

# American Time Use Survey User's Guide

*Understanding ATUS 2003 to 2019*

The American Time Use Survey (ATUS) is sponsored by the Bureau of Labor Statistics and conducted by the U.S. Census Bureau

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## CHAPTER 1: SURVEY OBJECTIVES

### 1.1 WHAT DO THE AMERICAN TIME USE SURVEY DATA MEASURE?

The American Time Use Survey (ATUS) is the Nation's first federally administered, continuous survey on time use in the United States. The goal of the survey is to measure how people divide their time among life's activities.

In ATUS, individuals are randomly selected from a subset of households that have completed their eighth month of interviews for the Current Population Survey (CPS). ATUS respondents are interviewed only one time about how they spent their time on the previous day, where they were, and whom they were with. The survey is sponsored by the Bureau of Labor Statistics and is conducted by the U.S. Census Bureau.

The major purpose of ATUS is to develop nationally representative estimates of how people spend their time. Many ATUS users are interested in the amount of time Americans spend doing unpaid, nonmarket work, which could include unpaid childcare, eldercare, housework, and volunteering. The survey also provides information on the amount of time people spend in many other activities, such as religious activities, socializing, exercising, and relaxing. In addition to collecting data about what people did on the day before the interview, ATUS collects information about where and with whom each activity occurred, and whether the activities were done for one's job or business. Demographic information—including sex, race, age, educational attainment, occupation, income, marital status, and the presence of children in the household—also is available for each respondent. Although some of these variables are updated during the ATUS interview, most of this information comes from earlier CPS interviews, as the ATUS sample is drawn from a subset of households that have completed month 8 of the CPS.

### 1.2 HOW CAN THE SURVEY RESULTS BE USED?

ATUS significantly furthers understanding about how Americans spend their time. Because ATUS data are collected on an ongoing, monthly basis, time-series data can be analyzed to identify any changes in how people spend their time. ATUS data can provide a wide range of applications for different users.

For example, many economists are interested in estimating the monetary value of nonmarket work. ATUS includes information about time spent doing both paid and unpaid activities. By using time-use data in conjunction with earnings data, economists are able to estimate the value of nonmarket production—such as housework, volunteer work, and childcare. Some efforts are being undertaken (outside BLS) to account for such measures when developing aggregate output estimates, including gross domestic product. ATUS data can also provide insight into the total number of hours people work—both at work and at other locations, such as home. Total hours of work can help economists more accurately measure productivity. Lawmakers may use the data to make more informed decisions, such as how a particular policy might affect people's behavior. Likewise, businesses can use ATUS data on how people spend their time to determine what kinds of goods and services to develop or market to a particular group.

ATUS data also include information on with whom and where respondents spend their time. From this, sociologists can determine, for example, the average amount of time fathers or mothers spend with their children, or how much time people spend with colleagues and friends. It also is possible to determine how much time people spend working outside of the office. All of this information can help researchers understand how people in the United States are dividing their time among the duties of childcare;

the demands of their jobs; their need to relax or exercise; and their religious, volunteer, and other commitments.

Many other countries have done or currently conduct time-use surveys. Time-use data have been collected on all continents except Antarctica. ATUS was designed to ensure that time-use information in the United States can be compared, at broad levels, with information from other countries.

## CHAPTER 2: HISTORY OF THE AMERICAN TIME USE SURVEY

### 2.1 DEVELOPMENTAL PHASES

The development of ATUS began in 1991, when it was first discussed at BLS as a statistical policy issue, and continued to January 2003, when ATUS data collection officially began. Since then, the survey has been continuously improved. The 12-year period from 1991 to 2003 is described in four developmental phases, below.

#### **Developmental phase 1: Early interest, 1991-1995**

From 1991 to 1995, BLS began to develop an understanding of other countries' collection of time-use data and the demands for such data in the United States.

- **1991: Unremunerated Work Act**  
This bill, which called on BLS to "conduct time-use surveys of unremunerated work performed in the United States," did not make it out of congressional committee, but it acted as the catalyst for BLS to begin studying the issue of collecting time-use data.
- **1992: Statistics Canada conference**  
Statistics Canada held a conference on the value and measurement of unpaid work. This conference exposed BLS to a gap in the United States Federal Statistical System—there was no measure of time use to enable an estimate of the value of unpaid work.
- **1995: United Nations conference in Beijing, China**  
The U.N. International Conference on the Status of Women again raised the issue of measuring and valuing unremunerated work as a topic of international interest. The conference's Platform for Action (item 206) stated that "national, regional and international statistical agencies should measure, in quantitative terms, unremunerated work that is outside national accounts and reflect its value in satellite or other official accounts that are separate from but consistent with core national accounts."<sup>1</sup>

#### **Developmental phase 2: Feasibility, 1997**

In 1997, BLS recognized a growing interest in time-use data. Consequently, the agency began exploring how researchers had used data from prior studies and how BLS might conduct a time-use survey.

- **1997: BLS Pilot Survey and BLS-MacArthur Conference**  
BLS conducted this trial survey to examine the viability of conducting a time-use survey by telephone in the United States. (This is discussed further in section 2.2.1.)

To present the findings from the pilot study and to become acquainted with time-use data and researchers, BLS cosponsored a conference with the MacArthur Foundation entitled "Time Use, Nonmarket Work and Family Well-Being." Three positive developments that arose from this conference included:

1. The introduction of BLS to the international community of time-use researchers and survey practitioners;

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<sup>1</sup> United Nations, 1995.

2. The presentation of evidence by researchers that time-use data were analytically very important and that the lack of a time-use survey was “the biggest single gap in the Federal Statistical System”<sup>2</sup>; and
3. The opportunity for the BLS time-use working group to receive critical feedback on the pilot study and advisement on the direction of work in the subsequent developmental phase.

**Developmental phase 3: Development of specifications, 1998-1999**

From 1998 to 1999, a small team of BLS researchers began to develop specifications for a BLS survey on time use.

- 1998: BLS working group  
The BLS Commissioner asked the working group to develop a more detailed plan for the collection of time-use data. The report that resulted from this request became the blueprint for the American Time Use Survey (ATUS).
- 1999: National Academy of Science (NAS) Conference  
As a follow up to the BLS-MacArthur Conference, the NAS held a workshop that explored the importance of time-use surveys and the conceptual and design issues associated with them. The BLS was invited to present its ideas on how it would go about collecting time-use data.
- 1999: Request for funds  
BLS made the first budget request for collecting time-use data to the Office of Management and Budget.

**Developmental phase 4: Building the survey, 2000-2002**

During 2000-2002, the survey specifications were turned into systems. This period included detailed testing, design work, software development, training, and other preparatory work for the survey.

- 2000: Budget for ATUS  
The survey received official approval and funding in December 2000. At this time, joint BLS-Census Bureau teams were formed to oversee the management of the survey, and they began working to fully operationalize the survey.
- 2001-2002: Survey development, operations field test, and coding tests  
During 2001 and 2002, developments took place in several areas of the survey, including the building of ATUS data-collection and coding instruments, the development of an activity-coding classification scheme, and the drafting of procedures for the call center. In addition, several decisions about the survey and operations were made during these 2 years; these included decisions about the survey's estimation objectives, the frequency of the survey, the survey reference period, how sampling would be done, what the questionnaire specifications would be, how the survey would be carried out operationally, and how the data would eventually be disseminated (discussed further in sections 2.2.2-2.2.6).
- 2003: Data collection  
January 2003 marked the official beginning of data collection for ATUS.

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<sup>2</sup> Bureau of Labor Statistics and MacArthur Network on the Family and the Economy, “Time Use, Non-Market Work, and Family Well-Being,” Summaries of the Time Use Conference, Nov. 20-21 (Bureau of Labor Statistics and MacArthur Foundation, 1997).

## 2.2 FIELD STUDY

Prior to full production in 2003, several tests and field studies were conducted that helped in the development of ATUS. In addition to the 1997 BLS-Westat pilot test, several important tests occurred between funding in December 2000 and full production in January 2003.

### 2.2.1 1997 PILOT STUDY

In 1997, BLS hired a survey contractor, Westat, to conduct a pilot study of two versions of a time-use survey using a telephone methodology. The pilot study drew on other surveys (primarily efforts by Statistics Canada) and provided a foundation for the development of testing specifications for ATUS. The pilot yielded valuable insights on response rates, the collection of simultaneous activities, and how to probe for specific information. In addition, the study guided subsequent research on contact strategies.

### 2.2.2 OPERATIONS TEST

Between April and June 2001, three simultaneous field tests were conducted by BLS and the Census Bureau. Because the field tests were done only once, the agencies decided to use a paper-and-pencil questionnaire and control system rather than automating the survey. Six important operational decisions were made as a result of these three field tests.

1. Households with no telephone number would be mailed a \$40 debit card to increase their likelihood of calling in to complete the survey. This debit card would not only give designated persons<sup>3</sup> in these households an incentive to participate, but also reimburse them for the telephone call. No debit cards would be mailed to households with telephone numbers.
2. Cases that had not been completed after the 8-week calling period would not be "recycled" to the field; that is, these households would not receive field visits from Census Bureau interviewers.
3. Designated persons would be eligible to report on only one specific day of the week; no other day of the week would be substituted for this day.
4. Designated persons would be called only on their designated interview day and would not be called prior to this day to set an appointment.
5. Priority Mail would be used to send out the advance materials (ATUS letter and brochure) to designated ATUS persons.
6. All ATUS interviewing would be done using computer-assisted telephone interviewing (CATI); there would be no in-person interviews.

These decisions were made by examining the response rate gains (if any) and the costs of multiple operational approaches and then choosing options that were viable within the ATUS annual budget.

### 2.2.3 COGNITIVE TESTING

BLS engaged in a series of cognitive pretesting efforts designed to ensure that respondents understand survey questions in a manner that is consistent with

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<sup>3</sup> ATUS randomly selects one person from each household in the sample to respond to the survey. (See section 3.3 on sample design and selection procedures.) This document refers to this household member as the designated person when discussing operations that take place before interview contact is made. Designated persons who respond to the survey are referred to as respondents.

the survey developers' intent. BLS requires that all survey questions undergo such testing and, if necessary, be revised until they solicit information consistent with research concepts.

Cognitive research was used to develop and improve ATUS summary questions on work and income-generating activities, secondary childcare, eldercare, and overnight trips of 2 or more days for a specific reference month.

These followup summary questions, asked after the respondent has completed the time diary, focus on getting additional information on important activities. For the childcare and eldercare questions, focus groups were used to develop a definition of secondary childcare and eldercare as well as wording for first-draft questions. For other questions, wording was drafted by ATUS staff and then tested. After drafting, questions were tested following a similar methodology: 20 to 30 people were recruited to participate in a mock ATUS interview followed by a face-to-face cognitive (debriefing) interview. The cognitive interviews were used to assess the ease or difficulty with which the respondents could recall the information required for the ATUS interview; the confidence with which they could report the information; omissions and errors in responses to summary questions; and other issues specific to each of the summary questions. The information gained from these tests was used to modify the summary questions so that they would better elicit the information desired by BLS and the Census Bureau.<sup>4</sup>

#### 2.2.4 CODING LEXICON TESTING

After data collection, activities reported by respondents must be coded using a three-tier coding system. To ensure that coding could be done accurately and the analytical value of the data preserved or enhanced, several coding tests were conducted. BLS conducted three tests using coders at the Census Bureau's National Processing Center in Jeffersonville, IN. Each test introduced a revised lexicon and more extensive coding rules and training than the previous one. The third test also evaluated the usability of new coding software. These tests led to numerous changes in the classification system.

An additional test was conducted by BLS and Westat in 2001 to measure coding accuracy and efficiency over time, to evaluate BLS coding training, and to assess the usability of the coding instrument. The tests showed that coding speed increased rapidly with experience, and coding accuracy increased as well, though not as quickly. BLS implemented several of Westat's recommendations to improve the classification system, the coding software, and the coding training.

Further progress was made in improving activity coding up to full production. These advancements include, but are not limited to, the development of rules and job aids for training purposes and the implementation of a coding verification and adjudication process.

#### 2.2.5 DRESS REHEARSAL

BLS and the Census Bureau conducted an ATUS dress rehearsal between April and August 2002. The purpose of this test was to conduct ATUS in a standard data production environment, incorporating most of the results from the 2001

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<sup>4</sup> Schwartz, 2000 and 2001.



operations field test. A sample of 7,000 designated persons was drawn from households that had completed the eighth month of CPS interviews, and these individuals were each assigned a day of the week about which they would be interviewed. Advance letters describing the time-use survey were sent to all designated persons, and those in households without a telephone number were offered a \$40 debit card to complete the interview.

The dress rehearsal was important because some operational issues of ATUS required further testing before full production began in 2003. ATUS was the first Census Bureau survey to use conversational interviewing to collect data. This also marked the first time that data from real interviews would be coded using the new ATUS classification system. It also was the first CATI interview designed using Blaise software<sup>5</sup> integrated into the Census Bureau's case management system and conducted at the Jeffersonville telephone center. A large-scale field test was necessary to evaluate the effectiveness of ATUS training modules to adequately prepare interviewers and coders; to determine respondents' reactions to a CATI time-use survey; and to determine whether case management, data collection, coding, and processing systems functioned as planned. The intent was to mirror full-production conditions as closely as possible to work out any operational problems that still remained. An interviewer debriefing after the dress rehearsal established that there were several areas of the training that needed improvement. In addition, various operational problems were fixed, operations management reports were developed, and the need to add a question clarifying volunteer activities was addressed during dress rehearsal.

## 2.2.6 PREFIELDING

From September to December 2002, BLS and the Census Bureau continued full-scale operations to refine the data-collection procedures, the CATI instrument, the calling strategy, and the coding lexicon. Refinements based on the results of the dress rehearsal and debriefing sessions were implemented and evaluated as the survey approached full production in January 2003.

## 2.3 Survey Changes

### 2.3.1 Eldercare Questions

Prior to 2011, the ATUS did not collect data on time spent providing eldercare. Recognizing the need for quality eldercare data, BLS had made many efforts over the years to develop questions to collect this information. In 2005, BLS hosted a subject matter expert panel to refine the concept of eldercare, to determine the most appropriate method for collecting the data within the ATUS design, and to obtain feedback on the kinds of measures that would best inform the eldercare research and policy communities. The development process over the years also included a review of existing eldercare measures, focus groups with caregivers, reviews of draft questionnaires by subject matter experts and survey methods experts, internal testing and refinement of the questions, and cognitive testing of the questions.

Questions on eldercare were introduced to the ATUS in January 2011. The ATUS eldercare questions were designed specifically to identify eldercare

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<sup>5</sup> Blaise software was developed by Statistics Netherlands and is the standard for both survey and coding applications at the Census Bureau.

providers and to measure the time they spent providing eldercare. Additional information, such as the relationship between the care provider and care recipient, the age of the care recipient, and the types of care activities that care providers do also are collected. The eldercare questions replaced the trips questions (see section 3.5).

## CHAPTER 3: SURVEY DESIGN

### 3.1 UNIVERSE

ATUS covers all residents living in households in the United States that are at least 15 years of age, with the exception of active military personnel and people residing in institutions such as nursing homes and prisons.

### 3.2 SAMPLING FRAME

The ATUS sample is drawn from the CPS, so the ATUS universe is the same as the CPS universe. The universe for the CPS is composed of the civilian, noninstitutional population residing in occupied households in the United States. From this universe, the CPS selects approximately 60,000 eligible households every month. About one-eighth (or about 7,500) of these retire permanently from the CPS sample each month after their eighth CPS interview attempt. Two months after households complete their eighth CPS interview, they become eligible for selection into the ATUS sample.

### 3.3 SAMPLE DESIGN AND SELECTION PROCEDURES

The ATUS sample is a stratified, three-stage sample. In the first stage of selection, the CPS oversample in the less-populous States is reduced. The CPS is designed to produce reliable estimates at the State and national level. Because of the CPS State reliability requirement, the less populous States are allocated a larger proportion of the national CPS sample than they would get with only a national reliability requirement. ATUS does not have a State reliability requirement. To improve the efficiency of the national estimates from the survey, the CPS sample is subsampled to obtain the ATUS sample, which is distributed across the States approximately equal to the proportion of the national population each one represents.

In the second stage of selection, households are stratified based on these characteristics: the race/ethnicity of the householder, the presence and age of children, and the number of adults in adults-only households. Sampling rates vary within each stratum. Eligible households with a Hispanic or non-Hispanic black householder are oversampled to improve the reliability of time-use data for these demographic groups. To ensure adequate measures of childcare, households with children are also oversampled. To compensate for this, households without children are undersampled.

In the third stage of selection, an eligible person from each household selected in the second stage is randomly selected to be the designated person for ATUS. An eligible person is a civilian household member at least 15 years of age. All eligible persons within a sample household have the same probability of being selected as the ATUS designated person.

### 3.4 SAMPLE SIZE

In 2003, 3,375 households leaving the CPS sample were selected for the ATUS sample each month (approximately 40,500 households annually). Based on the race/ethnicity of the householder and the presence and age of household children, households were classified into one of 12 possible strata. Table 3.1 lists the approximate number of households sampled each year in 2003 from each of the 12 strata.

Table 3.1. Estimated annual sample size by ATUS sampling strata, 2003

Household type	Race/ethnicity of household reference person in CPS			Total
	Hispanic	Non-Hispanic, black	Non-Hispanic, nonblack	
With at least one child under 6	1,500	1,000	5,400	7,900
With at least one child between 6 and 17	1,400	1,400	7,800	10,600
Single adult, no children under 18	800	1,800	5,900	8,500
Two or more adults, no children under 18	1,500	1,600	10,400	13,500
Total	5,200	5,800	29,500	40,500

Beginning with the sample introduced in December 2003, the monthly ATUS sample was reduced by 35 percent. This sample reduction was necessary to bring ATUS costs in line with the annual survey budget. After consideration and statistical analysis, BLS opted to reduce the sample from each stratum by the same proportion. This step reduced the precision somewhat for each group but had less of an effect on the precision of the estimates for the larger groups. This finding, coupled with an understanding that time-use patterns do not generally vary a great deal by race and ethnicity and that the focus of time-use estimation and analyses is likely to be larger population groups (e.g., men and women, employed and not employed), led BLS to choose this strategy. The approximate number of households sampled annually from each stratum after the sample reduction occurred is shown in table 3.2.

Table 3.2. Estimated annual sample size by ATUS sampling strata, 2004 and later

Household type	Race/ethnicity of household reference person in CPS			Total
	Hispanic	Non-Hispanic, black	Non-Hispanic, nonblack	
With at least one child under 6	1,200	600	3,400	5,200
With at least one child between 6 and 17	1,200	900	4,900	7,000
Single adult, no children under 18	700	1,600	4,300	6,600
Two or more adults, no children under 18	1,200	1,400	5,000	7,600
Total	4,300	4,500	17,600	26,400

### 3.5 SAMPLE ALLOCATION

The monthly sample is divided into four randomly selected panels, one for each week of the month. To ensure good measures of time spent on weekdays and weekend days, the sample also is split evenly between weekdays and weekend days. During the assignment of sample codes, 10 percent of the sample is allocated to each weekday, and 25 percent of the sample is allocated to each weekend day. The designated persons are then randomly assigned a day of the week about which to report and an

initial interview week code (the week of the interviewing period when the case is introduced).

Because the ATUS asks respondents only about “yesterday,” the survey may underestimate activities that occur on overnight trips away from home. Therefore, from 2005 to 2010, ATUS respondents were asked a series of questions about trips away from home for 2 or more nights in a row, during a specific reference month. Questions were asked about the number, duration, and purpose of overnight trips. This additional information may be used to adjust time-use estimates to correct for any bias introduced by the reporting methodology. The reference period for trips data was either the month before the initial contact attempt or 2 months prior to the interview month, whichever is most recent. Because the trips data are underused, the trips questions were replaced with eldercare questions in 2011.

### 3.6 RESPONSE RATES

BLS uses the American Association for Public Opinion Research's (AAPOR's) Response Rate 2 formula<sup>6</sup> for determining the ATUS response rates:

$$(C)/(C+R+NC+O+UE)$$

Where:

- C = Completes (complete or sufficient partial interview)
- R = Refusals
- NC = Noncontact (uncompleted callbacks; never contacted)
- O = Other (respondent absent, ill, or hospitalized; language barrier, etc.)
- UE = Unknown eligibility (phone number incorrect for household, unconfirmed number, etc.)

The ATUS overall response rates appear in table 3.3.<sup>7</sup> The response rate for persons in households without a telephone number is lower than those shown in the table, with an average annual response rate of about 33.2 percent. A survey conducted by BLS and the Census Bureau in early 2004 analyzing responses and operations data indicated that the primary reason for refusal is survey fatigue: the designated persons are tired of participating in the CPS survey and do not want to respond to another survey.<sup>8</sup>

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<sup>6</sup> See AAPOR's *Standard Definitions—Final Dispositions of Case Codes and Outcome Rates for Surveys, 2004*.

<sup>7</sup> These are response rates calculated prior to final processing and editing. During processing, cases with poor-quality data are moved from a complete response category to a nonresponse category, thus lowering final annual average response rates by 1 to 3 percentage points. Cases with poor-quality data are those containing fewer than five activities, those for which refusals or “don't remember” responses account for 3 or more hours of the 24-hour day, or both.

<sup>8</sup> See 3.2 for information on how ATUS selects respondents from households that have completed their eighth CPS interview.

Table 3.3. ATUS response rates by year

Year	Response rate (percent)
2003	57.8
2004	57.3
2005	56.6
2006	55.1
2007	52.5
2008	54.6
2009	56.6
2010	56.9
2011	54.6
2012	53.2
2013	49.9
2014	51.0
2015	48.5
2016	46.8
2017	45.6
2018	43.0
2019	42.0

## CHAPTER 4: DATA COLLECTION

### 4.1 ADVANCE MAILER

An advance mailer is sent to all ATUS designated persons to notify them that they have been selected for the ATUS sample. The advance mailer contains a letter and a brochure, both of which are printed in English and Spanish. The letter explains the nature of the survey, notifies the designated person of the date on which he/she will be contacted for the interview, and provides ATUS telephone and Internet contact information (see appendices A and B). The brochure contains a list of frequently asked questions designed to help designated persons better understand the survey (see appendix D). Between 2003 and mid-2011, advance mailers to minor designated persons (those under the age of 18) also included an explanatory letter to the parent or guardian (see appendix C). All advance mailers are sent by Priority Mail as described in chapter 2.

### 4.2 MODE OF DATA COLLECTION

All ATUS data are collected using computer-assisted telephone interviewing (CATI). The computerized interviewing instrument offers several benefits over a paper questionnaire. First, CATI automatically inserts any answer that a respondent gives in the beginning of a survey, such as a child's name, in corresponding later questions. Next, CATI verifies that all questions have been answered and that a respondent's answers are consistent throughout the questionnaire. CATI alerts the interviewer if there is a problem so that it can be resolved during the course of the interview. Also, CATI allows complex skip patterns to be programmed into the questionnaire to ensure consistent data quality and minimize human error. CATI also uses pop-up text boxes to instruct the interviewer to probe for more information when necessary. Overall, CATI reduces interviewer burden and clerical errors, ensures consistency and better data quality, and makes the interview experience more pleasant for respondents.

When the interview is complete, the tasks of processing, editing, coding, and analyzing the data are expedited because all of the collected information is already stored in the computer. CATI greatly reduces the amount of data entry that is necessary, as well as the errors associated with it.

### 4.3 CALL STRATEGY

The ATUS sample is randomized by day, with 50 percent of the sample reporting about weekdays, Monday through Friday, and 50 percent reporting about Saturday and Sunday. Designated persons must report about their activities on their designated day, without any substitution of days.

A designated person age 15 or older is selected randomly from each household to participate in the interview. No substitutes or proxy responses are allowed. All responses must be obtained directly from this designated respondent.

All ATUS interviews are conducted from the U.S. Census Bureau's telephone center at the National Processing Center in Jeffersonville, IN. The interviewers attempt calls in six call blocks throughout the day and are required to make at least one call in each call block until contact is made with each household. The call blocks vary according to the interview attempt day. The center uses an automated call scheduler, which tells

the interviewers when each household should be called. Once a household is contacted and the designated person agrees to complete the interview, the interviewer conducts the interview using CATI.

Data are collected for most, but not all, days of the year. Holidays, weather, and government closings affect the days on which data are collected, which varies by year. On average, data are *not* collected for 2 to 3 percent of the total number of days in a year. In 2013, a government shutdown resulted in a higher percentage of days on which the data were not collected.

#### 4.3.1 HOUSEHOLDS WITH A TELEPHONE NUMBER

If a telephone number is available from the CPS, an interviewer at the telephone center calls the household on the designated interview day to obtain a report about the designated person's activities on the previous (diary) day. When the interviewer enters the CATI system to conduct an interview, the first few screens that appear provide helpful information that was obtained during the CPS interview, such as the household roster and any notes recorded by the last CPS interviewer. For example, the CPS interviewer may note the best time to contact someone in the household. The interviewer attempts to contact the designated person after reviewing this information. When that person is reached, the interviewer introduces him or herself. Once the interviewer verifies that the designated person received the advance mailer explaining ATUS, the interview begins.

#### 4.3.2 HOUSEHOLDS WITHOUT A TELEPHONE NUMBER

A small percentage of the ATUS sample consists of households that did not provide a telephone number in their eighth CPS interview, or the phone number on record has an improbable string of numbers (such as all 0s).<sup>9</sup> In order to be a nationally representative survey, ATUS includes these households in its sample. These households also receive an advance mailer, but instead of providing a date when the designated person will be called, the letter asks the designated person to call the telephone center on a specified day to complete the interview. In addition to the letter and the brochure, the advance mailer for households that lack a telephone number includes an incentive in the form of an inactivated debit card for \$40. The debit card can be activated only with a PIN number provided to the respondent by the interviewer at the completion of the interview.

Since mid-2008, incentives are also sent to a limited number of households with telephone numbers that do not work, specifically those with telephone numbers assigned call outcome codes of "could not be completed as dialed" and "number changed, no new number given." In mid-2011, the ATUS expanded incentive-eligible households to include additional households with telephone numbers that do not work; specifically, those with telephone numbers that are "not in service" or "temporarily not in service." An incentive letter and a debit card are sent to each household assigned these call outcome codes after the household's first of 8 weeks in the sample.

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<sup>9</sup> CPS interviews may be conducted either by telephone or in person. If the eighth CPS interview is conducted in person, the respondent may or may not have provided a valid telephone number for the household. The ATUS interview is conducted only by telephone.



#### 4.4 THE INTERVIEW

The ATUS questionnaire contains both English and Spanish text. The telephone center has bilingual interviewers who conduct interviews in English but can interview in Spanish when the designated respondent speaks only Spanish or is more comfortable responding in that language.

The ATUS interview is a combination of structured questions and conversational interviewing. It consists of five major topics: the household roster, the time diary, the summary questions, eldercare, and a section related to information collected in the eighth CPS interview. The portion of the interview relating to the CPS is divided into four sections: labor force status, looking for work, industry and occupation, and earnings and school enrollment. These questions are used to update or confirm time-sensitive CPS data or to fill in missing CPS data.

For all parts of the interview except the collection of the time-use diary data (in section 4), interviewers read scripted text on the CATI screen and enter the reported responses.

For the time-use diary, the interviewer uses conversational interviewing rather than asking scripted questions. This is a flexible interviewing technique designed to allow the respondent to report on his or her activities comfortably and accurately. This technique also allows interviewers to use methods to guide respondents through memory lapses, to probe in a non-leading way for the level of detail required to code activities, and to redirect respondents who are providing unnecessary information. As each activity is reported, the interviewer records the verbatim responses on a new activity line. The interviewers are trained to ensure respondents report activities (and activity durations) actually done on the previous (diary) day, not activities done on a "usual" day. One technique interviewers use to do this involves emphasizing the word "yesterday" throughout the interview.<sup>10</sup>

The ATUS questionnaire is available online at <https://www.bls.gov/tus/questionnaires.htm>. Each section is described below in more detail.

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<sup>10</sup> For more information on conversational interviewing, see Michael F. Schober and Frederick G. Conrad, "Does Conversational Interviewing Reduce Survey Measurement Error?" *Public Opinion Quarterly* 61(December 1997):576-602.

Table 4.1. ATUS Survey

Section	Section description
S1: Introduction	In this section, the interviewer attempts to contact the designated person on the designated day. After contact, the interviewer verifies the designated person's address and informs the designated person that the call may be monitored. If the designated person refuses the interview or someone else in the household refuses for the designated person, the interviewer records who refused and the reason for refusal.
S2: Household Roster	In this section, the interviewer reviews the respondent's household composition, which includes the name, sex, birth date, and age of each household member, as well as each member's relationship to the respondent. The interviewer verifies and updates the roster to reflect any changes in the household—such as births or deaths—since the last CPS interview. Roster modifications also include any changes of residence for household members and any errors in the original CPS household roster.
S3: Employment	This section is used to determine whether the respondent worked in the last 7 days, was looking for a job, or was not in the labor force. The interviewer also asks if anyone in the household owns a business or a farm.
S4: Time-use diary	This part of the interview is used to collect a detailed account of the respondent's activities, starting at 4 a.m. the previous day and ending at 4 a.m. on the interview day. For each activity reported, the interviewer asks how long the activity lasted. For most activities, the interviewer also asks who was in the room or accompanied the respondent during the activity and where the activity took place.
S5: Summary questions	When the diary is complete, the interviewer asks follow-up questions to gain more information on the respondent's work, childcare, and volunteer activities. <ul style="list-style-type: none"> <li>• The interviewer first asks questions to identify activities that were done as part of the respondent's job and then asks about any income-generating activities that were not part of the respondent's main or other job.</li> <li>• Next the interviewer asks the respondent to identify activities and times when a child under age 13 was in the respondent's care (other than already mentioned primary childcare activities). This measure of secondary childcare is captured separately for the respondent's own children that live in the household; own children that live in another household; other (non-own) household children, such as siblings or grandchildren; and non-own nonhousehold children, such as a neighbor's children.</li> <li>• The interviewer then asks the respondent to identify any volunteer activities done for or through an organization.</li> </ul>
S5(a) (2011 and later): Eldercare	Questions in this section identify eldercare providers. If the respondent is an eldercare provider, the interviewer collects information about the care recipient's age, relationship to the respondent, the duration of care, whether or not care was provided yesterday, and if so, the activities done as care. This section replaced the trips questions in 2011.
S6 (2005-2010): Trips	Questions in this section elicit information on any overnight trips of 2 or more nights that occurred during a specific reference month. This section was replaced with questions about eldercare in 2011.
S7(a): Labor force status: Layoff/looking	In this section, the interviewer asks about the respondent's labor force status. Respondents who reported being unemployed, on layoff, or disabled in section 3 are asked if and how they are looking for work. Those who reported being on layoff also are asked if and when they expect to be recalled to their job.
S7(b): Labor force status: Employed	Next the interviewer collects or verifies information from CPS on the respondent's job title and job description, and on the industry in which the respondent works.
S8: Earnings & School enrollment	Lastly, the interviewer collects data on the respondent's usual earnings, including any overtime pay. Based on this information, the instrument then calculates the respondent's total weekly earnings, a figure confirmed by the respondent. Respondents between the ages of 15 and 49 are also asked about school enrollment.
S9: Conclusion	After the interview ends, the interviewer records any notes that may be helpful for coding the diary data. If the interview was not completed, the interviewer makes an appointment to call back on the same day or another designated day.

## 4.5 ATUS MODULES

The ATUS was designed so that organizations can sponsor a module, or series of questions on a special topic usually related to time use, at the end of the survey. An ATUS module lasts no longer than five minutes and is designed to supplement data from the core ATUS. For more information on sponsoring a module to the ATUS, please consult the [ATUS Module Policy](#).

### 4.5.1 EATING AND HEALTH MODULE

The Eating and Health (EH) Module was added to the ATUS in 2006-08 and again in 2014-16. The U.S. Department of Agriculture's (USDA) Economic Research Service and the National Institutes of Health's (NIH) National Cancer Institute sponsored the 2006-08 EH Module. This Module consisted of questions designed to examine relationships between time use; purchasing, preparing, and consuming food; and obesity. It contained questions on secondary eating (eating while doing other activities); secondary drinking (drinking beverages other than water while doing other activities); grocery shopping and meal preparation; participation in food and nutrition assistance programs; height and weight; and household income.

The EH Module was fielded again in 2014-16. This second iteration of the EH Module was sponsored by USDA's Economic Research Service, the USDA's Food and Nutrition Service, and the NIH's National Cancer Institute. The 2014-16 EH Module asked ATUS respondents about secondary eating; soft drink consumption; grocery shopping preferences and fast food purchases; meal preparation and food safety practices; participation in food assistance programs; general health; height and weight; exercise; and more. More information about the EH Module is available online at <https://www.bls.gov/tus/ehdatafiles.htm>.

### 4.5.2 Well-Being Module

A Well-Being (WB) Module, sponsored by the National Institute on Aging (NIA), was added to the ATUS and fielded for three full years—in 2010, 2012, and 2013. This module used the ATUS diary to capture how people felt during three randomly-selected activities. Specifically, respondents were asked to rate how happy, tired, sad, stressed, and in pain they felt. The module also captured how meaningful the activities were and whether they were interacting with anyone during the selected activities. These questions were not asked for times respondents reported sleeping, grooming, and engaging in personal activities.

Respondents also were asked a few questions about their general health. The 2012 and 2013 WB Modules included all of the questions from the 2010 WB Module as well as two additional questions that collected data about life satisfaction and respondents' emotional experience on the diary day. These questions provide information about the quality of life in the United States and they can be used to develop measures of well-being. More information about the WB Module is available online at <https://www.bls.gov/tus/wbdatafiles.htm>.

### 4.5.3 Leave Module

The Leave Module, sponsored by the Department of Labor Women's Bureau, was added to the ATUS and fielded in 2011, and a modified version was fielded in 2017-18. Both modules asked wage and salary workers about their use and access to paid and unpaid leave and the flexibility of their work schedules. The data provide a richer description of work, including information about the reasons for which workers are able to take paid and unpaid leave and their use of leave. The 2011 Leave Module included questions about whether workers could adjust their schedules or work locations to balance personal and work obligations instead of taking leave, whereas the 2017-18 Leave and Job Flexibilities Module asked workers whether they can and do work at home, their ability to change the hours they work, and their work schedules.

More information about the 2011 Leave Module and the 2017-18 Leave and Job Flexibilities Module, including data files and questionnaires, is available online at <https://www.bls.gov/tus/lvdatafiles.htm>.

## 4.6 FOLLOWUP PROCEDURES

ATUS interviewers are trained to use all of their skills and knowledge to complete the interview at the time of first contact with the household. If an interview is not completed, the interviewer attempts to set an appointment with the respondent to complete the interview later that day or on the next eligible reporting day. If a respondent refuses to complete the interview, a refusal conversion letter (see appendices E and F) is mailed to re-emphasize the importance of ATUS and to request that the respondent reconsider participating in the survey. The interviewer attempts to contact the respondent again during the 8-week period when his or her household remains in the ATUS sample.

## 4.7 CONFIDENTIALITY

ATUS data are collected by the Census Bureau under the authority of Title 13, United States Code, Section 8. Section 9 of the law requires that all information about respondents be kept strictly confidential and that the information be used only for statistical purposes. Designated persons are informed of their right to confidentiality under Title 13 in the ATUS advance letter and brochure, mailed approximately 10 days before the interview date. The ATUS advance letter also advises designated persons that this is a voluntary survey.

All Census Bureau security safeguards regarding the protection of data files containing confidential information against unauthorized use, including data collected through CATI, apply to ATUS data collection.

The BLS processing system design requires that ATUS data be securely transferred from the Census Bureau server to the BLS server.

## CHAPTER 5: CODING THE DATA

### 5.1 THE CODING LEXICON

The ATUS coding lexicon, or activity classification system, was originally based on the one used for the Australian Bureau of Statistics 1997 time-use survey. During a lengthy developmental phase, which included several coding and usability tests before the start of official ATUS data collection, the ATUS lexicon underwent many revisions. The result is a 3-tiered system, with 17 major, or first-tier, categories, each having 2 additional levels of detail (see appendix G). Each third-tier activity category also contains a list of examples of activities that fall into that category. Codes are periodically evaluated and updated prior to the start of each year's data collection. A document showing how the ATUS coding lexicons changed each year can be found at <https://www.bls.gov/tus/lexicons.htm>.

Coders at the telephone center assign a 6-digit classification code to each diary activity. The first two digits represent the major activity category; the next two digits represent the second-tier level of detail; and the final two digits represent the third, most detailed level of activity. For example, the ATUS code for "making the bed" is 020101. "Making the bed" is an example under the third-tier category, *Interior cleaning*, which is part of the second-tier category, *Housework*, which falls under the major activity category *Household Activities*:

#### 02 Household Activities

##### 01 Housework

01 Interior cleaning

02 Laundry

03 Sewing, repairing, and maintaining textiles

04 Storing interior household items, including food

99 Housework, n.e.c.

The final code in every tier is 99, which represents an activity not elsewhere classified (n.e.c.).

Four of the activity categories appearing in published tables and available from the database are composites of several coding-lexicon categories. For example, the two major coding-lexicon categories of "*Socializing, Relaxing, and Leisure*" and "*Sports, Exercise, and Recreation*" are combined into one category called *Leisure and Sports*. (See table 5.1.) See appendix H for a more detailed table linking the ATUS coding lexicon categories and major categories on the published tables.

Table 5.1. Bridge between published categories and coding lexicon categories

Published categories	Activity codes	Lexicon categories
Purchasing goods and services	07 08 09 Part of 10	Consumer purchases Professional and personal care services Household services Government services
Organizational, civic, and religious activities	14 15 Part of 10	Religious and spiritual activities Volunteer activities Civic obligations and participation
Leisure and sports	12 13	Socializing, relaxing, and leisure Sports, exercise, and recreation
Telephone calls, mail, and e-mail	16 020903 020904	Telephone calls Household and personal mail Household and personal e-mail

## 5.2 CODING RULES AND DESK AIDS

Because of the complexity of coding everyday activities reported in many different ways into fairly narrowly defined lexicon categories, coders use a comprehensive set of rules to guide their decisions. Rules applicable to each major lexicon category are available in a rules manual, as are miscellaneous rules—such as how to code passive, waiting, or watching activities—that apply to many categories. The miscellaneous rules also address conceptual issues in some detail, such as how to know when an activity is a helping one as opposed to the actual activity itself (e.g. how to determine if “feeding my neighbor’s dog” is a helping activity or pet care).

Numerous activities can conceivably be coded in more than one place in the lexicon, depending on several factors. For example, computer or Internet use may be coded as work, education, volunteering, or relaxing, depending on how the respondent identified the activity during data collection. For ambiguous activities, coders use flow charts that walk them through the logic required to make the correct activity code assignments. (See appendix I for coding rules.)

## 5.3 CODER QUALIFICATION

ATUS is unique in that it is the only survey conducted by the Census Bureau that uses the same personnel to do interviewing and coding, rather than referring collected data to coding specialists. Interviewers code one another’s cases, though never their own. This process is used because having knowledge of the coding lexicon categories gives interviewers a better understanding of the importance of probing for helpful information and recording activities properly, both of which make coding easier.

The telephone center uses a qualification process to prepare and certify coders for full production coding. New coders must pass a test panel within 30 days of completing training to be qualified for coding production panels. Formal coding evaluations and follow-ups occur quarterly for all coders.

All ATUS coders are expected to attain an average coding error rate of under 10 percent each month. If any qualified coder has an average coding error rate near 10 percent for the previous quarter, he is counseled by an ATUS supervisor. Qualified coders with production panel error rates equal to or exceeding 10 percent (even if previous panel error rates met qualification standards) are removed from both ATUS interviewing and coding production and placed in a re-qualification cycle.

## 5.4 ACTIVITY CODING

Data from completed cases are loaded into the ATUS coding application, which has multiple windows that let coders simultaneously view the activity being coded, the coding categories, and the respondent's time diary. In the time diary window, the following information is included for each activity: start time; duration; person(s) in the room with or accompanying the respondent; location; and whether or not the respondent identified the activity done as part of one's job, another income-generating activity, or volunteering through an organization. Tabs across the top of the screen can be accessed for further information on the respondent's industry and occupation, the ages and relationships of household members, and any notes about the case that the interviewer added for assistance with coding. The coding software also includes a search feature that helps coders find the correct code for ambiguous activities and increases coding speed.

Some activities are coded automatically before the coders see them. During data collection, interviewers have the option of using one of 12 precodes for commonly reported activities (such as sleeping or grooming) rather than typing the activity verbatim into the activity line of the time diary. Activities entered in this way are automatically assigned the correct corresponding six-digit lexicon activity codes before the diary data are loaded into the coding instrument. Although the autocoded activities show up in proper sequence in the coding instrument's diary, they cannot be changed by the coder.

### *Exhibit 5.1.*

#### **TRAVEL CODES**

Travel activities are a special case, and they have more complicated coding rules than other activities captured in the ATUS. In order to capture useful and detailed information, travel activities are coded according to the purpose of the travel. Travel codes are very specific, and they are named according to the purpose (e.g. Travel related to working, Travel related to work-related activities, and Travel related to job-search activities). While in reality a travel activity might be associated with many different purposes, the ATUS activity coding lexicon only allows one purpose to be assigned to each episode of travel. In most cases, this purpose is determined by the activity that immediately follows the travel activity. Homebound trips are an exception; in this case, the purpose of travel home usually is determined by the activity that preceded the travel episodes. These rules hold for single destination trips as well as multiple destination trips. Following are four examples that demonstrate the main ATUS travel coding rules.

Example 1. Respondent reports the following series of activities:  
Driving to the mall (20 minutes) → Eating dinner → Going shopping

ATUS coding rules are designed to identify a purpose for the travel that might not be indicated in the respondent's verbatim answer. There could be a number of reasons why someone would drive to the mall. She might be going shopping, going out to eat, going for a job interview, going to see a movie, or doing any number of activities. We cannot assign a code for this travel activity ("Driving to the mall") without first identifying a purpose; therefore, we look to the first activity done at the mall ("Eating dinner") and assign a code of Travel related to eating and drinking.

Example 2. Respondent reports the following series of activities:  
Work—main job (4 hours) → Driving home (1 hour) → Watching TV at home (2 hours)

The correct code for the activity "Driving home" is Travel related to working, because with few exceptions all homebound trips are coded according to the activity that precedes the trip rather than the one that follows.

Example 3. Respondent reports the following series of activities:

Driving to work (5 minutes)→Stopped to buy gas→Driving to work (45 minutes)→  
Stopped at drive-thru to buy breakfast→Driving to work (10 minutes)→Work—main job

Example 4. Respondent reports the following series of activities:

Driving (5 minutes)→Stopped to buy gas→Driving (45 minutes)→Stopped at drive-thru  
to buy breakfast→Driving (10 minutes)→Work—main job

Examples 3 and 4 are both examples of trips with multiple destinations, which is sometimes called "trip-chaining." These examples show two respondents with identical sequences of activities and only slight differences in the way they reported their travel. The ATUS coding rules ensure these activity sequences are coded the same way even though the respondents reported varying degrees of detail about their travel. As specified in the ATUS travel coding rules, each of these travel activities is assigned a purpose according to the activity that immediately follows the travel episode. Here, the first "driving to work" or "driving" activity is coded as Travel related to purchasing gas, the second travel episode is coded as Travel related to purchasing food (not groceries), and the final travel episode is coded as Travel related to working.

Members of the ATUS staff occasionally receive questions about data on commute times. Researchers interested in commute times or other travel times must consider the complexities of travel behaviors and the way travel episodes are coded in the ATUS while performing analyses. Such research will require an examination of respondents' time diaries and it may involve recoding the purpose of some travel episodes.<sup>11</sup>

For more detailed information, see the ATUS Coding Rules Manual and ATUS Coding Lexicons, both available here: <https://www.bls.gov/tus/documents.htm>.

## 5.5 VERIFICATION AND ADJUDICATION

The accuracy and consistency of coded ATUS data are critical to the usefulness and validity of the survey. For quality assurance purposes, the telephone center uses a verification and adjudication system. All cases are 100 percent verified, meaning that two different coders code each case. First, a coder assigns six-digit activity codes to all time-use data from a completed case (although not a case that he or she completed as an interviewer). Second, a different coder (the "verifier") recodes the same case without seeing the original coder's assigned codes. If the original coder and the verifier agree on all activity codes, the case is closed, and the data are ready for processing. If any activities have mismatching activity codes, the entire case is transferred to an adjudicator, who is a supervisor or coach with ATUS coding experience. The adjudicator assigns a correct code for any disputed activities then closes the case. The adjudicator also assigns an error code to the coder or verifier (or both) who assigned the incorrect code. Through coding error reports and informal discussions, supervisors or coaches give coders and verifiers feedback on why any activities were recoded.

<sup>11</sup> For more information about recoding travel activities in the ATUS, see, Mary Dorinda Allard, "What is the Impact of Recoding Travel Activities in the American Time Use Survey?" *Monthly Labor Review*, U.S. Bureau of Labor Statistics, May 2018, <https://doi.org/10.21916/mlr.2018.13>.



## 5.6 INDUSTRY AND OCCUPATION CODING

Activity coding is of primary importance to the survey. But ATUS also collects or updates demographic and labor force data that were first collected when the respondent's household participated in the CPS, some of which must also be coded. Information on the respondent's industry and occupation must be coded to the Census Bureau's industry and occupation (I&O) classification schemes.

The Census Bureau's Industry Classification System is based on the North American Industry Classification System. Beginning with the January 2014 ATUS, industry data were classified using the 2012 Census Industry Classification System. This system replaced the 2007 Census Industry Classification System. The 2007 Census Industry Classification System was incorporated beginning in the 2009 CPS and 2010 ATUS; it replaced the 2002 Census Industry Classification System, which was used by ATUS and CPS from 2003 until the 2007 classification scheme was implemented. There were only minor differences between the 2002, 2007, and 2012 Census Industry Classification Systems.

ATUS occupation codes use the Census Bureau's Occupation Classification System which is based on the Standard Occupational Classification. From 2003-10, ATUS and CPS used the Census Bureau's 2002 Occupation Classification System; starting in 2011, ATUS and CPS began using the Census Bureau's 2010 Occupation Classification System. There are numerous differences between the 2002 and 2010 Census Occupation Classification Systems and as a result, occupational data beginning in 2011 are not strictly comparable with earlier years.

If the respondent's industry and occupation have not changed since the eighth CPS interview, and the respondent provided adequate information in the CPS to accurately assign I&O codes, the four-digit Census Bureau industry and occupation codes are retrieved from the data obtained from the last CPS interview and entered into the ATUS data file. No further industry and occupation coding is required for these cases. However, if coders were not able to accurately assign I&O codes after the last CPS interview, or if respondents have changed jobs since the eighth CPS interview, meaning their industry of employment or occupation has changed, the I&O codes must be recoded at the National Processing Center (NPC) according to the updated information.

NPC coding specialists use a computer-assisted coding system specially designed for I&O coding. Computer terminals display the industry and occupation descriptions recorded by the interviewers from the respondents at the time of the ATUS interview. Both an industry code and an occupation code are assigned for each record; each code is determined at a four-digit level of detail.

I&O coding also involves 100 percent verification, with two coders coding each record. If the first and second coders do not agree on a specific code, the second coder reconciles the discrepancy and assigns the final code. A supervisor provides feedback on production and quality to the coding staff.

## CHAPTER 6: DATA EDITING, IMPUTATION, AND ITEM NONRESPONSE

### 6.1 DATA PROCESSING AND EDITING

The goal of ATUS data processing is to transform a raw data file, as collected by the interviewers, into microdata files that can be used to produce estimates of time spent in daily activities. Data processing is done at the Census Bureau in Suitland, MD. Several SAS data sets are created from the main input file during data processing.

Once these files are created, a verification/reformat program determines initial data quality before any editing or other processing takes place. A report is generated for each case based on the item being checked and the associated variables. Even though some editing takes place in the instrument at the time of the interview—such as corrections to the household roster and checks for missing diary activities—further editing is required once all the data are received.

### 6.2 DATA IMPUTATION PROCEDURES AND ITEM NONRESPONSE

Many of the edits performed on ATUS data deal with item nonresponse. Item nonresponse refers to a missing variable in an otherwise completed questionnaire. Generally, this occurs when respondents either don't know the answer to a question or they refuse to answer, but it can occur for other reasons as well. For example, a variable may not be recorded due to an interviewer or computer error. Item nonresponse should not be ignored because it is unlikely to occur at random. Ignoring missing data and restricting analysis to records with reported values relies on the implicit (and possibly inaccurate) assumption that all respondents are equally likely or unlikely to respond to the item and that estimates are approximately unbiased.

Imputation is a very common way of dealing with item nonresponse, and many ATUS variables are imputed if missing (please refer to the ATUS data dictionaries at <https://www.bls.gov/tus/dictionaries.htm> for further information on how to identify edited variables and their allocated values). A description of three imputation methods used on ATUS data is given in exhibit 6.1 below. Imputation fills in values for missing data, allowing analysts to work with "complete" cases. However, treating imputed cases as actual responses may overstate the precision of the estimates. The remainder of this chapter describes the different types of data edits and imputation procedures used on ATUS variables, and calculates the percent of variables that are missing and imputed.

*Exhibit 6.1.***ATUS IMPUTATION METHODS**

*Relational imputation.* Relational imputation infers the missing value from other characteristics on the person's record or from records of others in the same household. For instance, if race is missing, it is assigned based on the race of another household member or, failing that, taken from the previous record in the file. Missing occupation codes are sometimes assigned a code by viewing the industry codes and vice versa. If missing values cannot be assigned a code using this technique, they are assigned codes using one of the two following methods.

*Longitudinal assignments.* Longitudinal assignments are used primarily in the labor force edits. If a question is blank, the ATUS labor force module examines the eighth month of CPS data to determine whether there was an entry for that item. If so, the CPS value is assigned; otherwise, the item is assigned a value using the appropriate hot deck, as described next.

*Hot-deck allocation.* This method assigns a code to a missing value by copying the code of a record with similar characteristics. Hot decks are defined by characteristics depending on the nature of the question being referenced. For instance, most labor force questions use only age, race, sex, and occasionally another labor force item such as full- or part-time employment status, in defining the hot deck.

**6.3 EDITS AND IMPUTATION OF CPS VARIABLES IN THE ATUS**

Because the ATUS was designed with the CPS as a sample frame, many variables collected in the CPS are used when analyzing ATUS data, such as race and educational attainment. The ATUS is conducted two to five months after the CPS, and certain information that may have changed and could affect time use, such as employment status, is updated in the ATUS. Table 6.1 summarizes the lag time between the CPS and ATUS interviews. These CPS variables that are updated in the ATUS follow CPS edit and imputation procedures to varying degrees.<sup>12</sup> This section discusses which CPS variables are updated in the ATUS and how imputation procedures differ between the CPS and the ATUS for certain variables. It also discusses missing data for CPS variables that are not updated in the ATUS

Table 6.1. Lag time between CPS and ATUS interviews

Elapsed time between CPS and ATUS Interviews	
Time between CPS and ATUS interviews	Average percent of ATUS interviews
2 months	14
3 months	71
4 months	14
5 months	1

<sup>12</sup> For a complete description of CPS edit and imputation methodology, see Technical Paper 77 at <https://www.census.gov/programs-surveys/cps/technical-documentation/complete.html>.

### 6.3.1 CPS UPDATES IN THE ATUS

In addition to updating their household roster information, all ATUS respondents are re-asked an abbreviated set of the CPS labor force questions in order to determine if their labor force status has changed between the CPS and the ATUS. To minimize respondent burden, additional CPS variables relating to employment are only updated when the ATUS respondent indicates a change in labor force status, or if values for certain variables were imputed in the CPS. These include earnings, industry, and occupation.

#### *Earnings information*

Earnings variables are updated in ATUS only when there is evidence that the respondent's job changed, when the respondent went from not employed to employed, or if the CPS weekly earnings value was imputed. If any of these occurred, earnings information could be out of date or incorrect.

#### *Industry and occupation information*

If industry and occupation information was imputed in the eighth CPS interview, or there is evidence that the respondent changed jobs or job duties between the CPS and ATUS interviews, then industry and occupation information is re-asked in the ATUS.

Table 6.2 below indicates the percent of CPS earnings, industry, and occupation variables that were updated in the ATUS. The data are given in ranges because the percentages vary slightly year to year.

Table 6.2. Percent of selected CPS variables that are updated in ATUS

CPS earnings, industry, and occupation variables	
	Percent updated in ATUS
<i>Earnings</i>	
Hourly earnings	36 - 42
Weekly earnings	33 - 39
<i>Industry and Occupation</i>	20 - 38

ATUS respondents ages 15 to 49 are also asked about their school enrollment status.

### 6.3.2 EDITS THAT ARE SIMILAR IN THE CPS AND THE ATUS

The ATUS edits and imputation procedures for the labor force, industry and occupation, and earnings variables are almost identical to those used in CPS.

#### *Labor force edits*

A major labor force status recode classifies adults as employed, unemployed, or not in the labor force. Based on this recode, the labor force items related to each classification are edited, and longitudinal assignments and hot-deck allocations are used to impute missing values. There are fewer categories describing those who are not in the labor force in ATUS, but the categories for the employed and the unemployed are the same as those used in CPS.

#### *Industry and occupation edits*

In some cases, coders were unable to assign 4-digit industry or occupation codes using information collected in the ATUS interview. In these situations, the editing process assigns codes based on relational imputation and hot-deck allocations.

*Earnings edits*

Edits are performed on earnings-series items such as annual, weekly, or hourly rates of pay; hours worked; and overtime pay. Because respondents report earnings in many different ways, a usual weekly earnings recode is calculated so that respondents' earnings may be compared. Hot-deck allocation also is used here.

**6.3.3 EDITS THAT DIFFER BETWEEN THE CPS AND THE ATUS**

ATUS household, demographics, and school enrollment edits are different from the CPS edits because ATUS uses fewer variables and different age ranges. ATUS edits on these variables are performed using a modified version of the CPS edits. After ATUS/CPS household and demographic edits are applied to the ATUS variables, the CPS edits are applied. This step helps maintain continuity between CPS and ATUS estimates.

*Household and demographic edits*

These edits ensure consistency of age, sex, and relationship across household members between the CPS and the ATUS. Hot-deck allocations are used in this edit process.

*School enrollment edits*

School enrollment items, such as school level and full-time/part-time school attendance, are edited for individuals ages 15 to 49 in the ATUS. Hot-deck allocation based on age, race, and sex is used.

**6.3.4 CPS DATA THAT ARE NOT UPDATED IN ATUS**

In order to reduce respondent burden in the ATUS, certain CPS variables are not updated in the ATUS but are still important when analyzing time use data. Many of these are demographic variables, and include race, marital status, Hispanic origin, and educational attainment.

Another CPS variable that is not updated in the ATUS is family income. Prior to 2010, there was no imputation procedure for this in the CPS. Because it is a sensitive question, it is missing in many interviews. It is more likely to be missing in situations where the CPS respondent is younger; presumably, household children are less likely to know family income than household adults. Beginning in January 2010, CPS began imputing missing values for family income. However, ATUS cases drawn from CPS households that completed their eighth interview in 2009 will have missing values for the edited family income variable.

**6.3.5 MISSING CPS DATA FOR OTHER HOUSEHOLD MEMBERS**

About 3.0 percent of household members are new between the ATUS interview and the CPS interview. If a new member enters the household between the time of the CPS and the ATUS interviews, there will be no CPS information about that individual. Thus, variables such as educational attainment and earnings information will not be available for these individuals. However, new household members are usually young, such as children born between the CPS and the ATUS.

## 6.4 EDITS AND IMPUTATION OF UNIQUE ATUS VARIABLES

Many of the variables collected in the ATUS are unique to the survey and have their own edits and imputation procedures. All interviews with fewer than five activities reported in the 24-hour time diary and all interviews with activities (other than "don't know" and "refuse") covering fewer than 21 hours (incomplete records) are excluded from the ATUS data files. Remaining records undergo several edits in which imputation is performed on ATUS-specific data elements. The ATUS-specific data elements and their edits are described below.

### *Activity codes*

While ATUS coders attempt to code all activities, there are some activities that are impossible to code. This occurs for various reasons. Sometimes respondents refused to identify what they were doing or could not remember. Sometimes the interviewer did not record sufficient detail about the respondent's activity for it to be coded. Uncodeable activities are given a "data code" with a first tier activity code of 50. The incidence of "don't know" or "can't remember" activities increases with the age of the respondent.

### *"Who" code edits*

ATUS collects information ("who" codes) on the person(s) in the room with or accompanying the respondent during his or her activities, yet several activities are ineligible for a "who" code assignment. Therefore, one of the "who" code edits removes a "who" code from activities for which the codes would be inappropriate (such as personal activities). No imputation is performed on missing "who" codes.

### *"Where" code edits*

ATUS collects information ("where" codes) on the location or means of travel associated with the respondent's activities. Because not all activities are eligible for a "where" code assignment, one of the "where" code edits removes "where" codes from activities for which the codes would be inappropriate (such as personal activities). Another "where" code edit replaces inappropriate "where" codes with more realistic "where" codes, such as when a respondent reports being at home while driving his or her car. If the respondent does not supply the "where" code information for eligible activities, a set of rules is used to determine the missing location information.

### *Childcare edits*

ATUS collects data for several categories of secondary childcare (secondary childcare refers to care given by a respondent who is performing some other primary activity, such as preparing a meal). If the respondent does not answer secondary childcare questions for any reason, summary childcare times are allocated by substituting time spent on activities when children were present, excluding primary childcare activities.

### *Eldercare edits (collected starting in 2011)*

ATUS collects information about each eldercare recipient for whom the respondent provided care. This includes information about the relationship of the eldercare recipient to the respondent, the age of the recipient, and the duration of care for the recipient. If the respondent does not provide this information, an editing process assigns values for the missing relationship, age, and duration of care based on relational imputation, hot-deck allocation, or randomly within defined parameters. Respondent-level eldercare variables include the frequency of care, the number of eldercare recipients, and whether the respondent provided care yesterday. Imputation is not done for the respondent-level eldercare variables.

*Spouse/unmarried partner employment status*

ATUS collects information on the employment status and usual working hours of the respondent's spouse or unmarried partner. If this information is incomplete, longitudinal allocation is used to assign values from CPS. In the rare cases in which the information also is missing in CPS, allocations are made based on the age of the spouse or unmarried partner.

*Manual edits*

ATUS staff members review the data carefully after the editing process and occasionally find inconsistencies that need to be investigated using the verbatim responses provided during the interviews. Occasionally manual edits are made on various data elements. These are usually demographic variables, such as relationship to the respondent, age, or sex.

*Information about trips (collected in 2005-10)*

The ATUS Trips file contains information about the number, length, and purpose of all trips taken in a particular month. No imputation is done of these variables.

## 6.5 RATES OF MISSING AND IMPUTED DATA IN THE ATUS

In order to assess the quality of certain variables collected in the ATUS, the rates of missing and imputed data for these variables were calculated. The missing and imputation rates for ATUS variables were calculated using the following formula:

$$\text{Imputation (missing) rate} = \frac{\text{Total number of imputed (missing) responses}}{\text{Total number of required responses}} \times 100$$

Item nonresponse was found to be quite low in the ATUS, with most variables having an item nonresponse of well under 2 percent (see table 6.3). The data are given in ranges because the percentages vary slightly year to year. The two variables describing weekly and hourly earnings had a higher imputation rate because these variables are more sensitive than others.

Table 6.3. Rates of missing and imputed variables in ATUS

Missing and imputed ATUS Data		
	Percent Missing	Percent Imputed
<i>Edits that are similar between the CPS and ATUS</i>		
<i>Earnings</i>		
Weekly earnings	0	6 - 9
Hourly earnings	0	8 - 13
<i>Industry and occupation</i>		
Industry	0	1 - 2
Occupation	0	1 - 2
Class of worker	0	1 - 5
<i>Labor force status</i>		
Usual weekly hours, main job	0	< 1
Usual weekly hours, other job	0	1 - 2
Usual weekly hours, total	0	1 - 2
Multiple jobholding statuses	0	1 - 2
<i>Employment of spouse</i>		
Employment status	0	< 1
Usual weekly work hours	0	< 1

<i>Edits that differ between the CPS and ATUS</i>		
<i>School enrollment</i>		
Enrollment status	< 0.1	< 1
School level	0	1 - 2
Full- or part-time status	0	1 - 2
<i>ATUS demographic data</i>		
Age	< 0.1	1 - 2
Relationship to respondent	< 0.1	< 2
Sex	0	< 0.1
<i>CPS data that is not updated in the ATUS</i>		
<i>CPS demographic data</i>		
Race	0	2 - 5
Marital status	0	1 - 3
Hispanic origin	0	< 1
Educational attainment	0	< 2
Family Income (2003-early 2010) <sup>1</sup>	13	No imputation
Family Income (early 2010 and later) <sup>1</sup>	0	18 - 22
<i>Unique ATUS variables</i>		
<i>Secondary childcare</i>		
Total time spent providing secondary childcare to household and own non-household children < 13	0	1 - 4
Total time spent providing secondary childcare for non-own, non-household children < 13	0	0.1 - 2
<i>Eldercare respondent data</i>		
Provider	1 - 3	No imputation
Frequency	< 1	No imputation
Number of recipients	< 1	No imputation
Provided care yesterday	< 1	No imputation
<i>Eldercare recipient data</i>		
Relationship	0	< 1
Age	0	1 - 4
Duration	0	1 - 2
Uncodeable activities	< 2	No imputation
Where codes*	< 0.1	< 1
Who codes*	< 1	No imputation

\* "Where" and "who" are not collected for selected activities.

<sup>1</sup> Beginning in early 2010, an edited family income variable (HEFAMINC), in which item nonresponse was imputed or allocated, replaced the unedited family income variable (HUFAMINC) that previously had been available.

## 6.6 ADDITIONAL DATA EDITS

In addition to certain consistency edits performed by computer software during the interview and the various imputation procedures mentioned above, other edits are performed on the data. These other edits are data-suppression edits for confidentiality (any data elements identifying the respondent are suppressed). Once the data have been through data processing, editing, and imputation, the edited SAS data sets (see exhibit 6.2) are then created and given to BLS for analysis, further processing, and eventual publication. After a careful review of the data, some additional manual edits are made to selected elements.



Exhibit 6.2.

**ATUS DATA FILES**

**Respondent file.** This file contains one record per household and includes information about the ATUS respondent. The data--which were collected in the ATUS interview--include the respondent's employment status, layoff/looking status, industry, occupation, earnings, and more. Only complete and sufficient partial cases (at least five diary activities covering at least 21 of 24 hours) are included in the Respondent file.

**Roster file.** This file contains one record per household member for all households in which the designated person participated in ATUS; variables indicate household membership status, sex, relationship to designated respondent, and age. These variables were updated in the ATUS interview.

**Activity file.** This file contains information collected in the ATUS diary. There is one record per activity reported in the diary. The diary data include the activity code, the activity duration, start and stop times, and where the activity took place. This file also includes data about secondary childcare.

**Activity summary file.** This file is generated at BLS after all editing is complete. It contains one record per respondent and is a summary of the information on the Activity file. It also contains ATUS final weights and selected variables, such as age and labor force status, that are also available on other ATUS files.

**ATUS-CPS file.** This file contains one record per household member for all households in which an individual was selected to participate in ATUS. It contains the ATUS case ID number (TUCASEID) and the ATUS person line number (TULINENO) as identifiers. All information on the ATUS-CPS file is from the eighth CPS interview and dates from 2 to 5 months prior to the ATUS interview.

**Who file.** This file contains information about who was in the room with the respondent, or who accompanied the respondent, for most of the activities reported in the time diary. There is one record for each person who spent time with the respondent during each activity.

**Eldercare roster file (2011 and later).** This file contains information about eldercare recipients, such as their age, relationship to the respondent, and whether or not they live in the same household as the respondent.

**Case history file.** This file contains one record per case and provides refusal information, ATUS interviewer and coder identifiers (scrambled for privacy), and interview quality indicators.

**Call history file.** This file contains one record per call attempt and provides information about the outcome of each call.

**Trips file (2005-2010).** This file contains information about trips away from home that lasted at least 2 consecutive nights during a specific reference month; the file includes the number, duration, and purpose of overnight trips. There is one record for every trip taken. This file should be used with caution because it does not contain weights, and neither the ATUS final weights nor the ATUS base weights can be used to generate nationally-representative estimates with these data. The trips questions were replaced by the eldercare questions in 2011.

**Replicate weights file.** The replicate weights file contains base weights; 160 replicate base weights; and 160 replicate final weights for each ATUS final weight. There is one record for each case selected to be interviewed for ATUS. In 2003 to 2005, there is more than one ATUS final weight and thus more than one set of replicate weights (see chapter 7).

## CHAPTER 7: WEIGHTS, LINKING, AND ESTIMATION

### 7.1 WHY WEIGHTS ARE NECESSARY

Users need to apply weights when computing estimates with the ATUS data because simple tabulations of unweighted ATUS data produce misleading results. These weights have already been calculated and are found on the Respondent file. Users may simply apply them when generating estimates.

The ATUS weights compensate for three important aspects of the sampling and data-collection process:

- ATUS is based on a stratified random sample, whereby some demographic groups are oversampled to ensure adequate sample size for detailed estimates. The weights ensure that each group is correctly represented in the population.
- The ATUS sample is not uniformly distributed across the days of the week. About 25 percent of the sample is assigned to report on each of the 2 weekend days and 10 percent of the sample is assigned to each of the 5 weekdays. Hence, unweighted tabulations overestimate time spent in activities more often done on weekends and underestimate time spent in activities more often done on weekdays. The weights (variable TUFINLWGT) were constructed so that each day of the week is correctly represented for the sample month (in 2003 and 2004) or the sample quarter (in 2005 and later).
- Response rates differ across demographic groups and days of the week. For example, men have lower response rates than do women, so the weights for male respondents are larger, on average, than those for female respondents. The weights ensure that groups and days of the week are correctly represented in spite of differing response rates.

The ATUS final weights indicate the number of person-days the respondent represents. Thus, in 2003 and 2004, summing the weights of all respondents for a given month yields the number of person-days in that month (the total population times the number of days in the month); in 2005 and later, summing the weights of all respondents for a given quarter yields the number of person-days in that quarter (the total population times the number of days in the quarter). These weights can be used to estimate quarterly and annual averages.

### 7.2 CALCULATION OF WEIGHTS

Generating ATUS weights involves several steps. Because ATUS cases are selected from the CPS, the CPS weights (after the first-stage adjustment) are the basis for ATUS weights. These base weights are adjusted to account for the fact that less populous states are not oversampled in ATUS, as they are in the CPS. Further adjustments are made to account for the probability of selecting each household within the ATUS sampling strata and the probability of selecting each person from each sample household.

The nonresponse adjustment increases the weights of records of interviewed persons to account for eligible sample persons who were not interviewed in the ATUS. This adjustment is computed separately for each reference day.

ATUS records are weighted to reduce bias in the estimates due to differences in sampling and response rates across subpopulations and days of the week. Specifically, the data are weighted to ensure the following:

- In 2006 and later, weekdays represent about 5/7 and weekend days represent about 2/7 of the weighted data for the population as a whole and for selected subpopulations. The actual proportions depend on the number of weekdays and weekend days in a given quarter.
- In 2005, weekdays represent about 5/7 and weekend days represent about 2/7 of the weighted data for the population as a whole. The actual proportions depend on the number of weekdays and weekend days in a given quarter.
- In 2003 and 2004, weekdays represent about 5/7 and Saturday and Sunday each represent about 1/7 of the weighted data for the population as a whole. The actual proportions depend on the number of weekdays, Saturdays, and Sundays in a given month.
- The sum of the weights is equal to the number of person-days in the quarter (in 2005 and later) or in the month (in 2003 and 2004) for the population as a whole and, in 2004 and later, for selected subpopulations.

The method used to generate statistical weights (the variable TUFINLWGT) on the ATUS files changed each year from 2003 to 2006. In 2003, the ATUS weights add up to the number of person-days in the month (or the number of days in the month times the total population) only for the population as a whole. In 2004 and later, the ATUS weights add up to the number of person-days for selected subpopulations as well as for the general population.

The 2004 and 2005 weighting methods differed slightly from one another. In 2004, ATUS weights (variable TUFINLWGT) add up to the number of person-days in the month for the selected subpopulations and for the population as a whole. Weighted totals also correspond to the number of weekdays, Saturdays, and Sundays in each month. In 2005, ATUS weights add up to the number of person-days in the quarter rather than in the month for these groups, and weighted totals for the quarter correspond to the number of weekdays and weekend days rather than the number of Saturdays and Sundays separately. Even though ATUS weights were generated using different methods on the 2004 and 2005 data files, the methods are comparable and do not result in substantially different estimates.

The method used to generate TUFINLWGT for the 2006 data and later was different from the method used with the 2005 data. On the 2005 files, values of TUFINLWGT for weekdays add up to the number of person-days on weekdays for the population as a whole, and correspondingly for weekend days. On the 2006 and later files, values of TUFINLWGT for weekdays and weekend days add up to the number of person-days on weekdays and weekend days for selected subpopulations as well as for the general population.

Users who combine multiple years of ATUS data from the single-year data files must use weights that were generated using comparable methods. Coinciding with the release of the 2006 ATUS data, the variable TU06FWGT was added to the 2003 to 2005 Respondent and Activity Summary files. TU06FWGT is a weighting variable that was generated using the 2006 weighting method. Users who combine multiple years of ATUS data should use the variable TU06FWGT to weight the 2003 to 2005 data and the variable TUFINLWGT to weight the 2006 and later data.

The variables TU04FWGT (on the 2003 files) and TUFINLWGT on the 2004 and 2005 files also were generated using comparable weighting methods. Researchers who combine the 2003 to 2005 data files can use this combination of weighting variables or the variable TU06FWGT for all years. (Note that while the method used to generate TUFINLWGT changed from 2004 to 2005, the difference in methods is slight and has little impact on estimates.)

#### Valid weights for various combinations of years Combining ATUS single-year data files

1. 2003 through 2005: use TU06FWGT
2. 2006 and later years: use TUFINLWGT

#### Combining 2003 through 2005 single-year data files

1. 2003 through 2005: use TU06FWGT
- OR
1. 2003: use TU04FWGT
  2. 2004 and 2005: use TUFINLWGT

Researchers working with the multi-year data files created by BLS can use the statistical weighting variable TUFNWGTP. This variable was created using the 2006 weighting method and is available for all years.

See the ATUS Interview Data Dictionaries for more information about the weighting variables, available at: <https://www.bls.gov/tus/dictionaries.htm>.

## 7.3 LINKING ATUS FILES

To produce most estimates, users need to link ATUS files. All of the files contain the variable TUCASEID (ATUS identification number). Two other variables are used for linking in conjunction with TUCASEID, TULINENO (person line number) and TUACTIONITY\_N (activity number).

File	Linking Variables
<b>Basic ATUS data files</b>	
Respondent file	TUCASEID TULINENO (always equal to 1 on the Respondent file)
Roster file	TUCASEID TULINENO
Activity file	TUCASEID TUACTIONITY_N
Who file	TUCASEID TUACTIONITY_N TULINENO
ATUS-CPS file	TUCASEID TULINENO
Activity summary file	TUCASEID
Eldercare roster file (2011 and later)	TUCASEID TULINENO
<b>Additional ATUS data files</b>	
Case History file	TUCASEID

Call History file	TUCASEID
Trips file (2005-10)	TUCASEID
Replicate weights file	TUCASEID
<i>Eating and Health Module data files</i>	
EH Respondent file	TUCASEID TULINENO (always equal to 1 on the EH Respondent file)
EH Activity file	TUCASEID TUACTIONITY_N
EH Child file (2006-08)	TUCASEID TULINENO
EH Replicate weights file	TUCASEID
<i>Well-Being Module data files</i>	
WB Respondent file	TUCASEID TULINENO (always equal to 1 on the WB Respondent file)
WB Activity file	TUCASEID TUACTIONITY_N
WB Respondent replicate weights file	TUCASEID
WB Activity replicate weights file	TUCASEID TUACTIONITY_N
<i>Leave Module data files</i>	
LV Respondent file	TUCASEID TULINENO (always equal to 1 on the LV Respondent file)
LV Replicate weights file	TUCASEID

ATUS files can also be linked to CPS files using information on the ATUS-CPS file. See Appendices K-M for more information about linking ATUS and CPS files.

## 7.4 PRODUCING ESTIMATES WITH ATUS FILES

While numerous types of estimates and analyses can be produced using ATUS files, the four formulas below satisfy the needs of many users.

**Average hours per day.**  $\bar{T}_j$ , the average number of hours per day spent by a given population engaging in activity  $j$ , is given by

$$\bar{T}_j = \frac{\sum_i fwt_i T_{ij}}{\sum_i fwt_i}$$

where  $T_{ij}$  is the amount of time spent in activity  $j$  by respondent  $i$ , and  $fwt_i$  is the final weight for respondent  $i$ .

Examples of this type of estimate are the average number of hours per day that people spent watching TV, the average number of hours per day that men spent working, or the average number of hours per day that children under 18 spent doing homework.

**Daily participation rates.**  $P_j$ , the percentage of the population engaging in activity  $j$  on an average day, is computed using

$$P_j = \frac{\sum_i fwgt_i I_{ij}}{\sum_i fwgt_i}$$

where  $I_{ij}$  is an indicator that equals 1 if respondent  $i$  engaged in activity  $j$  during the reference day and 0 otherwise, and  $fwgt_i$  is the final weight for respondent  $i$ .

This formula allows users to generate estimates such as the percentage of people who watched TV on an average day, the percentage of men who worked on an average day, or the percentage of children under 18 who did homework on an average day.

Note that  $P_j$  does not represent the proportion of people who participate in activity  $j$  over periods longer than a day—for example, the percentage of persons who performed a volunteer activity at some time during 2003. Such a proportion is at least as large as the average proportion who volunteered per day in 2003 (and almost certainly larger). The proportion of people participating in any given activity cannot be computed from time diary data for any period longer than a day.

**Number of participants.**  $Num_j$ , the number of persons engaging in activity  $j$  during an average day, is given by

$$Num_j = \sum_i \frac{fwgt_i I_{ij}}{D}$$

where  $fwgt_i$  is the final weight for respondent  $i$ ,  $I_{ij}$  is an indicator that equals 1 if respondent  $i$  participated in activity  $j$  during the reference day and 0 otherwise, and  $D$  is the number of days in the estimation period (for example, 365 for annual averages for years other than leap years).

Using this formula, users can compute statistics such as the total number of people who watched TV per day, the total number of men who worked per day, or the total number of children under 18 who did homework per day.

**Average hours per day of participants.**  $\bar{T}_j^P$ , the average number of hours spent per day engaged in activity  $j$  by people who participated in that activity on that day, is given by

$$\bar{T}_j^P = \frac{\sum_i fwgt_i I_{ij} T_{ij}}{\sum_i fwgt_i I_{ij}}$$

where  $T_{ij}$  is the amount of time spent in activity  $j$  by respondent  $i$ ,  $fwgt_i$  is the final weight for respondent  $i$ , and  $I_{ij}$  is an indicator that equals 1 if respondent  $i$  participated in activity  $j$  during the reference day and 0 otherwise.

Examples of this type of estimate are the average number of hours per day that people who watched TV during a day spent watching, the average number of hours that men who worked during a day spent working, or the average number of hours per day that children under 18 who did homework during a day spent doing it.

**Example - Estimating the average amount of time Americans spent watching TV in 2007 (using the 2007 single-year data files)**

To estimate the amount of time Americans spent watching TV per day in 2007 based on answers to the survey, the user must follow two steps. In the first step, the total time spent watching TV is determined for each respondent. In the second step, ATUS weights are used to generate an estimate of average TV time for the population. There are two methods for determining the total time each respondent spent watching television. The easier method involves using variables on the Activity summary file; the other method involves obtaining variables from the Activity and the Respondent files. Both methods yield the same result. Because the Activity file includes a wealth of information about respondents' diary days, such as detail about when and where many activities took place, the second method offers researchers more flexibility than the first method. For example, by using the variable TEWHERE from the Activity file, the second method can be modified to generate an estimate of the amount of time Americans spent watching TV *at home* in 2007.

**Step 1: Determine the total time each respondent spent watching TV**

**Method 1: Activity summary file**

Following are the variables needed and their file locations:

Variable	File location	Variable description
t120303	Activity summary file	Time respondent spent watching television and movies (not religious)
t120304	Activity summary file	Time respondent spent watching television (religious)
TUFINLWGT	Activity summary file	ATUS final weight

The total amount of time that each respondent spent watching TV must be computed; this is done by summing t120303 and t120304.

**Method 2: Activity file and Respondent file**

Following are the variables needed and their file locations:

Variable	File location	Variable description
TUTIER1CODE	Activity file	First two digits of activity code
TUTIER2CODE	Activity file	Third and fourth digits of activity code
TUTIER3CODE	Activity file	Fifth and sixth digits of activity code
TUACTDUR24	Activity file	Total length of time spent doing activity
TUFINLWGT	Respondent file	ATUS final weight

TUCASEID is needed to link the Activity and the Respondent files.

The total amount of time that each respondent spent watching TV must be computed. There are two activity codes that capture TV watching: 120303

Television and movies (not religious) and 120304 Television (religious). The total amount of time each respondent spent watching TV can be calculated by looking at each case and adding up the activity durations (using TUACTION24) for all activities that have TUTIER1CODE = 12 and TUTIER2CODE = 03 and TUTIER3CODE = 03, and all activities that have TUTIER1CODE = 12 and TUTIER2CODE = 03 and TUTIER3CODE = 04. (Note that the variable TRCODE, which carries the value of each 6-digit activity code, was added to the Activity file in 2007; TRCODE can be used instead of TUTIER1CODE, TUTIER2CODE, and TUTIER3CODE.)

### Step 2: Estimate TV watching time for the population

For each case, the total amount of time spent watching TV is multiplied by the corresponding weight (TUFINLWGT × Total time watching TV, as shown in the following table excerpt). Then TUFINLWGT and the calculated TUFINLWGT × Total time watching TV are summed for all cases (not all cases are shown in the table excerpt). Finally, these totals are used in the average-hours-per-day formula.

TUCASEID	Total time watching TV	TUFINLWGT	TUFINLWGT x Total time watching TV
20070101070044	325	7,509,876.309742	2,440,709,800.66615
20070101070052	35	25,893,211.878954	906,262,415.76339
20070101070513	0	2,661,217.803227	0
20070101070594	330	1,235,892.547415	407,844,540.64695
...	...	...	...
Total		86,178,611,590.072	13,564,061,358,607

$$\bar{T}_j = \frac{\sum_i fwt_i T_{ij}}{\sum_i fwt_i} = 13564061358607 / 86178611590.072 = 157.395 \text{ minutes} = 2.62 \text{ hours}$$

See Appendix J of this User's Guide for more examples.

## 7.5 CALCULATING STANDARD ERRORS

Variances may be calculated for ATUS estimates using a replicate variance method. This method uses replicate weights to calculate replicate estimates. The deviations between the replicate estimates and the original estimate form the basis of the variance calculation. The ATUS replicate weights are based on the replicate weights developed for the CPS. ATUS begins with the CPS replicate weight after the first-stage ratio adjustment. Each replicate is processed through all of the stages of the ATUS weighting procedure. The CPS replicate weights are based on a modified balanced half-sample method of replication, developed in the 1980s by Robert Fay. CPS Technical Paper 77 (available at <https://www.census.gov/programs-surveys/cps/technical-documentation/complete.html>) describes the replication method.

The formula is

$$Var(\hat{Y}_o) = \left( \frac{4}{160} \right) \sum_{i=1}^{160} (\hat{Y}_i - \hat{Y}_o)^2$$



where  $Y$  is the characteristic of interest,

$\hat{Y}_o$  is the original estimate of  $Y$ ,

the SUM is over 160 replicate estimates, and

$\hat{Y}_i$  is the  $i^{th}$  replicate estimate of  $Y$ .

In section 7.4, there is an example that shows how to calculate the average hours per day individuals watched TV in 2007. The example showed that on average, individuals watched 2.62 hours per day. The standard error for this estimate is 0.0293.

There is one set of 160 replicate weights for each ATUS final weight (TUFINLWGT, TU04FWGT, and TU06FWGT). In 2003 to 2005, there is more than one set of ATUS replicate weights. All ATUS replicate weights are available in the Replicate Weights files that accompany the single-year data files, multi-year data files, and module files. All data files can be downloaded from the ATUS Web site, and are easily accessed from this location: <https://www.bls.gov/tus/data.htm>.

For each final weight, there are 160 replicate weights for each respondent. On the single-year data files, the variables are named FINLWGT001, FINLWGT002, etc.<sup>13</sup> The replicate weights can be linked to the appropriate ATUS respondents using the variable TUCASEID.

To calculate a variance using the formula shown above, calculate the statistic " $Y$ " using all 160 replicate final weights in the Replicate Weight file. That is, calculate  $\hat{Y}_{(1)}$  once using FINLWGT001 for each record, then calculate  $\hat{Y}_{(2)}$  using FINLWGT002 for each record, and so on, and finally calculate  $\hat{Y}_{(160)}$  using FINLWGT160 for each record. Sum the 160 squared deviations of the replicate estimates from the original estimate and multiply by  $(4/160)$  to get the variance.<sup>14</sup>

The standard error of the statistic is the square root of the variance.

## 7.6 LIMITATIONS OF THE DATA

While attempts have been made to collect the most accurate data possible, the ATUS data do have limitations. With the exception of childcare, information on secondary activities (activities that are done at the same time as the primary activity) is not collected. This could lead to underestimates of the amount of time people spend doing activities that are frequently done in combination with other activities. For example, ATUS estimates likely underestimate the amount of time people spend listening to music since so many people listen to music while doing other things.

Survey estimates are subject to nonsampling errors that may arise from many different sources, such as an inability to obtain information from all individuals in the sample,

<sup>13</sup> In 2003, the replicate weights corresponding to TUFINLWGT use a different naming convention. For more information about the naming convention, see the "read me" notes that accompany each replicates weights file.

<sup>14</sup> The factor of 4 in the variance estimator is the result of using replicate factors of 1.7, 1.0, and 0.3. The denominator indicates the number of replicate weights (160). For more information about the replication method, please see pages 83-84 of CPS Technical Paper 77 (available at: <https://www.census.gov/programs-surveys/cps/technical-documentation/complete.html>).

data entry errors, coding errors, and misinterpretation of definitions. Errors also could occur if nonresponse is correlated with time use. Nonsampling errors were not measured. However, the Census Bureau uses quality-assurance procedures to minimize nonsampling, data entry, and coding errors in the survey estimates.

For more information on data quality assessment measures in the ATUS, see chapter 10.

## CHAPTER 8: PUBLICATIONS AND DATA FILES

### 8.1 PUBLICATIONS

#### 8.1.1 BLS PUBLICATIONS

BLS has published annual news releases of time-use estimates since 2004. In addition, BLS periodically publishes news releases on unpaid eldercare in the United States. BLS has also published special news releases about married parents' use of time, and workers' access to and use of leave and job flexibilities (estimates from the 2011 Leave Module and 2017-18 Leave and Job Flexibilities Module). All of these news releases are available on the ATUS Web site, at <https://www.bls.gov/tus/>. The releases include descriptive highlights and several tables of time-use estimates.<sup>15</sup> The ATUS Web site also contains several charts, tables, and a list of ATUS-related papers appearing in BLS publications or as BLS working papers (<https://www.bls.gov/tus/research.htm>).

#### 8.1.2 NON-BLS PUBLICATIONS

Analyses of ATUS data or survey methods have appeared in the *Journal of Economic Perspectives*, *Survey Methodology*, and many other publications. A list of some of these analyses appears on the ATUS Web site at <https://www.bls.gov/tus/research.htm>.

#### 8.1.3 UNPUBLISHED TABLES

In addition to the tables published with ATUS news releases and other tables appearing on the ATUS Web site, ATUS data are compiled in numerous tables showing time use by various groups of individuals. These include tables of time use by various combinations of an individual's demographic characteristics, marital status, employment status, educational attainment, geographic location, and the presence and age of household children.<sup>15</sup> These unpublished tables are available in PDF format on request.

### 8.2 ATUS Data files

Files containing ATUS microdata are released at least once each year. These files contain records of respondents' answers to the survey questions as well as other information about the respondent and his or her household. These data are intended for users who wish to do their own tabulations and analyses. Both single- and multi-year ATUS data files are available. The single-year files contain data for interviews conducted in a one-year period; the multi-year files contain data for many years, with some adjustments made to account for changes that occurred over the years.

Details about respondents' characteristics and their time use are included in the following files: Household data from the eighth month (MIS-8) of CPS interviews appear on the ATUS-CPS file; data about ATUS respondents appear on the Respondent file; ATUS data on respondents' household composition appear on the Roster file; the ATUS time diary data appear on the Activity file; data summarizing the ATUS time diary

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<sup>15</sup> For information about reliability criteria for ATUS published and unpublished tables, please see Appendix N.

appear on the Activity summary file; data about who was with respondents during selected activities appear on the Who file, and data about persons for whom ATUS respondents provide eldercare appear on the Eldercare roster file (2011 and later). Additional files containing case and call history data, trips information (for 2005-10), and special weights also have been released; these additional files are available as single-year data files. (For descriptions of the ATUS files, see exhibit 6.2.)

The files are released in comma-delimited formats, downloadable from the ATUS Web site at: <https://www.bls.gov/tus/data.htm>. SAS, Stata, and SPSS programs to read the data into these statistical software packages are provided. In accordance with BLS and U.S. Census Bureau policies that protect respondents' privacy, identifying information is removed from the data prior to publication, and some responses are edited to protect the confidentiality of ATUS respondents.

Information about the variables contained in these data files can be obtained from the ATUS data dictionaries. ATUS Data dictionaries are available at: <https://www.bls.gov/tus/dictionaries.htm>.

Additionally, files containing ATUS module microdata occasionally are released. As with the ATUS data files, the module data files are released in comma-delimited formats, downloadable from the ATUS Web site. SAS, Stata, and SPSS programs to read the data into these statistical software packages are provided. In accordance with BLS and U.S. Census Bureau policies that protect respondents' privacy, identifying information is removed from the data prior to publication, and some responses are edited to protect the confidentiality of module respondents. These files have their own statistical and replicate weights. Section 7.3 contains a list of the ATUS module data files that currently are available, along with guidance on linking ATUS data to ATUS module data.

### 8.3 ATUS Database

The ATUS database contains mainly annual and some quarterly ATUS time series that are available from LABSTAT, the public data base of the Bureau of Labor Statistics. Data series that correspond to estimates presented in the annual [ATUS News Release](#) are available. There also are thousands of data series showing time-use estimates by sex, day of week, age, labor force status, and for parents. Guidance on extracting ATUS time series is available at: <https://www.bls.gov/tus/labstattips.htm>. The ATUS database webpage provides access to all of the extraction tools and is available at: <https://www.bls.gov/tus/database.htm>.

### 8.4 INFORMATION AND UPDATES

The ATUS Web site is a resource for up-to-date information about the American Time Use Survey. It includes background information about the survey, as well as links to time-use news releases, publications, and the microdata files. The ATUS homepage is available at: <https://www.bls.gov/tus/>.

Information about ATUS also is available by e-mail ([ATUSinfo@bls.gov](mailto:ATUSinfo@bls.gov)) or by telephone (202-691-6339).

The [ATUS staff](#) maintains a list of individuals interested in ATUS updates. The purpose of this list is to announce news releases and the availability of new data files. If you would like to be included on this list, e-mail [ATUSinfo@bls.gov](mailto:ATUSinfo@bls.gov).

## CHAPTER 9: Special Topics

### 9.1 ELDERCARE DATA

In 2011, questions about eldercare were added to the ATUS. These questions identify eldercare providers, collect basic information about the persons for whom ATUS survey respondents provide eldercare, and collect information about times the respondents provided eldercare on the diary day. Information about eldercare appears on the ATUS Respondent file, the ATUS Activity file, and the ATUS Eldercare Roster file.

Eldercare providers are identified using the variables TUELDER and TUELFREQ (Respondent data file). If the respondent indicates she had provided eldercare more than once during the past 3 to 4 months<sup>16</sup> (TUELFREQ is not equal to 6), basic information about each eldercare recipient is collected, as well as information about the activities done as eldercare on the diary day. The variable TUECYTD on the Respondent data file identifies respondents who provided eldercare on their diary day. The variable TUEC24 (Activity data file) identifies the activities done as eldercare, and TRTEC\_LN (Activity data file) provides the amount of time spent providing eldercare for each eligible activity. Personal care and personal care services (01XXXX and 0805XX) are not eligible activities. TRTEC (Respondent data file) sums the duration of eldercare activities from TRTEC\_LN to provide the total amount of time the respondent spent providing eldercare on the diary day.

The ATUS Eldercare Roster file contains information about persons who received eldercare. This includes information such as the relationship between the care provider and care recipient (TEELWHO), the age of the care recipient (TEAGE\_EC), how long the respondent had provided care to the recipient (TEELDUR and TEELYRS), and whether or not the eldercare recipient lives in the same household as the survey respondent (TRELHH).

For more information about the eldercare variables, please see the ATUS questionnaire (<https://www.bls.gov/tus/questionnaires.htm>) and the ATUS Interview Data Dictionary (<https://www.bls.gov/tus/dictionaries.htm>). Information about working with the ATUS data files is also available on the ATUS Web site at <https://www.bls.gov/tus/howto.htm>.

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<sup>16</sup> The time frame varies slightly by respondent because the question asks about care provided between the first day of a given reference month and the interview day.

## CHAPTER 10: ATUS Data Quality

### 10.1 DATA QUALITY MEASURES

Survey estimates are subject to nonsampling errors that may arise from many different sources. Census Bureau and BLS staff perform a number of quality assessment activities to minimize nonsampling, data entry, and coding errors in the ATUS data and to help produce higher quality estimates.

#### 10.1.1 NONRESPONSE

##### **Unit (person-level) nonresponse**

Census Bureau and BLS staff track response rates on a weekly, monthly, and annual basis. See chapter 3.6 for information about ATUS response rates. By tracking response rates, staff are able to identify and implement strategies to improve response rates and track the success of those strategies.

##### **Item nonresponse**

BLS staff track item nonresponse on an annual basis. Item nonresponse refers to a missing variable in an otherwise completed questionnaire. Item nonresponse is unlikely to occur at random. Ignoring missing data and restricting analysis to records with reported values relies on the implicit (and possibly inaccurate) assumption that all respondents are equally likely or unlikely to respond to the item and that estimates are approximately unbiased. Tracking the rates of missing and imputed data for these variables allows one to assess the quality of certain variables collected in the ATUS. Item nonresponse has been found to be quite low in the ATUS, with most variables having an item nonresponse rate of well under 2 percent. See chapter 6 for more information on ATUS item nonresponse and imputation procedures.

##### **Module nonresponse**

Module response rates are tracked separately from response rates to the main ATUS interview.

#### 10.1.2 NONRESPONSE ERROR

As with any survey with response of less than 100 percent, it is important to understand nonresponse and possible nonresponse bias in the ATUS. For example, are persons who respond different than those who do not? BLS and outside researchers periodically assess nonresponse bias in the ATUS. ATUS staff maintain a listing of these studies, which is available upon request.

#### 10.1.3 INTERVIEW QUALITY

##### **Interview Monitoring**

ATUS interviewers are regularly monitored by Census staff. This allows supervisors to evaluate an interviewer's ability to apply survey concepts and procedures during the actual interview, assess a new interviewer's job performance, identify interviewers who need additional training or guidance, and identify survey concepts and procedures on which interviewers need additional training.

**Insufficient Detail or Missing Travel information**

Interviewers must probe for additional detail for certain activities (for example, the interviewer must find out if a reported reading activity was done for work, class, volunteering, personal interest or something else) and record activities so they can be assigned an activity code after the interview. If they fail to do this, the activity is assigned a data error code of "insufficient detail in verbatim" or "missing travel or destination." These errors directly affect ATUS data quality because the activity information will be missing. Census staff track the number of activities assigned these data codes on a quarterly basis. Interviewers with unacceptable rates of interviewer error codes receive additional guidance and training. Those with high error rates are taken off of ATUS interviewing until they pass a re-qualification test.

**Average number of activity episodes per diary**

The average number of ATUS activities per diary has historically been about 19 activities. An interview with a lot fewer activity episodes can be a sign of an interviewer failing to probe for additional activities, memory problems, or some other reason. BLS tracks this metric on a quarterly basis, which allows BLS to address any noticeable trends in a timely manner.

**Average minutes per diary assigned data codes**

An interview with a high number of minutes assigned data codes, or uncodeable activities, can be a sign of interviewer error (e.g., an interviewer's failure to probe or record activities correctly), respondents' memory problems, or something else. BLS tracks the average minutes per diary assigned data codes on a quarterly basis.

**10.1.4 CODING QUALITY**

Census and BLS staff track coding error rates on a quarterly basis. These reports show coding error rates by interviewer. If an interviewer's coding error rate is too high, he is retrained on coding. See chapter 5.3 for more information on coding qualification.



## CONCEPTS AND DEFINITIONS

### [1. Operations and estimation terms](#)

### [2. Activity definitions](#)

#### 1. Operations and estimation terms

**Average day.** The average day measure reflects an average distribution across all persons in the reference population and all days of the week.

**Average hours per day.** The average number of hours spent in a 24-hour day (between 4 a.m. on the diary day and 4 a.m. on the interview day) doing a specified activity.

**Condition related to aging.** An ongoing ailment or physical or emotional limitation that typically affects older people, such as becoming more frail; having difficulty seeing, hearing, or physically moving; becoming more forgetful; tiring more quickly; or having specific medical ailments that are more common among older adults. It also refers to existing conditions that become progressively worse as one ages.

**Day of the week.** Estimates of time spent in activities on weekdays are an average of reports about Monday through Friday, excluding major weekday holidays. Estimates of time spent in activities on weekend days and holidays are an average of reports about Saturdays, Sundays, and the following holidays: New Year's Day, Easter, Memorial Day, the Fourth of July, Labor Day, Thanksgiving Day, and Christmas Day. In some years, data are not collected on various holidays.

**Designated day.** The day of the week on which a designated person will be called for an interview. For example, a person with a designated day of Tuesday will be called for up to eight consecutive Tuesdays to be interviewed about what she did on Monday.

**Designated person.** A person selected to participate in the ATUS.

**Diary day.** The diary day is the day about which the designated person reports. For example, the diary day of a designated person interviewed on Tuesday is Monday. Diary days are assigned, and designated persons may not substitute another day of the week on which to report.

**Earnings.** Data represent usual weekly earnings before taxes and other deductions and include any overtime pay, commissions, or tips usually received (at the main job in the case of multiple jobholders). Respondents are asked to identify the easiest way for them to report earnings (hourly, weekly, biweekly, twice monthly, monthly, annually, other) and how much they usually earn in the reported time period. Earnings reported on a basis other than weekly are converted to a weekly equivalent. The term "usual" is as perceived by the respondent. If the respondent asks for a definition of usual, interviewers are instructed to define the term as more than half the weeks worked during the past 4 or 5 months.

**Eldercare.** Eldercare consists of providing unpaid care or assistance to an individual who needed help because of a condition related to aging. This care can be provided by a family member or a non-family member. Care can be provided in the recipient's home, the provider's home, or a care facility, such as a nursing home. Eldercare can involve a range of care activities, such as assisting with grooming and feeding, preparing meals, arranging medical care, and providing transportation. Eldercare can also involve providing companionship or being available to assist when help is needed; thus it can be associated with nearly any activity.

**Eldercare provider.** Someone who provided eldercare more than one time in the 3 to 4 months prior to the interview day.

*Employment status.**Employed*

All persons who:

1. At any time during the seven days prior to the interview did any work at all as paid employees; worked in their own business or profession or on their own farm; or
2. Were not working during the seven days prior to the interview but had jobs or businesses from which they were temporarily absent because of illness, bad weather, vacation, childcare problems, labor-management disputes, maternity or paternity leave, job training, or other family or personal reasons, whether or not they were paid for the time off or were seeking other jobs; or
3. Usually worked 15 or more hours as unpaid workers in a family-operated enterprise.

*Employed full time*

Full-time workers are those who usually worked 35 or more hours per week at all jobs combined.

*Employed part time*

Part-time workers are those who usually worked fewer than 35 hours per week at all jobs combined.

*Not employed*

Persons are not employed if they do not meet the conditions for employment. Those who are not employed include individuals classified as unemployed as well as those classified as not in the labor force (as defined in the Current Population Survey).

**Household.** A household consists of all persons—related family members and all unrelated persons—who occupy a housing unit and have no other usual address. A house, an apartment, a group of rooms, or a single room is regarded as a housing unit when occupied or intended for occupancy as separate living quarters. A *householder* is the person (or one of the persons) in whose name the housing unit is owned or rented. The term householder is never applied to either husbands or wives in married-couple families but relates only to persons in families maintained by either men or women without a spouse.

**Household children.** Household children are children under age 18 residing in the household of the ATUS respondent. The children may be related to the respondent (such as their own children, grandchildren, nieces or nephews, or brothers or sisters) or not related (such as foster children or children of roommates or boarders).

**Own children.** The respondent's own children, whether they live in the respondent's household or in another household. Biological, step-, and adopted children are considered own children; foster children are not.

**Population measures.** These estimates refer to all people having a quality or characteristic in common. Estimates that refer to a population—such as all people or all employed people—account for every respondent in the population. Population estimates about an activity include all people, even those who did not engage in a specified activity on the diary day. For example, the population measure average hours per day that employed people worked includes all employed people and is an average of the days they did and the days they did not work.

**Participant measures.** These estimates refer only to individuals who engaged in a particular activity on the diary day. For example, the participant measure average hours per day that employed people worked on days they worked is an average for employed people on days they spent time working.

**Primary activity.** A primary activity is the main activity a respondent was doing at a specified time.

**Secondary activities.** A secondary (or simultaneous) activity is an activity done at the same time as a primary activity. With the exception of the care of children under age 13, information on secondary activities is not collected in ATUS. If respondents report doing more than one activity at the same time, they are asked to separate out the time spent on each activity or to specify which was their main activity.

**Secondary childcare.** Secondary childcare is care for children under age 13 that is done while doing something else as a primary activity, such as cooking dinner. Secondary childcare estimates are derived by summing the durations of activities during which respondents had at least one child under age 13 in their care while doing other things. The time individuals spend providing secondary childcare to household children is further restricted to the time between when the first household child under age 13 woke up and the last household child under 13 went to bed. It is also restricted to times the respondent was awake. If respondents report providing both primary and secondary care at the same time, the time is attributed to primary care only.

**"Where" categories.** A where code is provided for each activity except sleeping, grooming, and personal/private activities and except when respondents did not remember what they did or refused to answer. Where codes include place codes (e.g., home, workplace, or grocery store) and in-transit codes (e.g., car, bus, or airplane).

**"Who" categories.** For most activities reported, respondents are asked "Who was in the room with you" or "Who accompanied you?" Each household member and nonhousehold child is assigned a separate "who" code. Generic categories also exist for nonhousehold family members and for others (e.g., neighbors, friends). Prior to January 2010, "who" information was not collected for times during which respondents reported sleeping, grooming, personal/private activities, or working, nor when respondents did not remember what they did or refused to answer. In January 2010, the ATUS began collecting "who" information for times during which the respondent reported working.

## 2. Activity Definitions

**Caring for and helping household members.** Time spent doing activities to care for or help any child (under age 18) or adult in the household, regardless of the person's relationship to the survey respondent or the physical or mental health status of the person being helped, is classified here. Caring and helping activities for household children and adults are coded separately in subcategories.

Primary childcare activities include time spent providing physical care; playing with children; reading with children; assistance with homework; attending children's events; taking care of children's health care needs; and dropping off, picking up, and waiting for children. Passive childcare done as a primary activity (such as "keeping an eye on my son while he swam in the pool") also is included. A child's presence during the activity is not enough in itself to classify the activity as childcare. For example, "watching television with my child" is coded as a leisure activity, not childcare.

Caring for and helping household members also includes a range of activities done to benefit adult members of households, such as providing physical and medical care or obtaining medical services. Doing something as a favor for or helping another household adult does not automatically result in classification as a helping activity. For example, a report of "helping my spouse cook dinner" is considered a household activity (food preparation), not a helping activity, because cooking dinner benefits the household as a whole. By contrast, doing paperwork for another person usually benefits the individual, so a report of "filling out an insurance application for my spouse" is considered a helping activity.

**Caring for and helping nonhousehold members.** This category includes time spent in activities done to care for or help others—both children (under age 18) and adults—who do not live in the household. When done for or through an organization, time spent helping nonhousehold members is classified as volunteering rather than as helping nonhousehold members. Care of nonhousehold children, even when

done as a favor or helping activity for another adult, is always classified as caring for and helping nonhousehold children, not as helping another adult.

**Consumer purchases.** Time spent purchasing or renting consumer goods, regardless of the mode or place of purchase or rental (in person, online, via telephone, at home, or in a store) is classified into this category. Subcategories in this section include those for time spent purchasing gasoline, time spent purchasing groceries, and time spent purchasing other food items, as well as that for time spent in all other shopping activities.

**Eating and drinking.** All time spent eating or drinking (except that done as part of a work or volunteer activity), whether alone, with others, at home, at a place of purchase, or somewhere else, is classified as eating and drinking. Time spent purchasing or talking related to purchasing meals, snacks, and beverages is not counted as part of this category but is counted instead as time spent making consumer purchases.

**Educational activities.** Time spent taking classes for a degree or for personal interest (including taking Internet or other distance-learning courses), time spent doing research and homework, and time spent taking care of administrative tasks related to education (such as registering for classes or obtaining a school ID) are included in this category. For high school students, before-school and after-school extracurricular activities (except sports) also are classified as educational activities. Educational activities do not include time spent for classes or training received as part of a job. Time spent helping others with their education-related activities is classified as an activity involving caring for and helping others.

**Government services and civic obligations.** This category captures time spent obtaining and using government services (police, fire, social services), such as applying for welfare, and time spent purchasing government-required licenses or paying fines or fees. Civic obligations include government-required duties—such as serving jury duty or appearing in court—as well as activities that assist or influence government processes, such as voting and attending town hall meetings.

**Household activities.** Household activities are activities done by individuals to maintain their households. This category includes time spent in housework; cooking; lawn and garden care; pet care; vehicle maintenance and repair; home maintenance, repair, decoration, and renovation; and household management and organizational activities (such as filling out paperwork, balancing a checkbook, or planning a party). Food preparation, whether or not reported as done specifically for another household member, is always classified as a household activity, unless it was done as a volunteer, work, or income-generating activity. For example, “making breakfast for my son” is coded as a household activity, not as childcare.

**Household services.** Time spent arranging for and purchasing household services provided by someone else for pay is classified here. Household services include housecleaning; cooking; lawn care and landscaping; pet care; tailoring, laundering, and dry cleaning; vehicle maintenance and repairs; and home repairs, maintenance, and construction.

**Personal care.** Personal care activities include sleeping, grooming (such as bathing or dressing), health-related self-care, and personal or private activities. Receiving unpaid personal care from others (for example, “my sister put polish on my nails”) also is captured in this category.

**Professional and personal care services.** Time spent obtaining, receiving, and purchasing professional and personal care services provided by someone else for pay is classified into this category. Professional services include childcare, financial services and banking, legal services, medical and adult care services, real estate services, and veterinary services. Personal care services include services received from day spas, hair salons and barbershops, nail salons, and tanning salons. Activities classified here include time spent paying, meeting with, or talking to service providers, as well as time spent receiving the service or waiting to receive the service.

**Religious and spiritual activities.** Religious activities include those normally associated with membership in or identification with specific religions or denominations, such as attending religious services; participating in choirs, youth groups, or unpaid teaching (unless identified as volunteer activities); and engaging in personal religious practices, such as praying.

**Socializing, relaxing, and leisure.** This category includes face-to-face social communication and hosting or attending social functions. Time spent communicating with others via telephone calls, texting, mail, or e-mail is not part of this category. Leisure activities include watching television; reading; relaxing or thinking; playing computer, board, or card games; using a computer or the Internet for personal interest; playing or listening to music; and other activities, such as attending arts, cultural, and entertainment events.

**Sports, exercise, and recreation.** Participating in—as well as attending or watching—sports, exercise, and recreational activities, whether team or individual and competitive or noncompetitive, falls into this category. Recreational activities include yard games like croquet or horseshoes, as well as activities like billiards and dancing.

**Telephone calls.** This category captures time spent in telephone communication; it also includes texting and Internet voice and video calling. Telephone and Internet purchases of consumer goods are classified into the category of consumer purchases. Telephone calls identified as related to work or volunteering are classified as either work or volunteering.

**Traveling.** Nearly all time spent traveling is classified here. When a respondent reports doing another activity while traveling—for example, eating breakfast while riding the bus to work—the travel activity is recorded as the main activity. Walking and biking are considered traveling when they are used to get from one destination (an address or a building) to another, but not when the primary purpose is exercise. Travel done as an essential part of one's job—for example, driving a taxi—is recorded as work, not travel. Exhibit 5.1 in the User's Guide has examples of how travel activities are classified; typically they are dependent upon the activities that immediately follow and precede them.

**Volunteer activities.** This category captures time spent volunteering for or through an organization.

**Working and work-related activities.** This category includes time spent working, doing activities as part of one's job, engaging in income-generating activities not as part of one's job, and job search activities. "Working" includes hours spent doing the specific tasks required of one's main or other job, regardless of the location or time of day. "Work-related activities" include activities that are not obviously work but are done as part of one's job, such as having a business lunch or playing golf with clients. "Other income-generating activities" are those done "on the side" or under informal arrangement and are not part of a regular job. Such activities might include selling homemade crafts, babysitting, maintaining a rental property, or having a yard sale. These activities are those that individuals are paid for or will be paid.

**APPENDIX A: Advance letter to households with telephone numbers**

Dear Jane Doe,

Recently, you or a member of your household participated in the Current Population Survey. Please accept our thanks for your household's participation. Now we would like to request your help with a brief, one-time interview for the American Time Use Survey (ATUS).

This survey is the only reliable source of information about the unpaid work people do when they care for their children or the elderly, or when they engage in volunteer work, housework, lawn care, or other types of unpaid activities. This work is a vital part of the economy, and your participation in the ATUS is essential to provide an accurate picture of how Americans spend their time. Please read the enclosed brochure for an additional explanation of why ATUS is so important.

On [Day, date], a U.S. Census Bureau interviewer will call you to complete this one-time survey. If you would prefer to call us in advance to set up another time for your interview, we can be reached toll-free at 1-800-331-4706. Our hours are:

**Sunday: 11 a.m. - midnight (Eastern Time)**

**Monday – Saturday: 9 a.m. - midnight (Eastern Time)**

When called, you will be asked questions about how you spent your time on the previous day. You have been selected to represent people like you, and only you can accurately report how you use your time.

Please feel free to contact us with any questions:

Phone:

Email:

Web address: <https://www.bls.gov/respondents/tus/home.htm>

A Message from the Director

Enclosure

The U.S. Office of Management and Budget (OMB) has approved this survey and assigned it control number 1220-0175. Without OMB approval and this number, we would not be able to conduct this study. Title 29, United States Code, Section 1, and Title 13, United States Code, Section 8, authorize the U.S. Census Bureau to conduct this survey. Section 9 of Title 13, United States Code, requires us to keep all information about you and your household strictly confidential. We will use this information only for statistical purposes. Your voluntary cooperation is needed to make the results of this survey comprehensive and accurate. We estimate that it will take an average of 15-20 minutes to complete this survey. If you have any comments about the time estimate or any other aspect of this survey, including suggestions for reducing the burden, please send them to the Bureau of Labor Statistics, American Time Use Survey (1220-0175), 2 Massachusetts Avenue, NE, Room 4675, Washington, DC 20212.

**APPENDIX B: Advance letter to households without telephone numbers**

Dear Jane Doe,

Recently, you or a member of your household participated in the Current Population Survey. Please accept our thanks for your household's participation. Now we would like to request your help with a brief, one-time interview for the American Time Use Survey (ATUS).

This survey is the only reliable source of information about the unpaid work people do when they care for their children or the elderly, or when they engage in volunteer work, housework, lawn care, or other types of unpaid activities. This work is a vital part of the economy, and your participation in the ATUS is essential to provide an accurate picture of how Americans spend their time. Please read the enclosed brochure for an additional explanation of why ATUS is so important.

Because your participation is so important, we have enclosed a \$40 ATM debit card for you as a way of showing our gratitude. Once you have completed the survey, the interviewer will give you a Personal Identification Number (PIN) that will allow you to activate the card and receive your payment. More information about using the card is enclosed with this letter.

Since we do not have your phone number, it is very important that you call us toll-free at 1-800-232-1824, on **[DAY, Date]** to complete this one-time survey. Our hours are: Sunday, 11 a.m. - midnight (Eastern Time), and Monday – Saturday, 9 a.m. - midnight (Eastern Time).

If your scheduled date is not a convenient day to complete the interview, please call to set up another time that is more convenient for you.

When you call to complete the survey, you will be asked questions about how you spent your time on the previous day. You have been selected to represent people like you, and only you can accurately report how you use your time.

Please feel free to contact us with any questions:

Phone:

Email:

Web address: <https://www.bls.gov/respondents/tus/home.htm>

A Message from the Director

Enclosure

The U.S. Office of Management and Budget (OMB) has approved this survey and assigned it control number 1220-0175. Without OMB approval and this number, we would not be able to conduct this study. Title 29, United States Code, Section 1, and Title 13, United States Code, Section 8, authorize the U.S. Census Bureau to conduct this survey. Section 9 of Title 13, United States Code, requires us to keep all information about you and your household strictly confidential. We will use this information only for statistical purposes. Your voluntary cooperation is needed to make the results of this survey comprehensive and accurate. We estimate that it will take an average of 15-20 minutes to complete this survey. If you have any comments about the time estimate or any other aspect of this survey, including suggestions for reducing the burden, please send them to the Bureau of Labor Statistics, American Time Use Survey (1220-0175), 2 Massachusetts Avenue, NE, Room 4675, Washington, DC 20212.

**APPENDIX C: Advance letter to parents or guardians of minor respondents (sent 2003 to mid-2011)**

Parent or Guardian of [respondent's name]  
123 Welcome Drive  
Gladwood, MN 22222

Dear Parent or Guardian of [respondent's name]:

This letter is to inform you that your child has been selected to participate in the American Time Use Survey (ATUS). Conducted by the U.S. Census Bureau, the ATUS is a brief, one-time-only voluntary telephone interview that gathers information about how Americans spend their time. The survey includes people ages 15 years and older, and the answers your child provides will represent those of many teenagers. For this reason, your child's participation in the survey is very important.

The enclosed package provides you and your child with information about the survey and the types of questions we will ask in the interview. All responses are guaranteed to be confidential and will not be linked with your child's name or any other identifying information. An interviewer will call your child to conduct the survey on [day of week], [date]. If you have any questions, please contact us at the following:

Phone:

E-mail:

Web address: <https://www.bls.gov/respondents/tus/home.htm>

I hope that you will encourage your child to participate in this important survey.

Sincerely,

Enclosure



## APPENDIX D: Frequently asked questions (sent with advance letters)

### **What is the American Time Use Survey (ATUS)?**

The American Time Use Survey asks questions about how people spend their time. **Time is a resource**—just like money—and knowing how people spend their time helps answer important questions.

### **Why is it important that I participate?**

People use their time differently depending on their age and circumstances. This survey asks a wide variety of people how they use their time: students, retirees, workers, parents, men, and women. Your participation in this survey ensures we provide accurate data on the time use and quality of life of all people age 15 and over living in America. You are an important part of this survey.

### **What happens during the interview? What will you ask me?**

This one-time survey takes **15-20 minutes** to complete, from the moment you pick up the phone. We interview just one person from each household. After confirming some information about your household, the interviewer will ask you to recall how you spent the past 24 hours and then follow up with a few questions related to your time use.

### **I just participated in the Current Population Survey. Why are you contacting me again?**

When we interview you for the ATUS, we save time and money because we don't have to ask many of the background questions that were already asked in the Current Population Survey (CPS). This shortens the time required to complete the ATUS and allows us to conduct interviews with more people. Unlike the CPS, the ATUS is a one-time only survey.

### **When will I be interviewed?**

To capture a full picture of time use on all days of the week, we assigned you a specific day of the week as your interview day. If you are unavailable at the time of the interview, we would be happy to call you on the same day the following week. You can always call to schedule a time for the interview that is more convenient for you. **Your time is very important**—we know because we study it.

**I don't have time to complete the survey. Can someone else in my household participate instead?** You were carefully selected to represent thousands of other people in households similar to yours. Unfortunately, we cannot interview other members of your household, but we can work with you to set up a convenient interview time.

### **Are my answers confidential?**

Yes. You are protected by United States Code, Title 13, Section 9, which requires all information about you and your household to be kept strictly confidential and used only for statistical purposes. In compliance with this law, the Census Bureau cannot release any information that could identify you or your household to anyone, including market research firms, political campaigns, or other government agencies.

**Who is conducting the survey?**

The U.S. Census Bureau collects and processes the data. The Bureau of Labor Statistics (BLS) analyzes and publishes the information. The Census Bureau removes all confidential information from the data files, such as name and address, before the BLS reviews the data.

**I'm still in high school. Why was I selected?**

We interview people of all ages, including teenagers. How teenagers balance school, work, and time with family and friends is an important topic for educators, health professionals, and others. If you are under 18 and selected to represent your household in this survey, a parent or guardian is welcome to be on the line with you during the interview.

**APPENDIX E: Refusal conversion letter**

Ms. Respondent  
123 Welcome Drive  
Gladwood, MN 22222

Dear Ms. Respondent:

One of our interviewers contacted you recently regarding the American Time Use Survey (ATUS), but was unable to complete an interview. Because your participation is important, I am writing to ask for your much needed assistance in this survey.

[INSERT ONE OR MORE OF THE FOLLOWING PARAGRAPHS BASED ON REASON FOR RESPONDENT'S REFUSAL]

**Confidentiality**

We are conducting this survey under the authority of Title 13, United States Code, Section 8. Section 9 of this law requires us to keep all information about you and your household strictly confidential. We use this information only for statistical purposes. No information that could identify you or your family is ever released. In addition, you do not need to answer a question or report an activity that you feel is too personal.

**Why me? Ask someone else**

You are one of several people in your area, and one of many people in the country, who were selected to participate in the American Time Use Survey. The answers you provide represent those of many others, and are invaluable in helping lawmakers, employers, and researchers develop programs and policies that will help you and others in your community. Consequently, your participation in the survey is extremely important. Because you were randomly selected and represent others, we cannot substitute any other person for you.

**Tired of surveys**

We appreciate your previous cooperation with the Current Population Survey (CPS). Unlike the CPS, the American Time Use Survey is a one-time-only telephone survey that will take only 15 to 20 minutes to complete. Because you have already completed the CPS, we will not have to ask you many of the same questions again, which saves time. The information you provide is invaluable in helping lawmakers, employers, and researchers develop policy recommendations and identify services that assist workers and their families, children, and the elderly. Your help is needed to make sure the survey results are as reliable and meaningful as possible.

**I'm too busy/Why is it so important?**

We realize that you are a busy person and that your time is valuable. The survey will only take about 15 to 20 minutes to complete, and is a one-time-only survey. The information that you provide is invaluable in helping lawmakers, employers, and researchers develop recommendations, such as how to assist workers and families, as well as identify services needed for children and the elderly. Your particular help is needed because you will represent not only yourself, but also others like you, who live in your community.

If you would like to discuss any concerns you have about the survey, please contact us by phone or e-mail. Additional information about the ATUS, including some recent findings and answers to frequently asked questions, is also available on our respondents' Web site:

Phone:

E-mail:

Web address: <https://www.bls.gov/respondents/tus/home.htm>

I hope this letter addresses your concerns, and that you will strongly consider participating in the survey when we contact you again.

**APPENDIX F: Refusal conversion letter sent to parents or guardians of minor respondents**

Dear Parent or Guardian of ,

One of our interviewers recently attempted to contact your child regarding the American Time Use Survey (ATUS), but was unable to complete an interview. Because of the importance of your child's participation in this telephone survey, I am writing to ask for your assistance. We are trying to better understand how Americans age 15 years and over use their time. Since teens use their time differently than older age groups, it is very important that they be adequately represented in the survey. The answers your child provides will represent those of many other teens.

We understand that parents or guardians might have some concerns regarding their child's participation. Responses are confidential and will be used only for statistical purposes. Data released from this survey are not linked with your child's name or any other identifying information. The interviewers are trained professionals, sworn to protect the confidentiality of the data, and many have children of their own. Some parents of teenagers participating in the survey are more comfortable if the interviewer is the same sex as their child. You are welcome to contact us to make this arrangement or to discuss any other concerns. Additional information about the survey, including some recent findings and answers to frequently asked questions, is also available on our ATUS respondents' Web site:

Phone:

E-mail:

Web address: <https://www.bls.gov/respondents/tus/home.htm>

I hope this letter addresses your concerns, and that you will grant your child permission to participate in the ATUS when we contact your household again.

## **APPENDIX G: Link to the activity coding lexicon and coder rules manual**

All activity coding lexicons, coder rules manuals, and information about differences between the coding lexicons are available online at: <https://www.bls.gov/tus/lexicons.htm>.

## APPENDIX H: Bridge between published activity categories and ATUS coding lexicon activity categories

Each activity collected in the ATUS is assigned a 6-digit activity code, as defined in the ATUS Activity Lexicons (see <https://www.bls.gov/tus/lexicons.htm>). Some activity categories appearing in published tables and BLS's Labstat database (see <https://www.bls.gov/tus/database.htm>) are composites of several lexicon activity categories. These combined categories are identified by their ACTCODE. The following table shows how the composite activity categories published on tables and as data series map to the ATUS Activity Lexicon categories.

Published major categories	ACTCODE	Activity lexicon codes			Activity lexicon categories
		2008-2019	2005-2007	2003-2004	
Total, all activities	000000	NA	NA	NA	
Personal care	600001	01 1801	01 1801	01 1701	Personal care activities Travel related to personal care
Sleeping	010100	0101	0101	0101	Sleeping
Grooming	010200	0102	0102	0102	Grooming
Health-related self-care	010300	0103	0103	0103	Health-related self-care
Personal activities	010400	0104	0104	0104	Personal activities
Travel related to personal care	180100	1801	1801	1701	Travel related to personal care
Eating and drinking	600022	11 1811	11 1811	11 1711	Eating and drinking Travel related to eating and drinking
Eating and drinking	110100	1101	1101	1101	Eating and drinking
Travel related to eating and drinking	181100	1811	1811	1711	Travel related to eating and drinking
Household activities	600003	All 02, except (020903, 020904) 1802	All 02, except (020903, 020904) 1802	All 02, except (020903, 020904) 1702	Household activities (Household and personal mail and messages Household and personal e-mail and messages) Travel related to household activities
Housework	020100	0201	0201	0201	Housework
Interior cleaning	020101	020101	020101	020101	Interior cleaning
Laundry	020102	020102	020102	020102	Laundry
Storing interior household items, including food	020104	020104	020104	020104	Storing interior household items, including food
Food preparation and cleanup	020200	0202	0202	0202	Food and drink preparation, presentation, and cleanup
Food and drink preparation	020201	020201	020201	020201	Food and drink preparation
Kitchen and food cleanup	020203	020203	020203	020203	Kitchen and food cleanup
Lawn and garden care	020500	0205	0205	0205	Lawn, garden, and houseplants

Published major categories	ACTCODE	Activity lexicon codes			Activity lexicon categories
		2008-2019	2005-2007	2003-2004	
Household management	600005	0209 except (020903, 020904)	0209 except (020903, 020904)	0209 except (020903, 020904)	Household management  (Household and personal mail and messages Household and personal e-mail and messages)
Financial management	020901	020901	020901	020901	Financial management
Household and personal organization and planning	020902	020902	020902	020902	Household and personal organization and planning
Interior maintenance, repair, and decoration	020300	0203	0203	0203	Interior maintenance, repair, and decoration
Exterior maintenance, repair, and decoration	020400	0204	0204	0204	Exterior maintenance, repair, and decoration
Animals and pets	020600	0206	0206	0206	Animals and pets
Care for animals and pets, not veterinary care	020601	020601	020601	020601	Care for animals and pet (not veterinary care)
Walking, exercising, and playing with animals	020602	020602	020602	020602	Walking, exercising, and playing with animals
Vehicles	020700	0207	0207	0207	Vehicles
Appliances, tools, and toys	020800	0208	0208	0208	Appliances, tools, and toys
Travel related to household activities	180200	1802	1802	1702	Travel related to household activities
Purchasing goods and services	600018	07 08 09 1001 100304	07 08 09 1001  100301 100302 100399  1004 1099  1807 1808	07 08 09 1001  100301 100302 100399  1004 1099  1707 1708	Consumer purchases Professional and personal care services Household services Using government services Waiting associated with using government services Waiting associated with using police/fire services Waiting associated with obtaining licenses Waiting associated with using government services or civic obligations, not elsewhere classified Security procedures related to government services/civic obligations Government services, not elsewhere classified Travel related to consumer purchases Travel related to using professional and personal care services



Published major categories	ACTCODE	Activity lexicon codes			Activity lexicon categories
		2008-2019	2005-2007	2003-2004	
		1809 181001   181099	1809 181001   181099	1709   171001 171002 171003 171099	Travel related to using household services Travel related to using government services Travel related to using police/fire services Travel related to using social services Travel related to obtaining licenses and paying fines/fees Travel related to government services and civic obligations, not elsewhere classified
Consumer goods purchases	070000	07	07	07	Consumer purchases
Grocery shopping	070101	070101	070101	070101	Grocery shopping
Professional and personal care services	080000	08	08	08	Professional and personal care services
Financial services and banking	080200	0802	0802	0802	Financial services and banking
Medical and care services	080400	0804	0804	0804	Medical and care services
Personal care services	080500	0805	0805	0805	Personal care services
Household services	090000	09	09	09	Household services
Home maintenance, repair, decoration, and construction (not done by self)	090200	0902	0902	0902	Home maintenance, repair, decoration, and construction (not done by self)
Vehicle maintenance and repair services (not done by self)	090500	0905	0905	0905	Vehicle maintenance and repair services (not done by self)
Government services	600069	1001 100304  100301 100302 100399  1004 1099	1001  100301 100302 100399  1004 1099	1001  100301 100302 100399  1004 1099	Using government services Waiting associated with using government services Waiting associated with using police/fire services Waiting associated with obtaining licenses Waiting associated with using government services or civic obligations, not elsewhere classified Security procedures related to government services/civic obligations Government services, not elsewhere classified
Travel related to purchasing goods and services	600021	1807 1808	1807 1808	1707 1708	Travel related to consumer purchases Travel related to using professional and personal care services

Published major categories	ACTCODE	Activity lexicon codes			Activity lexicon categories
		2008-2019	2005-2007	2003-2004	
		1809 181001   181099	1809 181001   181099	1709  171001 171002 171003 171099	Travel related to using household services Travel related to using government services Travel related to using police/fire services Travel related to using social services Travel related to obtaining licenses and paying fines/fees Travel related to government services and civic obligations, not elsewhere classified
Caring for and helping household members	600007	03 1803	03 1803	03 1703	Caring for and helping household members Travel related to caring for and helping household members
Caring for and helping household children	600008	0301 0302 0303	0301 0302 0303	0301 0302 0303	Caring for and helping household children Activities related to household children's education Activities related to household children's health
Caring for and helping household children (except activities related to education and health)	030100	0301	0301	0301	Caring for and helping household children
Physical care for household children	030101	030101	030101	030101	Physical care for household children
Reading to and with household children	030102	030102	030102	030102	Reading to and with household children
Talking with and listening to household children	030106	030106	030106	030106	Talking with and listening to household children
Playing with household children, not sports	030103	030103	030103	030103	Playing with household children, not sports
Attending household children's events	030110	030110	030110	030110	Attending household children's events
Activities related to household children's education	030200	0302	0302	0302	Activities related to household children's education

Published major categories	ACTCODE	Activity lexicon codes			Activity lexicon categories
		2008-2019	2005-2007	2003-2004	
Helping household children with homework	030201	030201	030201	030201	Homework (household children)
Activities related to household children's health	030300	0303	0303	0303	Activities related to household children's health
Caring for and helping household adults	600009	0304 0305	0304 0305	0304 0305	Caring for household adults Helping household adults
Caring for household adults	030400	0304	0304	0304	Caring for household adults
Physical care for household adults	030401	030401	030401	030401	Physical care for household adults
Helping household adults	030500	0305	0305	0305	Helping household adults
Travel related to caring for and helping household members	180300	1803	1803	1703	Travel related to caring for and helping household members
Caring for and helping nonhousehold members	600010	04 1804	04 1804	04 1704	Caring for and helping nonhousehold members Travel related to caring for and helping nonhousehold members
Caring for and helping nonhousehold children	600011	0401 0402 0403	0401 0402 0403	0401 0402 0403	Caring for and helping nonhousehold children Activities related to nonhousehold children's education Activities related to nonhousehold children's health
Caring for and helping nonhousehold adults	600012	0404 0405	0404 0405	0404 0405	Caring for nonhousehold adults Helping nonhousehold adults
Caring for nonhousehold adults	040400	0404	0404	0404	Caring for nonhousehold adults
Helping nonhousehold adults	040500	0405	0405	0405	Helping nonhousehold adults
Travel related to caring for and helping nonhousehold members	180400	1804	1804	1704	Travel related to caring for and helping household members
Working and Work-related Activities	600013	05 1805	05 1805	05 1705	Working and work-related activities Travel related to work
Working	050100	0501	0501	0501	Working
Work-related activities	050200	0502	0502	0502	Work-related activities
Other income-generating activities	050300	0503	0503	0503	Other income-generating activities

Published major categories	ACTCODE	Activity lexicon codes			Activity lexicon categories
		2008-2019	2005-2007	2003-2004	
Job search and interviewing	050400	0504	0504	0504	Job search and interviewing
Travel related to work	180500	1805	1805	1705	Travel related to work
Educational activities	600016	06 1806	06 1806	06 1706	Education Travel related to education
Attending class	060100	0601	0601	0601	Taking class
Taking class for degree, certificate, or licensure	060101	060101	060101	060101	Taking class for degree, certification, or licensure
Homework and research	060300	0603	0603	0603	Research and homework
Travel related to education	180600	1806	1806	1706	Travel related to education
Organizational, civic, and religious activities	600030	14 15 1002 100305  1814  1815 181002	14 15 1002  100303 1814  1815 181002	14 15 1002  100303 1714  1715 171004	Religious and spiritual activities Volunteer activities Civic obligations and participation Waiting associated with civic obligations and participation Waiting associated with civic obligations, participation Travel related to religious and spiritual activities Travel related to volunteer activities Travel related to civic obligations and participation
Religious and spiritual activities	140000	14	14	14	Religious/Spiritual practices
Attending religious services	140101	140101	140101	140101	Attending religious services
Participating in religious practices	140102	140102	140102	140102	Participation in religious practices
Volunteering (organizational and civic activities)	600032	15 1002 100305	15 1002  100303	15 1002  100303	Volunteer activities Civic obligations and participation Waiting associated with civic obligations and participation Waiting associated with civic obligations, participation
Volunteer activities	150000	15	15	15	Volunteer activities
Administrative and support activities	150100	1501	1501	1501	Administrative and support activities
Social service and care activities (except medical)	150200	1502	1502	1502	Social service and care activities (except medical)
Indoor and outdoor	150300	1503	1503	1503	Indoor and outdoor maintenance, building, and cleanup activities

Published major categories	ACTCODE	Activity lexicon codes			Activity lexicon categories
		2008-2019	2005-2007	2003-2004	
maintenance, building, and cleanup activities					
Participating in performance and cultural activities	150400	1504	1504	1504	Participating in performance and cultural activities
Attending meetings, conferences, and training	150500	1505	1505	1505	Attending meetings, conferences, and training
Civic obligations and participation	100200	1002	1002	1002	Civic obligations and participation
Travel related to organizational, civic, and religious activities	600066	1814 1815 181002	1814 1815 181002	1714 1715 171004	Travel related to religious and spiritual activities Travel related to volunteer activities Travel related to civic obligations and participation
Leisure and sports	600023	12 13 1812 1813	12 13 1812 1813	12 13 1712 1713	Socializing, relaxing, and leisure Sports, exercise, and recreation Travel related to socializing, relaxing, and leisure Travel related to sports, exercise, and recreation
Socializing, relaxing and leisure	120000	12	12	12	Socializing, relaxing and leisure
Socializing and communicating	600024	1201 1202 120501 120502	1201 1202 120501 120502	1201 1202 120501 120502	Socializing and communicating Attending or hosting social events Waiting associated with socializing and communicating Waiting associated with attending or hosting social events
Socializing and communicating (except social events)	120100	1201	1201	1201	Socializing and communicating
Attending or hosting social events	120200	1202	1202	1202	Attending or hosting social events
Relaxing and leisure	120300	1203	1203	1203	Relaxing and leisure
Watching TV	600025	120303 120304	120303 120304	120303 120304	Television and movies (not religious) Television (religious)
Relaxing and thinking	120301	120301	120301	120301	Relaxing, thinking
Playing games	120307	120307	120307	120307	Playing games
Computer use for leisure, excluding games	120308	120308	120308	120308	Computer use for leisure (excluding games)
Reading for personal interest	120312	120312	120312	120312	Reading for personal interest

Published major categories	ACTCODE	Activity lexicon codes			Activity lexicon categories
		2008-2019	2005-2007	2003-2004	
Arts and entertainment (other than sports)	120400	1204	1204	1204	Arts and entertainment (other than sports)
Sports, exercise, and recreation	130000	13	13	13	Sports, exercise, and recreation
Participating in sports, exercise, and recreation	130100	1301	1301	1301	Participating in sports, exercise, and recreation
Walking	130131	130131	130131	130131	Walking
Attending sporting or recreational events	130200	1302	1302	1302	Attending sporting or recreational events
Travel related to leisure and sports	600029	1812 1813	1812 1813	1712 1713	Travel related to socializing, relaxing, and leisure Travel related to sports, exercise, and recreation
Telephone calls, mail, and e-mail	600033	16 1816 020903 020904	16 1816 020903 020904	16 1716 020903 020904	Telephone calls Travel related to telephone calls Household and personal mail and messages Household and personal e-mail and messages
Telephone calls (to or from)	160100	1601	1601	1601	Telephone calls (to or from)
Household and personal messages	600072	020903 020904	020903 020904	020903 020904	Household and personal mail and messages Household and personal e-mail and messages
Household and personal mail and messages	020903	020903	020903	020903	Household and personal mail and messages
Household and personal e-mail and messages	020904	020904	020904	020904	Household and personal e-mail and messages
Travel related to telephone calls	181600	1816	1816	1716	Travel related to telephone calls
Other activities, not elsewhere classified	600034	1818 1899 50	1818 1899 50	1717 1799 50	Security procedures related to traveling Traveling, not elsewhere classified Data codes

## APPENDIX J: Generating ATUS Estimates -- Examples

This appendix includes examples showing how to generate estimates using the 5 main ATUS single-year data files. The examples illustrate one method of solving each problem; as with most problems, there are other ways to correctly solve them. In some cases, SAS code is shown. It is not necessary to understand the SAS code to follow the examples.<sup>1</sup> The examples below illustrate calculations of: average day estimates for the total population, a subpopulation, and for participants; a count of persons; and a percent.

When generating estimates from the ATUS data files, it is best not to merge all files into one giant file. Doing so will almost always require more work than is necessary and lead to errors. Instead, follow these steps:

- **Consider the objective:** Deciding exactly what to compute can save a lot of time and prevent errors by providing a focus for your work with the files. A clearly stated objective is helpful in determining which data files, variables, formulas, and strategies are needed to meet it.
- **Identify the variables and activity codes needed and the files where they are located:** There are several key pieces of documentation to use when working with the data files. The Data Dictionaries include variable definitions and information about how the files are structured (<https://www.bls.gov/tus/dictionaries.htm>). The Frequently Used Variables document includes information about useful variables and where to find them (<https://www.bls.gov/tus/freqvariables.pdf>). The Activity Coding Lexicons provide information about the activity codes (<https://www.bls.gov/tus/lexicons.htm>).
- **Summarize the data to a respondent level:** The Activity, Roster, Who, and ATUS-CPS files all have multiple records per household. It is important to summarize the data to a respondent level to avoid mistakes such as double counting respondents.
- **Apply the appropriate formula:** Chapter 7 of this guide provides the formulas needed to generate estimates and standard errors with the ATUS data files.
- **Verify your results (if possible):** It is always helpful to verify at least one estimate with an official ATUS estimate. ATUS estimates are published annually in an ATUS news release, available from the ATUS home page: <https://www.bls.gov/tus>. A number of unpublished tables are available from ATUS staff by filling out a request form online at <https://data.bls.gov/cgi-bin/forms/tus?/tus/home.htm> or by calling (202) 691-6339.

**Note:** The ATUS Summary file summarizes the Activity file to a respondent level. It also includes frequently used variables from the Respondent, ATUS-CPS, and Roster files. In some cases, all data required for a calculation appear on the Activity Summary file.

The Activity summary file does not include detail about the diary day (such as data for a specific hour of the day or showing who was in the room with the respondent during an activity). Calculations requiring this detail necessitate use of the Activity file, which provides activity-level detail about the diary day.

The following examples do not use the Activity Summary file because it is relatively easy to use compared to the data files used here.

<sup>1</sup> Examples of SAS files also are shown. The variables \_TYPE\_ and \_FREQ\_ appear on some of the files shown in this appendix; these variables are automatically generated by SAS software.

The examples use these 2006 data files:

Respondent file:	atusresp_2006.dat
Activity file:	atusact_2006.dat
Roster file:	atusrost_2006.dat
ATUS-CPS file:	atuscps_2006.dat
Who file:	atuswho_2006.dat

These data files are available free of charge from the ATUS Web site at:

[https://www.bls.gov/tus/datafiles\\_2006.htm](https://www.bls.gov/tus/datafiles_2006.htm). The data files appear in zip files; each zip file also includes a description of the data file, and SAS, Stata, and SPSS programs that can be used to read the data file into the respective software package.

### Overview of examples

**Example 1:** Calculate the average hours per day in 2006 that Americans provided childcare as a primary activity to children living in their household.

- Uses the Respondent and Activity files

**Example 2:** Calculate the average hours per day that women age 18 and over, living in a household with at least one child under age 6, spent providing primary childcare to household children in 2006.

- Uses the Roster file and a data file created in example 1

**Example 3:** Calculate the average hours per day in 2006 that Americans who provided childcare as a primary activity to children living in their household spent providing this care.

1. Uses a data file created in example 1

**Example 4:** Calculate the number of persons residing in the South who did housework on an average day in 2006.

- Uses the Respondent, Activity, and ATUS-CPS files

**Example 5:** Calculate the percent of persons residing in the South who did housework on an average day in 2006.

- Uses a data file created in example 4

**Example 6:** Calculate the average hours per day in 2006 that Americans watched TV while they were with at least one own household child under age 18.

- Uses the Respondent, Roster, Activity, and Who files



**Example 1****Step 1: Objective:**

Calculate the average hours per day in 2006 that Americans provided childcare as a primary activity to children living in their household.

**Step 2: Variables and activity codes that are needed:**

TUCASEID (Case identifier, used to link files; appears on all files);

TUFINLWGT (Statistical weight, on the **Respondent file**);

TUACTDUR24 (Activity duration in minutes, truncated to a 24-hour day; on the **Activity file**)

TUTIER1CODE, TUTIER2CODE, & TUTIER3CODE (Identify activities, on the **Activity file**)

Care of household children, when provided as one's primary activity, corresponds to activity codes that begin with these 4 digits: 0301, 0302, and 0303.

Specific codes are shown in the following excerpt from the 2006 coding lexicon:<sup>1</sup>

<b>03 Caring For &amp; Helping Household Members</b>	
<b>01 Caring For &amp; Helping HH Children</b>	
01	Physical care for hh children
02	Reading to/with hh children
03	Playing with hh children, not sports
04	Arts and crafts with hh children
05	Playing sports with hh children
06	Talking with/listening to hh children
08	Organization & planning for hh children
09	Looking after hh children (as a primary activity)
10	Attending hh children's events
11	Waiting for/with hh children
12	Picking up/dropping off hh children
99	Caring for & helping hh children, n.e.c.*
<b>02 Activities Related to HH Children's Education</b>	
01	Homework (hh children)
02	Meetings and school conferences (hh children)
03	Home schooling of hh children
04	Waiting associated with hh children's education
99	Activities related to hh child's education, n.e.c.*
<b>03 Activities Related to HH Children's Health</b>	
01	Providing medical care to hh children
02	Obtaining medical care for hh children
03	Waiting associated with hh children's health
99	Activities related to hh child's health, n.e.c.*

<sup>1</sup> In the lexicon, the abbreviation "n.e.c." is short for "not elsewhere classified."

**Step 3: Summarize the data to a respondent level**

It can be helpful to summarize the three activity code variables (TUTIER1CODE, TUTIER2CODE, & TUTIER3CODE) into one. This can be done by concatenating the three variables that represent the first-, second-, and third-tiers of the 6-digit code. Here, the concatenated variable is named "code."

In SAS: `code=tutier1code||tutier2code||tutier3code;`

TUCASEID	TUACTIVITY_N	TUACTDUR24	TUTIER1CODE	TUTIER2CODE	TUTIER3CODE	code
20060101060033	1	180	01	01	01	010101
20060101060033	2	20	03	01	01	030101
20060101060033	3	120	03	01	03	030103
20060101060033	4	60	03	01	01	030101
20060101060033	5	10	18	07	01	180701
20060101060033	6	60	07	01	01	070101

Create a variable "childcare" that is equal to the total time each respondent spent providing primary childcare to household children. To do this, sum the times each respondent spent doing activities with codes that begin 0301, 0302, and 0303. Keep only variables that will be relevant at a respondent level; here, only variables that are necessary to complete the problem are retained. [In the SAS code, below, the input data set "act1" is simply the activity file plus the variable "code," as defined, above.]

Sample SAS code:

```
data act2 (keep=tucaseid childcare);
  set act1;
  by tucaseid;
  if first.tucaseid then childcare=0;
  if substr(code,1,4) in ('0301','0302','0303') then childcare+tuactdur24;
  if last.tucaseid then output;
run;
```

The output shows the identifier TUCASEID and the variable "childcare" which is the total minutes each respondent spent providing primary childcare to household children on the diary day:

(File name: act2):

	TUCASEID	childcare
1	20060101060001	0
2	20060101060014	0
3	20060101060025	0
4	20060101060033	390
5	20060101060038	0
6	20060101060049	120
7	20060101060057	245

Now that the activity data are summarized to the respondent level, link these data to the Respondent file using the identifier TUCASEID. Both files have one record per respondent (12,943 in 2006). It is necessary to link the files to obtain the statistical weight (variable TUFINLWGT), which appears on the Respondent file.

Sample SAS code:

```
data act2_resp (keep= tucaseid childcare tufinlwgt);
  merge atusresp_2006 act2;
  by tucaseid;
run;
```

The resulting file has 12,943 records, one for each respondent, and the 3 variables needed for the calculation:

(File name: act2\_resp):

	TUCASEID	TUFINLWGT	childcare
1	20060101060001	3384574.8596	0
2	20060101060014	3479067.9057	0
3	20060101060025	5825165.4274	0
4	20060101060033	5174447.2742	390
5	20060101060038	6353748.5253	0
6	20060101060049	8193457.4764	120
7	20060101060057	15175438.457	245

**Step 4:** Apply the appropriate formula (formulas are found in Chapter 7 of this Guide)

**Average hours per day.**  $\bar{T}_j$ , the average number of hours per day spent by a given population engaging in activity  $j$ , is given by

$$\bar{T}_j = \frac{\sum_i fwt_i T_{ij}}{\sum_i fwt_i}$$

where  $T_{ij}$  is the amount of time spent in activity  $j$  by respondent  $i$ , and  $fwt_i$  is the final weight for respondent  $i$ .

To calculate the average hours per day Americans spent providing primary childcare to household children, first multiply the statistical weight and the total time each respondent spent providing childcare. Here, that is (TUFINLWGT)\*(CHILDCARE).

$$fwgt_i T_{ij} = (TUFINLWGT_i) * (CHILDCARE_i)$$

$$= wtd\_childcare_i$$

This is what the data file looks like after WTD\_CHILDCARE has been created:  
(File name: formula1):

	TUCASEID	TUFINLWGT	childcare	wtd_childcare
1	20060101060001	3384574.8596	0	0
2	20060101060014	3479067.9057	0	0
3	20060101060025	5825165.4274	0	0
4	20060101060033	5174447.2742	390	2018034436.9
5	20060101060038	6353748.5253	0	0
6	20060101060049	8193457.4764	120	983214897.17

Now, looking again at the formula, notice that the numerator is the sum of WTD\_CHILDCARE for all 12,943 records; the denominator is the sum of TUFINLWGT for all 12,943 records.

$$\bar{T}_j = \frac{\sum_i fwgt_i T_{ij}}{\sum_i fwgt_i}$$

In SAS, the records can be summed with a PROC MEANS statement. Sample SAS code:

```
proc means data=formula1 sum;
    var tufinlwt wtd_childcare;
    output out=summarydata sum(tufinlwt)=denominator
        sum(wtd_childcare)=numerator;
run;
```

The output file is only one record. The variables "denominator" and "numerator" refer to the numerator and denominator for the calculation.<sup>1</sup>

(File name: Summarydata):

	_TYPE_	_FREQ_	denominator	numerator
1	0	12943	85089676117	2.0951963E12

<sup>1</sup> The variables \_TYPE\_ and \_FREQ\_ are automatically generated by SAS software. \_TYPE\_ = 0 indicates that all records on the input file were summed. The value for \_FREQ\_ is equivalent to the number of records that were summed by the PROC MEANS statement.

Divide the numerator by the denominator, and the result is the solution. Here, the variable "tot\_childcare" is equivalent to the numerator divided by the denominator:

	_TYPE_	_FREQ_	denominator	numerator	tot_childcare
1	0	12943	85089676117	2.0951963E12	24.623390078

The result is in minutes because the variable TUACTION24 is in minutes. In 2006, Americans spent an average of **24.6 minutes per day** providing primary childcare to household children. This corresponds to **0.41 hour per day**.

#### Step 5: Verify your results (if possible)

Look at Table 1 of the 2007 news release to verify the result

([https://www.bls.gov/news.release/archives/atus\\_06282007.pdf](https://www.bls.gov/news.release/archives/atus_06282007.pdf)); it corresponds to the line "Caring for and helping household children."

This estimate is an average across all 7 days of the week and for all persons, whether or not they actually provided childcare to household children on their diary day. Thus, it can be used to calculate an estimate of the average hours per week Americans provided primary childcare:

$$(0.41 \text{ hour per day}) * (7 \text{ days per week}) = 2.87 \text{ hours per week.}$$

Note: This estimate is for all persons in the U.S. civilian noninstitutionalized population, age 15 and over, whether or not they lived in households with children. If the calculation is restricted to persons living in households with children or to parents of household children, the results are higher.

### Example 2

#### Step 1: Objective:

Calculate the average hours per day that women age 18 and over, living in a household with at least one child under age 6, spent providing primary childcare to household children in 2006. (Example 2 is the same as example 1, except that it is restricted to a subpopulation: adult women living with a child under age 6.)

#### Step 2: Variables that are needed (in addition to the variables and activity codes used in Example 1):

TERRP (Relationship to survey respondent; on the **Roster file**);

TEAGE (Age of household children and Age of respondent; on the **Roster file**);

TESEX (Sex of respondent; on the **Roster file**);

TULINENO (Line number of household members and the respondent's own nonhousehold children; on the **Roster file**);

**Note:** This is one way to do the calculation; alternatively, one could use the variable TRYHHCHILD, on the Respondent file, to identify households with children under age 6. The results are the same.

**Step 3: Summarize the data to a respondent level**

In example 1, information about the time each respondent spent providing primary childcare to household children was summarized to a respondent level and then merged with the Respondent file. The combined Activity-Respondent file, named "act2\_resp," from example 1 includes information needed for example 2.

Below, is the combined Activity-Respondent file generated in example 1. Recall that the variable "childcare" is equivalent to the total minutes each respondent spent providing primary childcare to household children.

(File name: act2\_resp):

	TUCASEID	TUFINLWGT	childcare
1	20060101060001	3384574.8596	0
2	20060101060014	3479067.9057	0
3	20060101060025	5825165.4274	0
4	20060101060033	5174447.2742	390
5	20060101060038	6353748.5253	0
6	20060101060049	8193457.4764	120
7	20060101060057	15175438.457	245

Example 2 also requires information from the Roster file. First, summarize information on the Roster file to a respondent level and then merge it with the combined Activity-Respondent file from example 1.

This excerpt of the Roster file shows the variables needed to identify adult women living in households with children under age 6. Take a look at the file structure: Each line number (variable TULINENO) represents either a person in the respondent's household or one of the respondent's nonhousehold children under age 18. TULINENO = 1 identifies the respondent.

(File name: atusrost\_2006, selected variables):

	TUCASEID	TULINENO	TEAGE	TERRP	TESEX
1	20060101060001	1	73	19	1
2	20060101060014	1	33	18	2
3	20060101060014	2	14	22	2
4	20060101060014	3	13	22	1
5	20060101060025	1	32	19	1
6	20060101060025	2	33	21	2
7	20060101060033	1	19	18	2
8	20060101060033	2	41	24	2
9	20060101060033	3	11	25	2
10	20060101060033	4	0	22	1

TERRP = 40 identifies the respondent's nonhousehold children under 18; these are the only nonhousehold members who appear on the Roster file. It is important to exclude **nonhousehold children** under 6 from the calculation.

TEAGE = the age of each person. Here, TEAGE will be used to identify children under age 6 and respondents age 18 and over.

TESEX = information about each person's sex. Here, TESEX will be used to identify respondents who are women (TESEX = 2).

Now there is enough information to begin the calculation. First, identify households with a child under age 6. To do this, create an indicator variable "child\_05," where a value of "1" indicates the presence of a household child under 6 (at least one person on the Roster has  $0 \leq \text{TEAGE} \leq 5$  and  $\text{TERRP} \neq 40$ ) and a value of "0" indicates there were no household children under 6 present.

Sample SAS code:

```
data childpres (keep=tucaseid child_05);
  set atusrost_2006;
  by tucaseid;
  if first.tucaseid then child_05 = 0;
  if terrp ne 40 and teage in (0,1,2,3,4,5) then child_05 = 1;
  retain child_05;
  if last.tucaseid then output;
run;
```

This is what the output file looks like. There are 12,943 records, one for each respondent. The variable child\_05 identifies households with at least one child under age 6:

(File name: childpres):

	TUCASEID	child_05
1	20060101060001	0
2	20060101060014	0
3	20060101060025	0
4	20060101060033	1
5	20060101060038	0
6	20060101060049	1

Now, create a file that includes the respondent's age and sex and contains one record for each respondent. This information appears on the Roster file and corresponds to all records with TULINENO = 1. So, restrict the Roster file to cases with TULINENO = 1:

Sample SAS code:

```
data rost2 (keep=tucaseid tulinenno teage tesex);
  set atusrost_2006;
  if tulinenno=1;
run;
```

This is an excerpt of the output. There are 12,943 records, one for each respondent.

(File name: rost2):

	TUCASEID	TULINENO	TEAGE	TESEX
1	20060101060001	1	73	1
2	20060101060014	1	33	2
3	20060101060025	1	32	1
4	20060101060033	1	19	2

Now, there are three files that include the information needed to solve this example and all are now summarized to the respondent level:

- The Activity-Respondent file ("act2\_resp" from example 1) contains the statistical weights (TUFINLWGT) and the total time each respondent spent providing primary childcare to household children (CHILDCARE).
- The file "rost2" includes information about the respondent's age (TEAGE) and sex (TESEX). It was created by summarizing the Roster file.
- The file "childpres" has information about whether the respondent lived in a household with at least one child under age 6 (CHILD\_05). It was created by summarizing the Roster file.

Each of the files contains the identifier TUCASEID.

Merge these three files using the identifier TUCASEID. The resulting file contains 12,943 records, one for each respondent. It includes all the variables needed to select the subpopulation of interest: women 18 and over living in households with at least one child under age 6:

(File name: combined):

	TUCASEID	TUFINLWGT	childcare	child_05	TEAGE	TESEX
1	20060101060001	3384574.8596	0	0	73	1
2	20060101060014	3479067.9057	0	0	33	2
3	20060101060025	5825165.4274	0	0	32	1
4	20060101060033	5174447.2742	390	1	19	2
5	20060101060038	6353748.5253	0	0	52	2
6	20060101060049	8193457.4764	120	1	22	2

Next, select the subpopulation: women (TESEX = 2), age 18 and over (TEAGE > 17), living in households with a child under 6 (CHILD\_05 = 1)

Sample SAS code:

```
data women;
    set combined;
    if tesex = 2;
    if teage > 17;
    if child_05 = 1;
run;
```

There are 1,571 records in the output file, one for each woman age 18 and over living in a household with at least one child under 6.

(File name: women):

	TUCASEID	TUFINLWGT	childcare	child_05	TEAGE	TESEX
1	20060101060033	5174447.2742	390	1	19	2
2	20060101060049	8193457.4764	120	1	22	2
3	20060101060108	5942840.3145	45	1	28	2
4	20060101060545	2334152.2939	80	1	34	2
5	20060101060633	3622769.7785	0	1	25	2
6	20060101060753	1684955.7715	0	1	35	2



**Step 4:** Apply the appropriate formula.

This step is identical to that shown in example 1. Of course, the result will be different because the input file has been restricted to a subpopulation.

Again, use the same formula that was used in example 1:

**Average hours per day.**  $\bar{T}_j$ , the average number of hours per day spent by a given population engaging in activity  $j$ , is given by

$$\bar{T}_j = \frac{\sum_i fwt_i T_{ij}}{\sum_i fwt_i}$$

where  $T_{ij}$  is the amount of time spent in activity  $j$  by respondent  $i$ , and  $fwt_i$  is the final weight for respondent  $i$ .

Create the variable "wtd\_childcare" by multiplying the statistical weight and the total time each respondent spent providing primary childcare:

$$\begin{aligned} fwt_i T_{ij} &= (TUFINLWGT_i) * (CHILDCARE_i) \\ &= (wtd\_childcare_i) \end{aligned}$$

	TUCASEID	TUFINLWGT	childcare	child_05	TEAGE	TESEX	wtd_childcare
1	20060101060033	5174447.2742	390	1	19	2	2018034436.
2	20060101060049	8193457.4764	120	1	22	2	983214897.1
3	20060101060108	5942840.3145	45	1	28	2	267427814.1
4	20060101060545	2334152.2939	80	1	34	2	186732183.5
5	20060101060633	3622769.7785	0	1	25	2	

To generate the numerator, add the values of the variable WTD\_CHILDCARE for all 1,571 respondents in the subpopulation; to generate the denominator, add the values of the statistical weights, variable TUFINLWGT, for the 1,571 respondents.

The variable "totcare" is the numerator divided by the denominator. It equals the average minutes per day that the subpopulation spent providing childcare as a primary activity.

	_TYPE_	_FREQ_	denominator	numerator	totcare
1	0	1571	7609751066.8	1.0485336E12	137.78816674

Women age 18 and over, living in households with children under 6, spent 137.8 minutes (2.30 hours) per day providing childcare as a primary activity.

**Step 5:** Verify your results (if possible)

To verify that this is correct, compare it to the estimate corresponding to "Caring for and helping household children" that appears on the first page of Table 8 in the 2007 news release ([https://www.bls.gov/news.release/archives/atus\\_06282007.pdf](https://www.bls.gov/news.release/archives/atus_06282007.pdf)). It matches.

**Time-use estimates for “Participants”**

Examples 1 and 2 demonstrated how to calculate time-use estimates for the population or a specific subpopulation based on characteristics of the respondent or the respondent's household. The estimates included all persons meeting the criteria, whether or not they did the activity on their diary day.

Consider the difference between time-use estimates for a population (as in examples 1 and 2) and estimates for participants. This example illustrates the difference:

- Time-use for a population or subpopulation: **Americans spent 0.18 hour (11 minutes) per day doing laundry in 2006.** This estimate includes all persons in the population whether or not they did laundry on the diary day.
- Time-use for participants only: **On days they did laundry, Americans spent 1.09 hours per day doing the activity.** This estimate is much higher than the first because it is an average only for persons who spent at least some time doing laundry on the diary day.

The calculation for “Average hours per day for participants” is almost identical to those in examples 1 and 2. The difference is that both the numerator and denominator are now restricted only to persons who did a specific activity. In the formula, this restriction is represented by an indicator term that now appears in the numerator and denominator:

**Average hours per day of participants.**  $\bar{T}_j^P$ , the average number of hours spent per day engaged in activity  $j$  by people who participated in that activity on that day, is given by

$$\bar{T}_j^P = \frac{\sum_i fwt_i I_{ij} T_{ij}}{\sum_i fwt_i I_{ij}}$$

where  $T_{ij}$  is the amount of time spent in activity  $j$  by respondent  $i$ ,  $fwt_i$  is the final weight for respondent  $i$ , and  $I_{ij}$  is an indicator that equals 1 if respondent  $i$  participated in activity  $j$  during the reference day and 0 otherwise.

**Example 3****Step 1: Objective:**

Calculate the average hours per day in 2006 that Americans who provided childcare as a primary activity to children living in their household spent providing this care. (Re-visit example 1, but restrict it to participants only.)

**Step 2: Variables and activity codes that are needed:**

This step is identical to that shown in example 1.

**Step 3: Summarize the data to a respondent level:**

This step is the same as in example 1. Take another look at this data set from example 1. It includes 12,943 records, one for each respondent, and information about how much time the respondent spent providing childcare as a primary activity on the diary day (variable "childcare"):

(File name: formula1):

	TUCASEID	TUFINLWGT	childcare	wtd_childcare
1	20060101060001	3384574.8596	0	0
2	20060101060014	3479067.9057	0	0
3	20060101060025	5825165.4274	0	0
4	20060101060033	5174447.2742	390	2018034436.9
5	20060101060038	6353748.5253	0	0
6	20060101060049	8193457.4764	120	983214897.17

Note that the variable childcare includes many zeroes; these correspond to respondents that did not report any time providing childcare as a primary activity.

Step 4: Apply the appropriate formula:

**Average hours per day of participants.**  $\bar{T}_j^P$ , the average number of hours spent per day engaged in activity  $j$  by people who participated in that activity on that day, is given by

$$\bar{T}_j^P = \frac{\sum_i fwgt_i I_{ij} T_{ij}}{\sum_i fwgt_i I_{ij}}$$

where  $T_{ij}$  is the amount of time spent in activity  $j$  by respondent  $i$ ,  $fwgt_i$  is the final weight for respondent  $i$ , and  $I_{ij}$  is an indicator that equals 1 if respondent  $i$  participated in activity  $j$  during the reference day and 0 otherwise.

To calculate the average time participants spent providing childcare, restrict the data set to persons who reported providing care: **childcare > 0**. The resulting file has 3,680 records:

	TUCASEID	TUFINLWGT	childcare	wtd_childcare
1	20060101060033	5174447.2742	390	2018034436.9
2	20060101060049	8193457.4764	120	983214897.17
3	20060101060057	15175438.457	245	3717982422
4	20060101060092	16012956.51	20	320259130.19

The remainder of the calculation is identical to examples 1 and 2:

**Numerator** = sum of wtd\_childcare across all 3,680 respondents

**Denominator** = sum of TUFINLWGT across all 3,680 respondents

	_TYPE_	_FREQ_	denominator	numerator	totcare
1	0	3680	18366037446	2.0951963E12	114.07993111

Dividing the numerator by the denominator yields the solution to this problem; here, the variable "totcare" is the solution. **On days they provided childcare to household children, individuals spent on average 114 minutes (1.9 hours) providing care.**

**Step 5:** Verify your results (if possible)

This estimate is not published in the ATUS 2007 news release, but it does match an estimate that appears in an unpublished table (Summary table 4). Unpublished tables are available from [ATUS staff](https://data.bls.gov/cgi-bin/forms/tus?/tus/home.htm) by filling out a request form online at <https://data.bls.gov/cgi-bin/forms/tus?/tus/home.htm> or by calling (202) 691-6339.

#### **Example 4**

**Step 1:** Objective:

Calculate the number of persons residing in the South who did housework on an average day in 2006.

**Step 2:** Variables and activity codes that are needed:

TUCASEID (Case identifier, used to link files; appears on all files);

TUFINLWGT (Statistical weight, on the **Respondent file**);

TULINENO (Line number of household members and the respondent's own nonhousehold children, on the **ATUS-CPS file**);

GEREG (Region of the United States, on the **ATUS-CPS file**);

TUACTDUR24 (Activity duration in minutes, truncated to a 24-hour day; on the **Activity file**);

TUTIER1CODE, TUTIER2CODE, & TUTIER3CODE (Identify activities on the **Activity file**);

Activity codes for Housework are shown in the following excerpt from the 2006 lexicon:

<b>02 Household Activities</b>	
<b>01 Housework</b>	
01	Interior cleaning
02	Laundry
03	Sewing, repairing, & maintaining textiles
04	Storing interior hh items, inc. food
99	Housework, n.e.c.*
<b>02 Food &amp; Drink Prep., Presentation, &amp; Clean-up</b>	

**Step 3: Summarize the data to a respondent level**

Two data sets must be summarized to the respondent level: the Activity file and the ATUS-CPS file. Start by working with the Activity file. As in example 1, create the variable "code" which is equal to the full 6-digit activity code.

In SAS: `code = tutier1code || tutier2code || tutier3code;`

	TUCASEID	TUACTIVITY_N	TUACTDUR24	TUTIER1CODE	TUTIER2CODE	TUTIER3CODE	code
129	20060101060057	15	20 02	01	02		020102
130	20060101060057	16	120 03	02	01		030201
131	20060101060057	17	20 02	02	02		020202
132	20060101060057	18	90 02	01	02		020102
133	20060101060057	19	45 03	01	01		030101

Note that this respondent has at least two episodes of housework: Activities 15 and 18 (TUACTIVITY\_N indicates the activity number) are both coded as activity "020102" which refers to "laundry."

For each respondent, sum the activity durations for each episode of Housework (codes beginning with 0201).

Sample SAS code:

```
data housewk (keep=tucaseid housework);
  set atusact_2006;
  code=tutier1code||tutier2code||tutier3code;
  by tucaseid;
  if first.tucaseid then housework=0;
  if substr(code,1,4)= '0201' then housework+tuactdur24;
  if last.tucaseid then output;
run;
```

The output includes the variable "housework" that is equivalent to the total minutes each respondent spent doing housework on the diary day. The output file contains 12,943 records, one for each respondent in 2006. Keep only those variables that make sense at the respondent level.

(File name: housewk):

	TUCASEID	housework
1	20060101060001	0
2	20060101060014	0
3	20060101060025	0
4	20060101060033	10
5	20060101060038	0
6	20060101060049	0
7	20060101060057	230
8	20060101060067	0
9	20060101060077	0

Next, summarize the ATUS-CPS file to the respondent level. The ATUS-CPS file contains one line for each person in each household selected to participate in ATUS, whether or not the person did participate.

Here is an excerpt of the ATUS-CPS file:

	TUCASEID	TULINENO	GEREG
1	20060101060001	1	3
2	20060101060014	1	4
3	20060101060014	2	4
4	20060101060014	3	4
5	20060101060025	1	3
6	20060101060033	1	3
7	20060101060033	2	3

Because this problem requires information about the respondent only, first restrict the ATUS-CPS file to persons selected to participate in ATUS (TULINENO=1). This eliminates all the extra records that refer to other household members and nonhousehold children.

Sample SAS code:

```
data cps (keep=tucaseid tulinenno gereg );
    set atuscps_2006;
    if tulinenno=1;
run;
```

The resulting file has 25,304 records, one for each person selected to participate in ATUS. It includes the case identifier and information about the region in which that person lives, as recorded in the eighth CPS interview.

(File name: cps):

	TUCASEID	TULINENO	GEREG
1	20060101060001	1	3
2	20060101060014	1	4
3	20060101060025	1	3
4	20060101060033	1	3
5	20060101060038	1	2

Note that this file contains more records than needed because it includes records for persons who were selected for the ATUS sample but who did not participate in the survey. The 2006 ATUS-CPS file includes the variable TRATUSR that can be used to identify persons who participated in ATUS. When working with the 2003 to 2005 files or all of the years combined, the ATUS-CPS file alone does not include the information necessary to identify ATUS respondents. The Respondent file, which has one unique record for each person who responded to the survey, can be used to identify survey respondents in 2003 to 2005. Here, the Respondent file is used to restrict the file "cps" (shown above) to ATUS respondents only.

Merging the Respondent file and the file that was just created, "cps," yields a data set with 25,304 records. This is an excerpt of what it looks like:

	TUCASEID	GEREG	TUDIARYDATE	TUDIARYDAY	TUFINLWGT
34	20060101060630	4	20060129	1	2746366.6102
35	20060101060633	4	20060122	1	3622769.7785
36	20060101060641	4	20060130	2	9892431.0033
37	20060101060653	4			
38	20060101060656	4	20060128	7	7931083.0873

Variables that were collected during the ATUS interview have missing values or blanks for persons who did not participate in the ATUS interview. Use one of these variables to eliminate the records of persons who did not participate in ATUS. For example, eliminate cases with no diary date, which corresponds to instances where TUDIARYDATE is blank.

Sample SAS code:

```
data cps_resp (keep=tucaseid tufinlwt greg );
  merge cps atusresp_2006;
  by tucaseid;
  if tudarydate ne ' ';
run;
```

The resulting file now has 12,943 records and variables from the Respondent and ATUS-CPS files that are needed to solve the problem.

(File name: cps\_resp):

	TUCASEID	GEREG	TUFINLWGT
1	20060101060001	3	3384574.8596
2	20060101060014	4	3479067.9057
3	20060101060025	3	5825165.4274
4	20060101060033	3	5174447.2742
5	20060101060038	2	6353748.5253
6	20060101060049	3	8193457.4764

Now, merge the combined ATUS-CPS - Respondent file (file name: cps\_resp) with the file that summarizes how much time each respondent spent doing housework on the diary day (file name: housewk). Merge the data files using the common identifying variable TUCASEID.

(File name: cps\_resp\_act):

	TUCASEID	GEREG	TUFINLWGT	housework
3	20060101060025	3	5825165.4274	0
4	20060101060033	3	5174447.2742	10
5	20060101060038	2	6353748.5253	0
6	20060101060049	3	8193457.4764	0
7	20060101060057	2	15175438.457	230
8	20060101060067	1	10618544.227	0

**Step 4:** Apply the appropriate formula.

To calculate the number of persons who reside in the South who did housework on an average day in 2006, apply this formula:

**Number of participants.**  $Num_j$ , the number of persons engaging in activity  $j$  during an average day, is given by

$$Num_j = \sum_i \frac{fwgt_i I_{ij}}{D}$$

where  $fwgt_i$  is the final weight for respondent  $i$ ,  
 $I_{ij}$  is an indicator that equals 1 if respondent  $i$  participated in activity  $j$  during the reference day and 0 otherwise, and  
 $D$  is the number of days in the estimation period (for example, 365 for annual averages for years other than leap years).

The numerator is the sum of the statistical weights for persons in the subpopulation (persons residing in the South who did housework). The denominator is 365, the number of days in 2006.

**Note:** When working with multiple years of ATUS data, the denominator is the sum of all days in the multi-year period. For example, when working with the 2003-06 data combined, the denominator would be 1,461 (365+366+365+365) days.

$fwgt_i I_{ij}$  = TUFINLWGT for persons in the subpopulation

First, restrict the data set to persons who did housework on the diary day (housework > 0) and who live in the South (GEREG = 3).

Sample SAS code:

```
data subpop;
    set cps_resp_act;
    if gereg = 3;
    if housework > 0;
run;
```

The output file contains 1,861 records, one for each respondent who met the selection criteria. Now, sum the weights (TUFINLWGT) for all 1,861 records.

Sample SAS code:

```
proc means data=subpop sum;
    var tufinlwgt;
    output out=summarydata sum(tufinlwgt)=numerator;
run;
```



The output file contains one record; the variable "numerator" is the sum of the statistical weights for the subpopulation.

	_TYPE_	_FREQ_	numerator
1	0	1861	10773706011

Divide the variable "numerator" by 365 to obtain the solution to the problem; here, "result" is the solution:

	_TYPE_	_FREQ_	numerator	result
1	0	1861	10773706011	29517002.769

29,517,003 persons who reside in the South did housework on an average day in 2006.

#### Step 5: Verify your results (if possible)

This estimate does not appear on the 2007 news release tables, but it does match an estimate appearing on an unpublished table, on Summary table 2. Unpublished tables are available from [ATUS staff](https://data.bls.gov/cgi-bin/forms/tus?/tus/home.htm) by filling out a request form online at <https://data.bls.gov/cgi-bin/forms/tus?/tus/home.htm> or by calling (202) 691-6339.

### Example 5

**Step 1:** Objective: Calculate the percent of persons residing in the South who did housework on an average day in 2006.

**Step 2:** Variables and activity codes that are needed:

This step is identical to that shown in example 4.

**Step 3:** Summarize the data to a respondent level

This example begins with the combined ATUS-CPS - Respondent - Activity file, named "cps\_resp\_act," from example 4:

(File name cps\_resp\_act):

	TUCASEID	GEREG	TUFINLWGT	housework
3	20060101060025	3	5825165.4274	0
4	20060101060033	3	5174447.2742	10
5	20060101060038	2	6353748.5253	0
6	20060101060049	3	8193457.4764	0
7	20060101060057	2	15175438.457	230
8	20060101060067	1	10618544.227	0

Recall that this combined data file contains 12,943 records, one for each respondent to the 2006 ATUS. There are four variables: TUCASEID, the case identifier; GREG, which contains information about each respondent's geographic region; TUFINLWGT, the statistical weight assigned to each respondent; and HOUSEWORK, the total minutes each respondent spent doing housework on the diary day.

**Step 4:** Apply the appropriate formula.

**Daily participation rates.**  $P_j$ , the percentage of the population engaging in activity  $j$  on an average day, is computed using

$$P_j = \frac{\sum_i fwgt_i I_{ij}}{\sum_i fwgt_i}$$

where  $I_{ij}$  is an indicator that equals 1 if respondent  $i$  engaged in activity  $j$  during the reference day and 0 otherwise, and  $fwgt_i$  is the final weight for respondent  $i$ .

Note that the numerator is identical to the numerator in example 4. It is the sum of the statistical weights for persons in the subpopulation (persons residing in the South who did housework on their diary day). The denominator is the sum of the statistical weights for all persons residing in the South, whether or not they did housework on the diary day.

$$P_j = \frac{\text{Sum of the statistical weights for persons residing in the South who did housework on the dairy day}}{\text{Sum of the statistical weights for all persons residing in the South}}$$

The numerator is identical to the one calculated in example 4 (the variable "numerator"):

	_TYPE_	_FREQ_	numerator
1	0	1861	10773706011

To finish solving the problem, calculate the denominator and then divide the numerator by the denominator.

Recall that the ATUS-CPS - Respondent - Activity file ("cps\_resp\_act") contains 12,943 records, one for each person who participated in ATUS in 2006. To determine the sum of the statistical weights for persons residing in the South (the denominator), restrict the data set to persons residing in the South (GREG = 3).

Sample SAS code:

```
data subpop_denom;
  set cps_resp_act;
  if greg = 3;
run;
```

There are 4,705 respondents who met the criteria and thus there are 4,705 records appearing in the output file. On the output file, GREG = 3 for all records. The file also includes the total minutes each respondent spent doing housework on the dairy day; this information was needed to calculate the numerator but it is not needed to calculate the denominator.

(File name: subpop\_denom):

	TUCASEID	GREG	TUFINLWGT	housework
39	20060101061275	3	5912125.2082	0
40	20060101061282	3	3539889.3339	0
41	20060101061291	3	12186882.357	5
42	20060101061297	3	1903575.4397	90
43	20060101061443	3	11120161.624	0
44	20060101061456	3	2378633.3536	135

Sum the statistical weights (TUFINLWGT) for all 4,705 respondents; this sum appears as the value for the variable "denominator," below.

Sample SAS code:

```
proc means data=subpop_denom sum;
  var tufinlwt;
  output out=summarydata1 sum(tufinlwt)=denominator;
run;
```

	_TYPE_	_FREQ_	denominator
1	0	4705	30484747591

What percent of persons who reside in the South did housework on an average day in 2006?

$$P_j = \frac{10,773,706,011}{30,484,747,591} = 0.35$$

Multiply the participation rate by 100 to learn that 35 percent of Southerners did housework on an average day in 2006.

**Step 5:** Verify your results (if possible)

This estimate matches one that can be calculated using the results appearing on an ATUS unpublished table, on Summary table 2. Unpublished tables are available from [ATUS staff](#) by filling out a request form online at <https://data.bls.gov/cgi-bin/forms/tus?/tus/home.htm> or by calling (202) 691-6339.

**Example 6****Step 1: Objective:**

Calculate the average hours per day in 2006 that Americans watched TV while they were with at least one own household child under age 18.

**Step 2: Variables and activity codes that are needed:**

TUCASEID (Case identifier, used to link files; appears on all files);

TUFINLWGT (Statistical weight, on the **Respondent file**);

TEAGE (Age of household children and Age of respondent; on the **Roster file**);

TULINENO (Line number of household members and the respondent's own nonhousehold children; on the **Roster file and the Who file**);

TUWHO\_CODE (Information about who was in the room with the respondent; **on the Who file**);

TUACTIVITY\_N (Line number of the activity; on the **Activity file and the Who file**);

TUACTDUR24 (Activity duration in minutes, truncated to a 24-hour day; on the **Activity file**)

TUTIER1CODE, TUTIER2CODE, & TUTIER3CODE (Identify activities, on the **Activity file**)

Activity codes: 120303 and 120304

**Step 3: Summarize the data to a respondent level**

This problem involves working with the trickiest of the ATUS files—the Who file. Take a look at the structure of the Who file (atuswho\_2006):

- Note that an activity number is repeated when multiple persons were present during the activity
- TULINENO indicates the person number for household members and the respondent's nonhousehold children under age 18; if a positive value appears, more information can be learned about the person by linking the Who and Roster files

(File name: atuswho\_2006):

	TUCASEID	TUACTIVITY_N	TRWHONA	TULINENO	TUWHO_CODE
71	20060101060033	11	0	4	22
72	20060101060033	12	0	2	24
73	20060101060033	13	0	2	24
74	20060101060033	14	0	4	22
75	20060101060033	14	0	2	24
76	20060101060033	14	0	3	25

The Who file contains at least one record for each activity each respondent reported (the variable TUACTIVITY\_N is the activity number). It also contains one record for each WHO code reported for each activity. One strategy for working with the Who file involves first summarizing the data to an activity level and then summarizing the data to a respondent level. Before summarizing the data to an activity level, first merge the Who file with the Roster file.

Take a look at the structure of the Roster file:  
(File name: atusrst\_2006):

	TUCASEID	TULINENO	TEAGE	TERRP	TESEX
7	20060101060033	1	19	18	2
8	20060101060033	2	41	24	2
9	20060101060033	3	11	25	2
10	20060101060033	4	0	22	1
11	20060101060038	1	52	18	2
12	20060101060038	2	56	20	1

Start by merging the Who and Roster files by their 2 common identifiers: TUCASEID and TULINENO. If working in SAS, be sure the data are properly sorted before merging the data sets.

Sample SAS code:

```
proc sort data=atuswho_2006; by tucaseid tulinenno; run;
proc sort data=atusrost_2006; by tucaseid tulinenno; run;

data who_rost (keep= tucaseid tuactivity_n tulinenno tuwho_code teage);
  merge atuswho_2006 atusrst_2006;
  by tucaseid tulinenno;
run;
```

(File name: who\_rost):

	TUCASEID	TUACTIVITY_N	TULINENO	TUWHO_CODE	TEAGE
17463	20060112050670	18	3	22	3
17464	20060112050670	6	4	22	0
17465	20060112050670	7	4	22	0
17466	20060112050670	17	4	22	0
17467	20060112050670	18	4	22	0
17468	20060112050671	1	-1	-1	.
17469	20060112050671	10	-1	-1	.
17470	20060112050671	11	-1	55	.
17471	20060112050671	12	-1	-1	.
17472	20060112050671	13	-1	53	.

The resulting file (named "who\_rost") includes information from both the Who and Roster files, for persons identified on both files. The variable TEAGE has a missing value when:

- A respondent spent time with someone who was not on the Roster file<sup>1</sup> and thus that person does not have a TULINENO (corresponding to records with TULINENO = -1 and TUWHO\_CODE > 0);
- A respondent reported sleeping, grooming, or other private activities for which the WHO information is not collected (corresponding to records with TULINENO = -1 and TUWHO\_CODE = -1).

<sup>1</sup> The Roster file contains information about members of each respondent's household and the respondent's own nonhousehold children under age 18.

Identify times when the respondent was in the room with one of the respondent's own household children under age 18. Own household children under 18 can be identified by restricting the data set by TEAGE (TEAGE < 18) and TUWHO\_CODE (TUWHO\_CODE = 22). (TUWHO\_CODE = 22 refers to "own household children.")

Sample SAS code:

```
data ownkids;
    set who_rost;
    if tuwho_code = 22 and teage < 18;
run;
```

Each record on the resulting file (named "ownkids") identifies an activity where at least one household child under age 18 was present. The file contains multiple records for activities in which more than one of the respondent's own household children was present—this is apparent when the data are sorted by TUCASEID and then TUACTIVITY\_N, as shown here:

(File name: ownkids):

	TUCASEID	TUACTIVITY_N	TULINENO	TUWHO_CODE	TEAGE
55	20060101060108	2	2	22	15
56	20060101060108	2	3	22	8
57	20060101060108	2	4	22	7
58	20060101060108	2	5	22	5
59	20060101060108	5	2	22	15
60	20060101060108	5	3	22	8
61	20060101060108	5	4	22	7
62	20060101060108	5	5	22	5
63	20060101060108	6	2	22	15
64	20060101060108	6	3	22	8

Restrict the file "ownkids" such that there is only one record per activity for those activities where an own child under 18 was present. Also, create an indicator variable "child" with a value of "1" indicating the presence of an own household child under age 18.

Sample SAS code:

```
data ownkids2 (keep=tucaseid tuactivity_n child);
    set ownkids;
    by tucaseid tuactivity_n;
    child=1;
    if last.tuactivity_n then output;
run;
```

The file "ownkids2" contains one record for each activity for each respondent where at least one own household child was present. The file contains 47,989 records.

(File name: ownkids2):

	TUCASEID	TUACTIVITY_N	child
1	20060101060014	9	1
2	20060101060033	2	1
3	20060101060033	3	1
4	20060101060033	4	1
5	20060101060033	5	1
6	20060101060033	6	1
7	20060101060033	7	1
8	20060101060033	8	1
9	20060101060033	9	1
10	20060101060033	10	1
11	20060101060033	11	1
12	20060101060033	14	1
13	20060101060033	15	1
14	20060101060033	16	1
15	20060101060033	19	1
16	20060101060033	20	1
17	20060101060033	23	1
18	20060101060049	12	1

Now that the information needed from the Who and Roster file is summarized to an activity level, merge this combined file (named "ownkids2") with the Activity file. This requires using two identifiers: TUCASEID and TUACTIVITY\_N. Keep only the variables needed for the calculation. As in example 1, the variable "code" is created; it is equivalent to the 6-digit activity code. The file that results (named "ownkids2\_act") has 263,286 records, one for each activity reported by each respondent in 2006.

Sample SAS code:

```
data ownkids2_act (keep=tucaseid tuactivity_n child code tuactdur24);
  merge ownkids2 atusact_2006;
  by tucaseid tuactivity_n;
  code=tutier1code||tutier2code||tutier3code;
run;
```

(File name: ownkids2\_act):

	TUCASEID	TUACTIVITY_N	child	TUACTDUR24	code
46	20060101060033	1	.	180	010101
47	20060101060033	2	1	20	030101
48	20060101060033	3	1	120	030103
49	20060101060033	4	1	60	030101
50	20060101060033	5	1	10	180701
51	20060101060033	6	1	60	070101
52	20060101060033	7	1	10	180701
53	20060101060033	8	1	60	070101
54	20060101060033	9	1	10	180701
55	20060101060033	10	1	20	030101
56	20060101060033	11	1	45	030101
57	20060101060033	12	.	10	020104
58	20060101060033	13	.	60	020201
59	20060101060033	14	1	60	110101

Note that the variable “child” has missing values for times when an own household child under 18 was not present during the activity.

Now, sum the activity-level file (named “ownkids2\_act”) to a respondent level. Similar to the technique used in earlier examples, it is helpful to create a respondent-level variable that, for each respondent, will be equivalent to the total time the respondent spent watching TV while in the room with an own household child. Watching TV is identified by two codes: 120303 and 120304. The presence of an own household child during the activity is indicated by child = 1.

Sample SAS code:

```
data tv_child (keep=tucaseid tvchild);
  set ownkids2_act;
  by tucaseid;
  if first.tucaseid then tvchild=0;
  if code in ('120303', '120304') and child=1 then tvchild+tuactdur24;
  if last.tucaseid then output;
run;
```

The resulting file (named “tv\_child”) has 12,943 records, one for each respondent in 2006. The variable “tvchild” contains the number of minutes that each respondent spent watching TV while sharing the room with an own household child under age 18.



(File name: tv\_child):

	TUCASEID	tvchild
39	20060101060714	0
40	20060101060716	0
41	20060101060740	0
42	20060101060749	160
43	20060101060753	120
44	20060101060768	0
45	20060101060785	0
46	20060101060809	100
47	20060101060818	0
48	20060101060823	0

Next, merge the file "tv\_child" with the Respondent file to obtain the statistical weights. Merge the files using the common identifier TUCASEID.

Sample SAS code:

```
data together (keep=tucaseid tufinlwgt tvchild);
    merge tv_child atusresp_2006;
    by tucaseid;
run;
```

The file "together" contains 12,943 records, one for each respondent in 2006. It also contains all the data necessary to solve the problem, summarized to the respondent level.

(File name: together):

	TUCASEID	tvchild	TUFINLWGT
1	20060101060001	0	3384574.8596
2	20060101060014	0	3479067.9057
3	20060101060025	0	5825165.4274
4	20060101060033	30	5174447.2742
5	20060101060038	0	6353748.5253
6	20060101060049	0	8193457.4764

**Step 4:** Apply the appropriate formula.

The final part of the calculation is identical to example 1. Use this formula:

**Average hours per day.**  $\bar{T}_j$ , the average number of hours per day spent by a given population engaging in activity  $j$ , is given by

$$\bar{T}_j = \frac{\sum_i fwt_i T_{ij}}{\sum_i fwt_i}$$

where  $T_{ij}$  is the amount of time spent in activity  $j$  by respondent  $i$ , and  $fwt_i$  is the final weight for respondent  $i$ .

Follow the same steps as in example 1. The results are shown below. The variables "numerator" and "denominator" refer to the numerator and denominator for the formula shown above. The variable "tot\_tvchild" is the final result, the numerator divided by the denominator.

	_TYPE_	_FREQ_	denominator	numerator	tot_tvchild
1	0	12943	85089676117	1.5293158E12	17.972988482

Americans spent 18 minutes per day on average watching TV while their own household children under age 18 were present in the room.

If this estimate seems low, recall that it includes all persons in the U.S. civilian population age 15 and over, whether or not they lived in households with children.

**Step 5:** Verify your results (if possible)

This estimate is not available in an ATUS table (although it has been independently programmed and verified).

## APPENDIX K: Linking ATUS files to CPS files

One of the strengths of the ATUS is that the data files can be linked to data files from the Current Population Survey (CPS), a large monthly household survey sponsored by the Bureau of Labor Statistics and conducted by the Census Bureau.

Households selected to participate in the CPS are contacted for an interview each month for four months. They are then contacted eight months later for another four monthly interviews. For example, a household first contacted for an interview in April 2002 would be contacted for an interview in April 2002, May 2002, June 2002, and July 2002, and then again in April 2003, May 2003, June 2003, and July 2003. These monthly interviews are known as the Basic CPS. The month of the eighth interview is known as the MIS-8 month (or the Month-in-sample 8 month). The CPS rotation scheme is shown in Appendix L.

Additionally, CPS supplement surveys on specific topics are conducted periodically. These are generally added to the Basic CPS survey for a given month. Some supplements are conducted on a regular basis. . Other supplements are conducted on a less regular basis.

ATUS data files can be linked to the Basic CPS files as well as to CPS supplement files. The ATUS files can be linked to the CPS files using information on the ATUS-CPS file. There is no one variable that uniquely identifies a person or a household; a number of different variables must be used to link files.

The CPS file format changed in May 2004, and some variables previously used for linking were removed. This document will discuss how to link to files before May 2004 and also during or after May 2004. CPS variable names in this document are based on the CPS data dictionaries available at the Census CPS Web site (<https://www.census.gov/programs-surveys/cps/data/datasets.html>).

One thing researchers should keep in mind when linking ATUS data files to CPS files is that there may be a considerable time difference in when the interviews occurred. The eighth CPS interview (MIS-8) occurred two to five months prior to the ATUS interview. The fourth CPS interview (MIS-4) occurred a year and two to five months prior to the ATUS interview.

Even though it is possible to link CPS supplements to ATUS data, the interview dates may be so far apart that researchers may not want to use the information. For example, a CPS household responding to a CPS supplement in their first CPS interview (MIS-1) may not be interviewed for ATUS for another 20 months.

This appendix covers the following topics:

I. Linking ATUS Files to CPS files

- I.A. Linking the ATUS-CPS file to the eighth Basic CPS Interview (MIS-8)
- I.B. Linking the ATUS-CPS to a particular Basic CPS month (not necessarily the final interview)
- I.C. Linking the ATUS-CPS file to CPS supplements other than ASEC (March supplement)
- I.D. Linking the ATUS-CPS file to the ASEC (March supplement)

II. Linking CPS files to other CPS files or CPS supplements

- II.A. Linking Basic CPS files to other Basic CPS files or to CPS supplements other than ASEC (March supplement)
- II.B. Linking Basic March CPS files to the ASEC (March supplement) files
- II.C. Linking two ASEC (March supplement) files

III. Common problems

IV. Obtaining CPS data and documentation

## I. Linking ATUS files to CPS Files

### I.A. Linking the ATUS-CPS file to the eighth Basic CPS Interview (MIS-8)

The ATUS-CPS file contains almost all of the information available on the Basic CPS files, with a few exceptions (such as some geographic variables). To obtain such information, researchers must link the ATUS-CPS file to the eighth Basic CPS interview file. (For a detailed list of variables that are on the Basic CPS files and not on the ATUS-CPS file, please see the ATUS-CPS data dictionaries at <https://www.bls.gov/tus/dictionaries.htm>.)

Because the eighth CPS interview occurs two to five months prior to the ATUS interview, fifteen months of CPS files—from August to October of the following year—link to a given ATUS-CPS file. For example, CPS files from August 2003 to October 2004 link to the 2004 ATUS-CPS file.

Due to the May 2004 format change in CPS, researchers must use one set of variables to link cases whose eighth CPS interview occurred before May 2004, and another set to link cases whose eighth CPS interview occurred during or after May 2004. The fields HRMONTH and HRYEAR4 identify when the eighth CPS interview occurred.

#### 1. When the eighth CPS interview (MIS-8) occurred prior to May 2004

If the following condition is true:

1.  $\text{HRYEAR4} \leq 2003$  OR ( $\text{HRYEAR4} = 2004$  and  $\text{HRMONTH} < 5$ )

then use the following variables to link:

- HRHHID
- PULINENO
- HRMONTH
- HRYEAR4
- HRSERSUF

Note that HRSERSUF has different default values in the ATUS-CPS file and the CPS files available for download on the Census CPS FTP Web site. Failure to account for this will result in many mismatches.

#### 2. When the eighth CPS interview (MIS-8) occurred during or after May 2004

If the following condition is true:

- $\text{HRYEAR4} > 2004$  or ( $\text{HRYEAR4} = 2004$  and  $\text{HRMONTH} \geq 5$ )

then use the following variables to link:

- HRHHID
- PULINENO
- HRMONTH
- HRYEAR4
- HRHHID2

**Example: Linking the 2004 ATUS-CPS file to Basic CPS (MIS-8) files**

Basic CPS files for August 2003 through October 2004 link to the 2004 ATUS-CPS file. Because of the May 2004 format change, two sets of linking variables are needed.

1. Link the 2004 ATUS-CPS file to Basic CPS files for months prior to May 2004 using:

- HRHHID
- PULINENO
- HRMONTH
- HRYEAR4
- HRSERSUF

All 2004 ATUS records where  $\text{HRYEAR4} = 2003$  OR ( $\text{HRYEAR4} = 2004$  and  $\text{HRMONTH} < 5$ ) will match to a Basic CPS record from August 2003 through April 2004. The ATUS selects only a subset of those who were interviewed for CPS, so there will be many CPS records for which there is no corresponding ATUS record. Delete all records for which there is no match. The remaining records comprise FILE1.

2. Link to CPS files for May 2004 and later months using:

- HRHHID
- PULINENO
- HRMONTH
- HRYEAR4
- HRHHID2

All 2004 ATUS records where ( $\text{HRYEAR4} = 2004$  and  $\text{HRMONTH} \geq 5$ ) will match to a Basic CPS record from May 2004 through October 2004. The ATUS selects only a subset of those who were interviewed for CPS, so there will be many CPS records for which there is no corresponding ATUS record. Delete all records for which there is no match. The remaining records comprise FILE2.

3. Concatenate FILE1 and FILE2. The remaining file should have exactly the same number of records as does the ATUS-CPS file.

4. To verify that the linking was done correctly, compare the values of age (PRTAGE on the ATUS-CPS file and PEAGE on the Basic CPS), sex (PESEX), and race (PTDTRACE on the ATUS-CPS file and PRDTRACE on the Basic CPS). There should be no differences.

**I.B. Linking the ATUS-CPS file to a particular Basic CPS month (not necessarily the final interview)**

Researchers may wish to know how Basic CPS questions were answered in a given month, especially if they are looking at CPS supplement data for that month.

Linking the ATUS-CPS file to a specific non-MIS-8 Basic CPS month requires using different linking variables than does linking to an MIS-8 month.

## 1. When the Basic CPS month occurred prior to May 2004

- Identify all possible MIS-8 months for the particular Basic CPS month. For assistance with this step, refer to Appendix L and the example below.
- If all possible MIS-8 months are prior to May 2004, the Basic CPS file and the ATUS-CPS file can be linked using the following variables:
  - HRHHID
  - PULINENO
  - HUHNUM
  - HRSERSUF
  - HRSAMPLE

Note that HRSERSUF has different default values in the ATUS-CPS file and the CPS files available for download on the Census CPS Web site. Failure to account for this will result in many mismatches.

- If at least one possible MIS-8 month is May 2004 or later

Several variables must first be defined:

- On the ATUS-CPS file:
  - HUHNUM  
If HRHHID2 ≠ -1 then HUHNUM = last digit of HRHHID2  
(The restriction ensures that valid values of HUHNUM are not overwritten)
  - HRSERSUF  
If HRHHID2 ≠ -1 then HRSERSUF = digits 3 and 4 of HRHHID2 converted to alpha characters (00 = blank, 01 = A, 02 = B, etc.)  
(The restriction ensures that valid values of HRSERSUF are not overwritten)
  - NumHRSAMPLE  
If HRHHID2 ≠ -1 then NumHRSAMPLE = digits 1 and 2 of HRHHID2  
If HRHHID2 = -1 then NumHRSAMPLE = numeric part of HRSAMPLE (characters 2 and 3)
- On the Basic CPS file:
  - NumHRSAMPLE = numeric part of HRSAMPLE (characters 2 and 3)
- Link the Basic CPS files to the ATUS-CPS file using the following variables:
  - HRHHID
  - PULINENO
  - HUHNUM
  - HRSERSUF
  - NumHRSAMPLE

Note that HRSERSUF has different default values in the ATUS-CPS file and the CPS files available for download on the Census CPS Web site. Failure to account for this will result in many mismatches.

2. When the CPS month is from May 2004 or later, link the Basic CPS file and the ATUS-CPS file using the following variables:

- HRHHID
- PULINENO
- HRHHID2

Example: Linking the 2004 ATUS-CPS file to the 2004 Basic April CPS (not just MIS-8)

1. Since April 2004 is prior to May 2004, first identify all possible MIS-8 months for households receiving the 2004 Basic April CPS.

Refer to Appendix L, and take Year 1 to be 2004. Those households interviewed for April 2004 were D, C, B, A, PP, OO, NN, and MM. Those in MM had an MIS-8 month of April 2004, but all of the other groups had other MIS-8 months. Those in NN, OO, and PP had MIS-8 months of May 2004, June 2004, and July 2004 respectively. The other four groups—D, C, B, and A—had MIS-8 months of July 2005, June 2005, May 2005, and April 2005 respectively. The 2004 ATUS-CPS file can only be linked to the households that had MIS-8 months in 2004. Therefore, possible MIS-8 months are April 2004, May 2004, June 2004, and July 2004.

Since May 2004, June 2004, and July 2004 are all from May 2004 or later, several variables must be defined before linking can occur.

2. Define three new linking variables on the ATUS-CPS file:

- If HRHHID2  $\neq$  -1 then HUUHNUM = last digit of HRHHID2
- If HRHHID2  $\neq$  -1 then HRSERSUF = digits 3 and 4 of HRHHID2 converted to alpha characters (01 = A, 02 = B, etc.)
- If HRHHID2  $\neq$  -1 then NumHRSAMPLE = digits 1 and 2 of HRHHID2  
If HRHHID2 = -1 then NumHRSAMPLE = numeric part of HRSAMPLE (digits 2 and 3)

3. Define one new linking variable on the Basic April CPS file:

- NumHRSAMPLE= numeric part of HRSAMPLE (digits 2 and 3)

4. Link the Basic April CPS and the ATUS-CPS file using:

- HRHHID
- PULINENO
- HUUHNUM
- HRSERSUF
- NumHRSAMPLE

Many ATUS-CPS records will not have a CPS match. Many CPS records will not have an ATUS-CPS match. Delete all records that do not have a match. The remaining records comprise all members of households that were interviewed for the April 2004 Basic CPS and who were selected to be contacted for an ATUS interview.

The remaining file will have fewer than the total number of records on the ATUS-CPS file with HRYEAR4 = 2004 and HRMONTH = 4, 5, 6, or 7. All records in the ATUS-CPS file with HRYEAR4 = 2004 and HRMONTH = 4—in other words, those records with an MIS-8 month of April—should match to the April 2004 Basic CPS. While every ATUS-CPS record matches to

an MIS-8 record, this is not true of other MIS months. A household could have missed its MIS-7 monthly interview, for example, and still have received an MIS-8 monthly interview.

5. To verify that the linking was done correctly, compare values of sex (PESEX) and race (PRDTRACE on the 2004 Basic April CPS and PTDTRACE on the ATUS-CPS file). There should only be a very small number of records that do not match on these two variables.

### I.C. Linking the ATUS-CPS file to CPS supplements other than ASEC (March supplement)

Section IV of this appendix contains links to a list of CPS supplements.

#### 1. When the CPS supplement file occurred prior to May 2004

- Identify all possible MIS-8 months that could have received the supplement. For assistance with this step, refer to Appendix L and the example below.
- If all possible MIS-8 months are prior to May 2004 then use the following variables to link:
  - HRHHID
  - PULINENO
  - HRSERSUF
  - HUHNUM
  - HRSAMPLE

Note that HRSERSUF has different default values in the ATUS-CPS file and the CPS files available for download on the Census CPS Web site. Failure to account for this will result in many mismatches.

- If at least one possible MIS-8 month is May 2004 or later

Several variables must first be defined:

- On the ATUS-CPS file:
  - HUHNUM  
If HRHHID2 ≠ -1 then HUHNUM = last digit of HRHHID2  
(This restriction will ensure that you do not overwrite previous valid values of HUHNUM)
  - HRSERSUF  
If HRHHID2 ≠ -1 then HRSERSUF = digits 3 and 4 of HRHHID2 converted to alpha characters (00 = blank, 01 = A, 02 = B, etc.)  
(This restriction will ensure that you do not overwrite previous valid values of HRSERSUF)
  - NumHRSAMPLE  
If HRHHID2 ≠ -1 then NumHRSAMPLE = digits 1 and 2 of HRHHID2  
If HRHHID2 = -1 then NumHRSAMPLE = numeric part of HRSAMPLE (characters 2 and 3)
- On the Basic CPS file:
  - NumHRSAMPLE = numeric part of HRSAMPLE (characters 2 and 3)



- Link the Basic CPS to the ATUS-CPS file using the following variables:
  - HRHHID
  - PULINENO
  - HUHNUM
  - HRSERSUF
  - NumHRSAMPLE

Note that HRSERSUF has different default values in the ATUS-CPS file and the CPS files available for download on the Census CPS Web site. Failure to account for this will result in many mismatches.

**2. If the CPS supplement is from May 2004 or later, link the CPS supplement and the ATUS-CPS file using the following variables:**

- HRHHID
- HRHHID2
- PULINENO

Example: Linking the 2003, 2004, and 2005 ATUS-CPS files to the October 2003 Internet and Computer Use supplement

1. Since October 2003 is prior to May 2004, first identify all possible MIS-8 months that could have received the October 2003 Internet and Computer Use supplement.

Refer to Appendix L, and take Year 1 to be 2003. Households interviewed in October 2003 were in J, I, H, G, VV, UU, TT, and SS. Those in SS had October 2003 as their MIS-8 month, but all of the other groups had other MIS-8 months. Those in TT, UU, and VV had MIS-8 months of November 2003, December 2003, and January 2004 respectively. The other four groups - J, I, H, and G - had MIS-8 months of January 2005, December 2004, November 2004, and October 2004 respectively. Therefore, possible MIS-8 months are November 2003, December 2003, January 2004, October 2004, November 2004, December 2004, and January 2005.

Since October 2004, November 2004, December 2004, and January 2005 are all later than May 2004, several variables must be defined before linking can occur.

2. Define three new linking variables on the 2003-2005 ATUS-CPS files:

- If HRHHID2 ≠ -1 or missing then HUHNUM = last digit of HRHHID2
- If HRHHID2 ≠ -1 or missing then HRSERSUF = digits 3 and 4 of HRHHID2 converted to alpha characters (01 = A, 02 = B, etc.)
- If HRHHID2 ≠ -1 or missing then NumHRSAMPLE = digits 1 and 2 of HRHHID2  
If HRHHID2 = -1 or missing then NumHRSAMPLE = numeric part of HRSAMPLE (digits 2 and 3)

3. Define one new linking variable on the October 2003 Internet and Computer Use supplement file:

- NumHRSAMPLE= numeric part of HRSAMPLE (digits 2 and 3)

4. Link the October 2003 Internet and Computer Use supplement and the 2003-2005 ATUS-CPS file using:

- HRHHID
- PULINENO
- HUUHNUM
- HRSERSUF
- NumHRSAMPLE

Many ATUS-CPS records will not have a match to the October 2003 Internet and Computer Use supplement. Many October 2003 Internet and Computer Use supplement records will not have a match to the ATUS-CPS file. Delete all records that do not have a match. The remaining records comprise all members of households that were interviewed for the October 2003 Internet and Computer Use supplement and who were selected to be contacted for an ATUS interview.

The remaining file will have fewer than the total number of records on the ATUS-CPS file with (HRYEAR4 = 2004 and HRMONTH = 1, 10, 11, 12) or (HRYEAR4 = 2003 and HRMONTH = 10, 11, or 12) or (HRYEAR4 = 2005 and HRMONTH = 1). This is because not everyone who could have been interviewed for the October 2003 Internet and Computer Use supplement actually was interviewed.

5. To verify that the linking process worked correctly, compare the values of sex (PESEX) and race (PTDTRACE on the ATUS-CPS file and PRDTRACE on the October 2003 Internet and Computer Use supplement). There should be only a very small number of records that do not match on these two variables.

#### I.D. Linking the ATUS-CPS file to the CPS ASEC (March supplement)

Linking to the ASEC (March supplement) is particularly difficult for several reasons. Two variables used for linking, HRSERSUF and HRSAMPLE, are not included on the ASEC file prior to 2005. In order to increase the sample size, CPS includes two oversamples in the ASEC—the SCHIPS and Hispanic oversamples. The ATUS-CPS files do not include the CPS SCHIPS or Hispanic oversamples, and steps must be taken to exclude these when matching 2003 and 2004 ATUS files to ASEC files. Because of the complexity of the linking, there are directions on how to link to each year. Note in particular that the value of H-SEQ is different in 2003 and 2004.

##### Linking 2003 ATUS-CPS to 2003 CPS ASEC (March supplement)

1. Restrict the 2003 ASEC to:

- $5 \leq \text{H-MIS} \leq 8$  AND
- $\text{H-SEQ} \leq 78864$  AND
- $\text{A-FNLWGT} > 0$

The first restriction will limit the ASEC file to the more recent of the two interviews (most households receive the ASEC interview twice). Since the linking variables available on the ASEC file do not uniquely identify households, it also reduces the likelihood of false matches. The last two restrictions ensure that the SCHIPS and Hispanic oversamples are removed; without this step, there will be duplicate household identification and person line numbers.

## 2. Restrict the 2003 ATUS-CPS file to:

- HRYEAR4 = 2003 AND
- HRMONTH = 3, 4, 5, or 6

Since the linking variables available on the ASEC file do not uniquely identify households, this step reduces the likelihood of false matches.

## 3. Link the 2003 ATUS-CPS file and the 2003 ASEC using:

- Household identification number
  - HRHHID on the ATUS-CPS file
  - H-IDNUM on the ASEC file
- Person line number
  - PULINENO on the ATUS-CPS file
  - A-LINENO on the ASEC file
- Household number
  - HUHNUM on the ATUS-CPS file
  - H-HHNUM on the ASEC file

## 4. After the linking, there will be a small number of duplicates and mismatches. This is because the linking variables available on the ASEC file do not uniquely identify households. Use the following variables to eliminate mismatches and duplicates:

- Age
  - PRTAGE on the ATUS-CPS file
  - A-AGE on the ASEC file

Caution: the information on the ATUS-CPS file may have been collected at a later date than the ASEC file, and so age may be greater
- Sex
  - PESEX on the ATUS-CPS file
  - A-SEX on the ASEC file

In 2003, race is not a good screening variable because new definitions were introduced and it is missing for much of the ATUS-CPS file.

**Linking 2004 ATUS-CPS to 2004 CPS ASEC (March supplement)**

## 1. Restrict the 2004 ASEC to:

- $5 \leq H-MIS \leq 8$  AND
- $H-SEQ \leq 78575$  AND
- $A-FNLWGT > 0$

The first restriction will limit the ASEC file to the more recent of the two interviews (each household receives the ASEC questions twice). Since the linking variables available on the ASEC file do not uniquely identify households, it also reduces the likelihood of false matches. The last two restrictions ensure that the SCHIPS and Hispanic oversamples are removed; without this step, there will be duplicate household ID and line numbers.

## 2. Restrict the 2004 ATUS-CPS file to:

- HRYEAR4 = 2004 AND
- HRMONTH = 3, 4, 5, or 6

Since the linking variables available on the ASEC file do not uniquely identify households, this step reduces the likelihood of false matches.

3. Define HUUHNUM for HRMONTH  $\geq 5$

- If HRMONTH  $\geq 5$  THEN HUUHNUM = last digit of HRHHID2

The variable HUUHNUM is missing (-1) on the ATUS-CPS file for records with HRYEAR4 = 2004 and HRMONTH  $\geq 5$  and must be recreated in order to link properly.

4. Link the 2004 ATUS-CPS file and the 2004 ASEC using:

- Household identification number
  - HRHHID on the ATUS-CPS file
  - H-IDNUM on the ASEC file
- Person line number
  - PULINENO on the ATUS-CPS file
  - A-LINENO on the ASEC file
- Household number
  - HUUHNUM on the ATUS-CPS file
  - H-HHNUM on the ASEC file

5. After the linking, there will be a small number of duplicates and mismatches. This is because the linking variables available on the ASEC file do not uniquely identify households. Use the following variables to eliminate mismatches and duplicates:

- Age
  - PRTAGE on the ATUS-CPS file
  - A-AGE on the ASEC file

Caution: the maximum value for age changed in May 2004, and so some age mismatches may not really be mismatches. Some of those over age 85 are coded as 80 on one file and 85 on the other. Also, remember that the information on the ATUS-CPS file may have been collected at a later date than the ASEC file, and so age may be greater.
- Sex
  - PESEX on the ATUS-CPS file
  - A-SEX on the ASEC file
- Race
  - PTDTRACE on the ATUS-CPS file
  - PRDTRACE on ASEC file

**Linking ATUS-CPS to CPS ASEC (March supplement) for years 2005 and later**

1. Restrict the ASEC to:

- $5 \leq H-MIS \leq 8$  AND
- $A-FNLWGT > 0$

The first restriction will limit the ASEC file to the more recent of the two interviews (each household receives the ASEC questions twice). Since the linking variables available on the ASEC file do not uniquely identify households, it also reduces the likelihood of false matches. The second restriction ensures that the Hispanic oversample is removed.

## 2. Restrict the ATUS-CPS file to:

- HRYEAR4 = year of ATUS-CPS data file AND
- HRMONTH = 3, 4, 5, or 6

Since the linking variables available on the ASEC file do not uniquely identify households, this step reduces the likelihood of false matches.

## 3. Link the ATUS-CPS file and the ASEC using:

- Household identification number (part 1)
  - HRHHID on the ATUS-CPS file
  - H-IDNUM1 on the ASEC file
- Household identification number (part 2)
  - HRHHID2 on the ATUS-CPS file
  - H-IDNUM2 on the ASEC file
- Person line number
  - PULINENO on the ATUS-CPS file
  - A-LINENO on the ASEC file

## II. Linking CPS files to other CPS files or supplements

Some ATUS data users also have questions about how to link CPS data files to other CPS data files. The following instructions are included for those who are trying to link only CPS data files and not ATUS files. These instructions cover three different scenarios:

- How to link Basic CPS files to other Basic CPS files or Basic CPS files to CPS supplement files
- How to link Basic March CPS files to the ASEC (March supplement) files
- How to link two ASEC files

### II.A. Linking Basic CPS files to other Basic CPS files or to CPS supplements (other than ASEC/March supplement)

1. When both CPS files (or both the CPS file and the CPS supplement) occurred prior to May 2004, then use the following variables to link:
  - HRHHID
  - PULINENO
  - HRSERSUF
  - HUUHNUM
  - HRSAMPLE
2. If one file is prior to May 2004 and the other is May 2004 or later, then several variables must be defined:
  - on the later CPS file (May 2004 or later):
    - HUUHNUM = last digit of HRHHID2
    - HRSERSUF = digits 3 and 4 of HRHHID2 converted to alpha characters (00 = -1 or default value, 01 = A, 02 = B, etc.)
    - NumHRSAMPLE = digits 1 and 2 of HRHHID2
  - on the earlier CPS file (prior to May 2004):
    - NumHRSAMPLE = numeric part of HRSAMPLE (characters 2 and 3)
  - Use the following variables to link:
    - HRHHID
    - PULINENO
    - HUUHNUM
    - HRSERSUF
    - NumHRSAMPLE
3. If both files are May 2004 or later, use the following variables to link:
  - HRHHID
  - HRHHID2
  - PULINENO

Example: Linking the 2004 Basic April CPS file to the 2005 Basic April CPS

1. Since April 2004 is prior to May 2004 and April 2005 is after May 2004, several variables must be defined before linking can occur.

2. Define three new linking variables on the 2005 Basic April CPS file:

- HUUHNUM = last digit of HRHHID2
- HRSERSUF = digits 3 and 4 of HRHHID2 converted to alpha characters (00 = -1, 01 = A, 02 = B, etc.)
- NumHRSAMPLE = digits 1 and 2 of HRHHID2

3. Define one new linking variable on the 2004 Basic April CPS file:

- NumHRSAMPLE= numeric part of HRSAMPLE (digits 2 and 3)

4. Link the 2004 Basic April CPS file and the 2005 Basic April CPS file using:

- HRHHID
- PULINENO
- HUUHNUM
- HRSERSUF
- NumHRSAMPLE

Many records will not match. This is due to the fact that many of those who were interviewed for the 2004 Basic April CPS were not interviewed for the 2005 Basic April CPS. Delete all records that do not have a match.

5. To verify that the linking was done correctly, compare values of sex (PESEX) and race (PRDTRACE). There should only be a very small number of records that do not match on these two variables.

## II.B. Linking Basic March CPS files to ASEC (March supplement) files of the same year

Linking the Basic March CPS file to the ASEC file is difficult prior to 2005 because the linking variables HRSERSUF and HRSAMPLE are not on the ASEC. The linking variables that remain - HRHHID, HUUHNUM, and PULINENO - do not uniquely identify individuals or households. This results in some incorrect matches. From 2005 onward, the presence of the variable HRHHID2, which incorporates the information that was formerly in HRSERSUF and HRSAMPLE, makes linking much easier.

(Note that the variable H-MIS, which indicates the record's month-in-sample, is not always accurate on the ASEC file. Records that are given the ASEC because they are part of a CPS oversample may have incorrect values of H-MIS.)

### Linking the 2003 and/or 2004 Basic March CPS to the ASEC (March supplement) of the same year

1. Link the Basic March CPS to the ASEC of the same year using:

- HRHHID
- PULINENO
- HUUHNUM

1. Screen for duplicates and mismatches. These occur because the linking variables available on the ASEC file do not uniquely identify households. Use the following variables to eliminate mismatches and duplicates:
  - Age
    - PEAGE on the Basic March CPS file
    - A-AGE on the ASEC file
  - Sex
    - PESEX on the Basic March CPS file
    - A-SEX on the ASEC file
  - Race
    - PRDTRACE on Basic March CPS file and ASEC file

### Linking the 2005 or later Basic March CPS to the ASEC (March supplement) of the same year

Link the Basic March to the ASEC of the same year using:

- HRHHID
- PULINENO
- HRHHID2

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### II.C. Linking two ASEC (March supplement) files

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The ASEC file is the most difficult of the CPS supplements to link. This is due to a number of factors:

- The linking variables of HRSERSUF and HRSAMPLE are not on the ASEC prior to 2005 (from 2005 onward, the presence of the variable HRHHID2, which incorporates the information that was formerly in HRSERSUF and HRSAMPLE, makes linking much easier). The linking variables that remain—HRHHID, HUHHNUM, and PULINENO—do not uniquely identify individuals or households. This results in some incorrect matches.
- In order to increase sample size, the ASEC includes two oversamples—known as the SCHIPS and the Hispanic oversamples. When the oversampled records were included in the ASEC file, the variable identifying the month was changed to 3 to protect confidentiality. This means that—prior to 2005—these oversampled cases could not be identified.
- Some oversampled individuals are interviewed only once for ASEC. These are individuals who are oversampled because of their unusual demographic characteristics (for example, mixed race households with children). As they are interviewed only once for the ASEC, there are no matches for these cases.

(Note that the variable H-MIS, which indicates the record's month-in-sample, is not always accurate on the ASEC file. Records that are given the ASEC because they are part of a CPS oversample may have incorrect values of H-MIS.)

### Linking the 2003 ASEC to the 2004 ASEC

1. Link the 2003 Basic March CPS to the 2003 ASEC (March supplement) using the instructions in II.B
2. Link the 2004 Basic March CPS to the 2004 ASEC (March supplement) using the instructions in II.B



3. Link the two merged Basic-ASEC files using the following variables:

- HRHHID
- PULINENO
- HUUHNUM
- HRSAMPLE
- HRSERSUF

Many 2003 ASEC records will not link to 2004 ASEC records. Delete all records that do not have matches.

This method will also work for linking the 2002 ASEC to the 2003 ASEC.

#### Linking the 2004 ASEC to the 2005 ASEC

1. Link the 2004 Basic March to the 2004 ASEC using the instructions in II.B

2. On the merged 2004 Basic-ASEC file define:

- NumHRSAMPLE = Numeric part of HRSAMPLE (positions 2 and 3)
- NumHRSERSUF = convert alpha character into a numeric (A=1, B=2, etc.)

3. On the 2005 ASEC define:

- NumHRSAMPLE = Digits 1 and 2 of HRHHID2
- NumHRSERSUF = Digits 3 and 4 of HRHHID2

4. Link the merged 2004 Basic-ASEC file and the 2005 ASEC using the following variables:

- HRHHID
- PULINENO
- HUUHNUM
- NumHRSAMPLE
- NumHRSERSUF

Many 2004 ASEC records will not link to 2005 ASEC records. Delete all records that do not have matches.

#### Linking two ASEC files from 2005 or later

1. Link the two ASEC files using the following variables:

- HRHHID
- HRHHID2
- PULINENO

Many ASEC records from one year will not link to ASEC records from the other. Delete all records that do not have matches.

### III. Common problems

Linking can be a frustrating and lengthy process. Researchers who are having trouble linking should examine four things in particular:

1. Variable type and length  
Sometimes files obtained from different places will have different types and/or lengths for linking variables. For example, one file may have HRHHID as a numeric field and another may have it as a character field. Some software packages will not allow you to merge variables of the same name that have different characteristics or lengths.
2. Leading zeros  
Some sources of the data have leading zeros on certain fields and some do not. For example, some versions of the CPS files have leading zeros on HRHHID and others do not.
3. Variable defaults  
Some sources of the data have different default values for missing variables. For example, the default value of HRSERSUF appears in some datasets as -1 and in others as a blank.
4. Variable names  
Some sources of the data have different variable names for the same variable. Variable names in this document are based on the data dictionaries on the Census CPS Web site (<https://www.census.gov/programs-surveys/cps/data/datasets.html>).

#### IV. Obtaining CPS data and documentation

##### Basic CPS, CPS Supplements, and Complete Technical Documentation

Basic CPS data files, CPS supplement data files, including CPS ASEC (March supplement), and survey documentation are available at:

- CPS data files and data dictionaries: <https://www.census.gov/programs-surveys/cps/data/datasets.html>
- CPD technical documentation: <https://www.census.gov/programs-surveys/cps/technical-documentation.html>

## APPENDIX L: Basic CPS Rotation

This appendix is intended as an aid for researchers who wish to link ATUS and CPS data. The CPS sample rotation scheme is complicated and is not fully described in this appendix. More detailed information about the CPS rotation and sample can be found in CPS Technical Paper 77

<https://www.census.gov/programs-surveys/cps/technical-documentation/complete.html>.

The CPS rotation scheme follows a 4-8-4 pattern. A given household is in the sample for four consecutive months, not in the sample for the next eight consecutive months, and in the sample again for the next four consecutive months.

The following table illustrates the CPS rotation scheme. Each group - represented by a letter or a letter/number combination - is interviewed for a total of eight months. For example, a household first interviewed in May (month-in-sample 1 or MIS-1) would be interviewed again in June (MIS-2), July (MIS-3), and August (MIS-4). The household would then be out of the sample for eight months and would not be interviewed again until May of the following year (MIS-5). The final three interviews would occur in June (MIS-6), July (MIS-7), and August (MIS-8) of the following year.

		Month-in-sample (MIS)							
		MIS-1	MIS-2	MIS-3	MIS-4	MIS-5	MIS-6	MIS-7	MIS-8
Year 1	January	A	XX	WW	VV	MM	L1	K1	J1
	February	B	A	XX	WW	NN	MM	L1	K1
	March	C	B	A	XX	OO	NN	MM	L1
	April	D	C	B	A	PP	OO	NN	MM
	May	E	D	C	B	QQ	PP	OO	NN
	June	F	E	D	C	RR	QQ	PP	OO
	July	G	F	E	D	SS	RR	QQ	PP
	August	H	G	F	E	TT	SS	RR	QQ
	September	I	H	G	F	UU	TT	SS	RR
	October	J	I	H	G	VV	UU	TT	SS
	November	K	J	I	H	WW	VV	UU	TT
	December	L	K	J	I	XX	WW	VV	UU
Year 2	January	M	L	K	J	A	XX	WW	VV
	February	N	M	L	K	B	A	XX	WW
	March	O	N	M	L	C	B	A	XX
	April	P	O	N	M	D	C	B	A
	May	Q	P	O	N	E	D	C	B
	June	R	Q	P	O	F	E	D	C
	July	S	R	Q	P	G	F	E	D
	August	T	S	R	Q	H	G	F	E
	September	U	T	S	R	I	H	G	F
	October	V	U	T	S	J	I	H	G
	November	W	V	U	T	K	J	I	H
	December	X	W	V	U	L	K	J	I

## APPENDIX M: Statistical weights for merged data from the ATUS and a CPS supplement

Analyses of ATUS and CPS data require the use of statistical weights that account for the complex sampling designs of the surveys. Researchers who link the ATUS data to a CPS supplement will be able to identify a subset of ATUS respondents who lived in households that participated in the supplement; however, no statistical weights have been developed for this subset of respondents.

This section of the User's Guide summarizes BLS findings about whether the ATUS final weights can be used to analyze a subset of ATUS respondents for which data are available in a CPS supplement. Specifically, it provides information about whether the ATUS weighting variable TUFINLWGT can be used to analyze the subset of 2007 ATUS respondents for which information is available on the December 2006 Food Security Supplement (FSS).

Data from the 2007 ATUS were linked to the 2006 FSS using the method detailed in Appendix K of this guide on page 92. About one-third of the ATUS respondents lived in households that had participated in the FSS: there were 3,837 "matched" cases in which ATUS respondents had additional data available on the FSS and 8,411 "unmatched" cases in which there was no additional data available from the FSS. The following table shows how many matched and unmatched cases there were for each month of the 2007 ATUS data.

**Table 1. The number of matched and unmatched cases for the ATUS and FSS by month of the 2007 ATUS**

Month	Matched cases (1)		Unmatched cases (2)	
	Frequency	Percent	Frequency	Percent
01	0	0.00	1358	16.15
02	95	2.48	805	9.57
03	939	24.47	119	1.41
04	1071	27.91	39	0.46
05	794	20.69	46	0.55
06	791	20.62	190	2.26
07	138	3.60	956	11.37
08	9	0.23	885	10.52
09	0	0.00	1030	12.25
10	0	0.00	1083	12.88
11	0	0.00	884	10.51
12	0	0.00	1016	12.08

(1) A matched case is an ATUS case in which additional data were available on the FSS.

(2) An unmatched case is an ATUS case in which no data were available on the FSS.

Most of the matched cases were for ATUS respondents interviewed in the months of March to June 2007. The ATUS final weighting variable TUFINLWGT was used to generate time-use estimates for

matched cases. When these estimates were compared to estimates for all ATUS respondents for calendar year 2007, there were some slight differences, likely due to seasonality in the ATUS data.

Because of this seasonality, estimates generated from matched data using the final weighting variable TUFINLWGT should be interpreted as applying *only* for months when the bulk of the matches occur. Thus, in the FSS example, it is approximately correct to use TUFINLWGT for matched cases as long as analyses are restricted to March to June 2007.

## APPENDIX N: Reliability Criteria for ATUS Published and Unpublished Tables

ATUS data must meet reliability standards before being presented to the public for both published and unpublished, but available, tables. In 2010, a new standard was developed that takes into account the coefficient of variation, standard error, and number of observations available before reporting an estimate. Prior to 2010, a standard was in place that only included the sample size or population base for the estimate.

Beginning with the 2010 data, ATUS estimates of average hours per day and participation rates are not published unless there are a minimum number of respondents representing the given population. Additional publication criteria are applied that include the number of respondents who reported doing a specified activity and the standard error or coefficient of variation for the estimate. Estimates that are considered "close to zero" or that round to zero (e.g., 0.00 for estimates of hours), are published as approximately zero or "~0."

For a detailed description of the statistical reliability criteria necessary for publication, please contact ATUS Staff.