b>						
Longitudinal household weight 1	0.0	-0.4	0.0	-1.9	0.0	1.7
Longitudinal household weight 2	0.0	0.8	0.4	-2.8	0.0	2.0
Person's panel weight	0.5	1.1	0.0	-1.1	0.9	1.3
Calendar 1984 weight	1.8	1.6	2.0	0.0	4.8	4.1
<b>Maximum error, 1984-1985</b>						
Longitudinal household weight 1	-0.7	-0.5	2.7	-4.0	1.9	3.0
Longitudinal household weight 2	0.7	0.9	5.3	-4.9	1.6	3.1
Person's panel weight	1.2* *	1.2	4.9	-3.2	3.6	2.5
	2.5* *	1.7	6.9	-2.0	7.5	5.3
<b>Net household change, 1984-1986</b>						
Longitudinal household weight 1	0.9	-1.3	2.8	1.3	3.1	7.2
Longitudinal household weight 2	2.4	1.2	5.8	0.1	3.3	7.1
Person's panel weight	3.8	2.3	8.9	2.7	5.3	8.4
Adjusted Current Population Survey	1.9-3.2	0.5-1.4	5.8-17.9	1.6-5.0	3.0-9.1	1.1-3.4
Official Current Population Survey	3.8	1.6	20.1	5.6	10.2	3.8

**Minimum error, 1984-1986**

Longitudinal household weight 1	-1.0	-1.8	-3.0	-0.3	0.0	3.8
Longitudinal household weight 2	0.0	0.0	0.0	1.5	0.0	3.7
Person's panel weight	0.6	0.9	0.0	0.0	0.0	4.9

**Maximum error, 1984-1986**

Longitudinal household weight 1	-2.3	-2.7	-15.1	-3.7	-6.0	6.1
Longitudinal household weight 2	0.8	0.7	-12.1	-4.9	-5.8	6.0
Person's panel weight	1.9	1.8	-9.0	-2.3	-3.8	7.3

\* Period 1984-1985 refers to change between January 1, 1984, and January 1, 1985.

Period 1984-1986 refers to change between January 1, 1984, and January 1, 1986.

Text of paper describes derivation of range of values for 'Adjusted Current

Population Survey and derivation of estimates of minimum and maximum error.

\*\*Statistical significance of error estimates indicated for 90 percent confidence level.

**Table 2. Alternative Estimates of Net Percent Change in Number of Households and Alternative Estimates of Minimum and Maximum Error in SIPP Estimates, by Household Type for 1984-1985 and 1984-1986\* (continued).**

ESTIMATE TYPE AND BASIS	Family Households			Nonfamily Households		
	Total	Married couple	Male householder	Female householder	Male householder	Female householder
<b>Minimum error, 1984-1986</b>						
Longitudinal household weight 1	-1.0	-1.8	-3.0	-0.3	0.0	3.8
Longitudinal household weight 2	0.0	0.0	0.0	1.5	0.0	3.7
Person's panel weight	0.6	0.9	0.0	0.0	0.0	4.9
<b>Maximum error, 1984-1986</b>						
Longitudinal household weight 1	-2.3 **	-2.7**	-15.1	-3.7	-6.0	6.1
Longitudinal household weight 2	0.8	0.7	-12.1	-4.9	-5.8	6.0
Person's panel weight	1.9 **	1.8	-9.0	-2.3	-3.8	7.3 **

\*Period 1984-1985 refers to change between January 1, 1984, and January 1, 1985.

Period 1984-1986 refers to change between January 1, 1984, and January 1, 1986.

Text of paper describes derivation of range of values for "Adjusted Current

Population Survey" and derivation of estimates of minimum and maximum error.

\*\*Statistical significance of error estimates indicated for 90 percent confidence level.

**Table 3. Approximate Household Attrition Rates and Weighted and Unweighted Estimates of Household Dissolution Rates by Household Type for 1984-1986\***

ESTIMATE TYPE AND BASIS	Total	<u>Family Households</u>		Female house- holder	<u>Nonfamily Households</u>	
		Married house- couple	Male holder		Male house- holder	Female house- holder
<b>Household Attrition Rates, 1984-1986</b>						
Longitudinal household weight 1	19.5	18.1	24.7	25.0	24.4	16.5
Longitudinal household weight 2	20.6	19.8	25.3	25.3	24.7	16.6
Person's panel weight	21.2	20.1	27.7	26.2	25.9	16.9
<b>Weighted estimate of percent dissolved for non-attrited households</b>						
Longitudinal household weight 1	17.1	9.4	42.7	26.7	34.7	22.7
Longitudinal household weight 2	17.0	9.4	42.4	26.7	34.7	22.6
Person's panel weight	16.9	9.4	41.9	26.5	34.0	22.5
<b>Unweighted estimate of percent dissolved for non-attrited households</b>						
Longitudinal household weight 1	17.3	0.5	42.1	26.8	34.2	22.3
Longitudinal household weight 2	16.6	9.4	41.8	26.6	34.0	22.1
Person's panel weight	16.5	9.5	41.1	26.4	33.1	22.0

\* *Period 1984-1986 refers to change between January 1, 1986. Unweighted estimates are based on households that were assigned positive weights of the types indicated.*