

American Time Use Survey (ATUS) Data Dictionary:

2021 Well-being Module Data

Variables collected in the ATUS Well-being Module

June 2022

The ATUS Well-being Module was sponsored by the University of Minnesota and the University of Maryland.  
The ATUS is sponsored by the Bureau of Labor Statistics and conducted by the U.S. Census Bureau.

# Important Information about the Well-being Module Data Dictionary

## Introduction

The University of Minnesota and the University of Maryland sponsored the 2021 Well-being (WB) Module of the American Time Use Survey (ATUS). The ATUS is sponsored by the Bureau of Labor Statistics and conducted by the U.S. Census Bureau. The purpose of this document is to provide general information about the ATUS and WB Module and detailed information about the variables available on the 2021 ATUS WB Module data files: the WB Respondent files and the WB Activity files. The 2021 WB Module was conducted from March through December and data files contain information gathered from the ATUS interviews. All WB Module questions were asked at the end of the ATUS interview.

In the ATUS, sample cases for the survey are selected monthly, and interviews are conducted continuously throughout the year. ATUS sample households are chosen from the households that completed their eighth (final) interview for the Current Population Survey (CPS). ATUS sample households are selected to ensure that estimates will be nationally representative of the U.S. civilian noninstitutional population age 15 and over. One individual is randomly chosen from each household and is interviewed by telephone about his or her activities on the day before the interview. We refer to the list of activities as the “time diary” and the day the diary refers to as the “diary day.” For more information about the ATUS, please see the ATUS User’s guide ([www.bls.gov/tus/atususersguide.pdf](http://www.bls.gov/tus/atususersguide.pdf)).

All ATUS respondents with diaries from March 1 through December 31, 2021 were selected for the WB Module. In the module, 3 activities from the diary were randomly selected and 7 questions related to the quality of life were asked about each activity; a few general questions about health status were asked for each respondent. The 2021 WB Module includes two questions about general life satisfaction and how the respondent’s feelings compared to those on a typical day for which the respondent was being interviewed. The activities selected for the WB Module were required to meet the following criteria:

- The activity had to be at least 5 minutes in duration
- The following activities and responses were not eligible for selection:
  - Sleeping (0101xx)
  - Grooming (0102xx)
  - Personal Activities (0104xx)
  - Don’t know/Can’t remember (500106)
  - Refusal/None of your business (500105)

For more information about the questions asked in the WB Module and about the ATUS activity classification system, please see the WB Module questionnaire ([www.bls.gov/tus/wbmquestionnaire.pdf](http://www.bls.gov/tus/wbmquestionnaire.pdf)) and the ATUS Activity Coding Lexicons ([www.bls.gov/tus/lexicons.htm](http://www.bls.gov/tus/lexicons.htm)).

This data dictionary lists all the variables available on the WB files and their valid values. It also provides directions on how to read the data dictionary.

Two other data dictionaries describe the basic ATUS data files. The first describes the ATUS-CPS file, which contains data from the CPS files for those selected to be surveyed for ATUS and members of their households. (The information on the ATUS-CPS file was collected two to five months before the ATUS interview and may have been out of date at the time of the ATUS survey.) The second is the ATUS interview data dictionary which describes the variables available on five files: the Roster file, the Activity file, the Who file, the Eldercare Roster file, and the Respondent file. These variables were collected and assigned in the ATUS interview.

Two other data dictionaries describe additional ATUS data files. The first describes the ATUS Survey Methods data, made up of the Case History file and the Call History file. The second describes the Trips file. The trips questions were replaced by questions about eldercare in 2011; 2010 is the last year for which the Trips data dictionary was created.

Each of these additional data dictionaries describes variables from an individual year. They are available on the ATUS Web site at [www.bls.gov/tus/dictionaries.htm](http://www.bls.gov/tus/dictionaries.htm).

## ATUS WB Module Data Files

The following data files include data available from the ATUS WB module interviews.

### 1. WB Respondent File

This file contains case-specific variables collected in the WB Module (that is, variables for which there is one value for each respondent). These include, for example, general health information, how well-rested the respondent felt on his diary day (the day about which he was interviewed), and WB Module respondent-level statistical weights. There is one record for each WB Module respondent.

Below is a simplified example. The TUCASEID identifies each household, and TULINENO identifies each individual within the household. The example contains responses from 5 individuals; note that the respondent always has TULINENO=1. (All records on the WB Respondent file have TULINENO=1 because only one person in the household responded to the ATUS.) In the example, each respondent has a corresponding statistical weight (WUFINLWGT) for use in generating estimates representative of the U.S. civilian, noninstitutional population age 15 and over. The use of the supplement weight WUFINLWGT is explained in the “ATUS and WB Module weights and estimation” section below.

All ATUS respondents are selected to participate in the WB Module. However, if an insufficient number of questions are answered, the person is not included as a WB Module respondent. See Appendix A for a description of how these cases are determined.

This example also demonstrates that each respondent has corresponding values denoting general health status (WEGENHTH) and how well-rested the respondent felt (WEREST). The actual WB Respondent file contains additional variables.

TUCASEID	TULINENO	WUFINLWGT	WEGENHTH	WEREST
20210301100605	1	4040229.08	5	2
20210604101229	1	1438440.99	4	1
20210807100994	1	3151945.82	2	4
20210908101868	1	1621125.07	1	3
20211211101129	1	14724370.75	3	1

### 2. WB Activity File

In the WB Module, the survey randomly selects 3 activities reported by each respondent. For each selected activity, the respondents were asked 7 questions related to quality of life (5 affect questions, 1 question about how meaningful the activity was, and 1 question about whether the respondent was interacting with anyone during the activity). The order of the 5 affect questions was randomly determined for each respondent. This file includes the activity-level information collected in the WB Module, including activity number and information about how the respondent felt during the selected activities.

There is one record for each activity selected for the module. The activities must meet the following selection criteria:

- The activity must be at least 5 minutes in duration
- The following activities and responses were not eligible for selection:
  - Sleeping (0101xx)
  - Grooming (0102xx)
  - Personal Activities (0104xx)
  - Don't know/Can't remember (500106)
  - Refusal/None of your business (500105)

A simplified example of the WB Activity file appears below. This is an illustration showing information about the 3 activities selected for the WB module from one respondent's time diary. Because only one person was interviewed per household, each TUCASEID on the WB Activity file identifies a respondent.

Each activity is identified by an activity number (TUACTIONITY\_N). In the example, each activity has corresponding values denoting how happy the respondent felt during the activity (WUHAPPY) and whether the respondent was interacting with anyone during the activity (WUINTERACT) in addition to the activity-level statistical weight (WUFNACTWT). The use of WUFNACTWT is explained in the “ATUS and WB Module weights and estimation” section below. (The actual WB Activity file contains more variables describing the feelings associated with each selected activity.)

TUCASEID	TUACTIONITY_N	WUHAPPY	WUINTERACT	WUFNACTWT
20210401102152	2	3	2	12059879.6
20210401102152	7	1	2	2009974.4
20210401102152	13	6	1	4019965.4

3. WB Replicate weights files

The WB Replicate Weights files contain weights necessary for generating standard errors for WB Module estimates. The WB Respondent Replicate weights file contains one record for each individual who responded to the WB Module. The WB Activity Replicate weights file contains one record for each activity selected for the WB Module. Technical information about the WB Replicate weights files can be found in the text document that is enclosed in the WB Module Replicate Weights zip files. See Chapter 7 of the ATUS User’s Guide ([www.bls.gov/tus/atususersguide.pdf](http://www.bls.gov/tus/atususersguide.pdf)) for guidance on calculation of standard errors using the replicate weights

**ATUS and WB Module weights and estimation**

ATUS final weights (TUFINLWGT)

The ATUS final weights (found on the ATUS Respondent file) need to be applied when computing estimates with the ATUS data because simple tabulations of unweighted ATUS data produce misleading results. The ATUS weights are designed to produce estimates for an average person-day. That is, estimates represent time use for an average person, on an average day. Summing the weights for all respondents in a given year yields the number of persons in the population times the number of days in the year. The ATUS weights compensate for important aspects of the sampling and data collection process. The weights ensure that each demographic group is represented in the weighted sample in proportion to its share in the population. They also ensure that each day of the week is correctly represented. For more information about the ATUS weights and their use in producing estimates with the ATUS data, please see Chapter 7 of the ATUS User’s guide ([www.bls.gov/tus/atususersguide.pdf](http://www.bls.gov/tus/atususersguide.pdf))

WB Module final weights

WB respondent weights (WUFINLWGT)

The WB respondent-level final weights should be used instead of the ATUS final weights when using WB Module data to create general WB estimates for measures such as health, use of pain medication, hypertension, and general time use. Because some ATUS respondents did not complete the WB Module, the WB respondent-level final weights account for this nonresponse. Like the ATUS final weights, the WB Module respondent weights are person-day weights; summing the WB respondent final weights yields the number of persons in the population times the number of days in the period. General WB estimates (not related to activity affects) should be produced using WUFINLWGT (instead of TUFINLWGT) according to the procedures in Section 7.4 of the ATUS User’s guide.

WB activity weights (WUFNACTWT)

The WB Module activity weight is designed to estimate average levels of affect for the population during activities eligible for the module. They can also be used to estimate population averages for functions of affect such as “U-indexes” (Krueger 2007)<sup>1</sup>. The weights account for the time respondents spent doing each sampled activity and the total time they spent in activities eligible for selection in the module. They also

<sup>1</sup> Krueger, Alan B. 2007. “Are We Having More Fun Yet? Categorizing and Evaluating Changes in Time Allocation.” *Brookings Papers on Economic Activity*, Vol. 2007, No. 2, pp. 193-215.

account for differences between respondents in the probability that a specific activity was sampled. For a discussion of the construction and justification for the WB activity weights, please see Appendix B.

As an example of their use in estimation, the average level of pain that persons experienced during their eligible activities during a day ( $\bar{P}$ ) can be estimated as

$$(1) \quad \bar{P} = \frac{\sum_i \sum_k w_{ik} P_{ik}}{\sum_i \sum_k w_{ik}}$$

where  $i$  denotes respondent,  $k$  denotes sampled activity,  $P$  denotes the reported level of pain, and  $w_{ik}$  denotes the weight attached to activity  $k$  for respondent  $i$ . In general, one should use the WB Activity weights to estimate the average level of affect(s) for selected populations on an average day. For example, one can use these weights to construct and compare estimates of the average level of pain felt by persons age 65 and over and persons under age 65 on an average day, or the average level of stress felt by men and women on an average day.

The WB activity weights cannot be used to estimate how the average person in a population felt during a specific activity on an average day. This is because the ATUS collects only single-day time diaries from respondents and calculation of a person-weighted average of affect during an activity (the affect the average participant has during a minute of the activity) requires collecting more than one time diary from each respondent. For example, one cannot use the WB activity weights to estimate how happy the average person felt while shopping. As an illustration, consider two people with different preferences for shopping: Person A doesn't mind shopping and so he shops on twice as many days per year as person B, who does not like to shop. On average, the ATUS data will pick up person A's shopping twice as often as person B's shopping. Without knowledge of how frequently respondents participate in a given activity (for example, how often person A and B shop), it is not possible to adjust for this difference in behavior; such an adjustment is needed to calculate how the average person felt while shopping.

The WB activity weights are person-day based rather than time based—that is, equation (1) estimates the average affect level across the population of person-days. Accordingly, this formula cannot be applied to estimate the average level of affect during a minute of a specific type of activity—the average level of pain while working for pay, for example. Denote this time-based average as  $\bar{P}^*$ . An unbiased estimate of  $\bar{P}^*$  can be generated by modifying WUFNACTWT by multiplying it by the total amount of time in eligible activities (WRTELG) and applying equation (1), restricted to observations of the activity of interest:

$$(2) \quad \bar{P}^* = \frac{\sum_i \sum_k I_{ik} w'_{ik} P_{ik}}{\sum_i \sum_k I_{ik} w'_{ik}} = \frac{\sum_i T_i \sum_k I_{ik} w_{ik} P_{ik}}{\sum_i T_i \sum_k I_{ik} w_{ik}}$$

where  $w'$  denotes the modified weights,  $T_i$  denotes WRTELG for respondent  $i$ , and  $I_{ik}$  is an indicator variable for the activity of interest.

For example, in 2021, the estimate for the average level of pain that employed persons experienced during all eligible activities, using the person-day average shown in equation (1), was 0.82, where 0 is no pain at all and 6 is pain as bad as it can be. Modifying the weights and calculating the average level of pain felt during the time employed persons spent working (0501), using the time-based average shown in equation (2), resulted in an estimate of 1.00. See Appendix B for an illustration of the calculation of these estimates.

Some activity weights are assigned a value of zero. If an insufficient number of questions were answered for the activity, a weight of zero was assigned. See Appendix A for a discussion of the assignment of the activity weights.

**WB Module weights – general recommendations**

1. Estimates using the general health questions (those on the WB respondent file) and not any of the WB module activity data should use WUFINLWGT.
2. Estimates using only the WB Module activity data should use WUFNACTWT.
3. Estimates using data from the WB Module respondents in conjunction with the activity-level WB Module data should use WUFNACTWT.

**WB Module Naming Conventions and Definitions**

WB Module variables are named according to specified rules. Variables with a first character of “W” (for Well-being) were collected or created through the WB Module interview questions. Variables with a first character of “T” (for time use) were collected or created through the ATUS interview. Two variables created through the ATUS interview but constructed for the purpose of the WB module are an indicator of module eligibility for each activity in the ATUS diary (TRWBELIG), and an indicator of respondent participation in the WB Module (TRWBMODR). These variables are on the ATUS files. There are only three “T” variables on the WB Module files. These are the ATUS case ID (TUCASEID); the ATUS person line number (TULINENO) and the ATUS activity number (TUACTIONITY\_N); these variables are used to link WB files to ATUS files.

The second and third characters of the name identify the type of variable, and the remaining characters consist of a descriptive name. The rules regarding the first two or three characters are described in the table below:

Abbreviation	Variable Type	Definition
U	Unedited Variable	An unedited variable generally is produced by the Computer Assisted Telephone Interview (CATI) instrument, either collected or assigned during the interview.
E	Edited Variable	An edited variable is one that has gone through an editing process (a process checking for consistency). Values of edited variables are almost always equal to values of the corresponding unedited variables. Data differ when a value is allocated or imputed by the processing system based on allocation rules specified in ATUS processing. Allocations are typically performed when the unedited variable contains a value of blank, "don't know," or "refused."  An edited version of a variable exists only if that variable goes through an editing process. If there are no edits for a variable, then only an unedited version of that variable exists.
RT	Summary Variable	These variables summarize the amount of time respondents spent doing selected activities. For example, WRTELIG is the total time the respondent spent in all activities eligible to be selected for the WB Module,
X	Allocation Flag	Each edited variable has a corresponding allocation flag indicating the nature of the allocation. For example, if WUHBP is "don't know," WEHBP would be allocated, and this would be indicated by a WXHBP value of 42. See the section below on allocation flags for the standard list of values.

Using these rules, variables can be more readily understood based on their names. For example, the variable WEREST can be broken down as follows:

- The first character “W” indicates that this variable was collected or created through the ATUS WB Module interview questions
- The second character “E” indicates that this variable went through an editing process; it also means there will be a corresponding allocation flag, WXREST, to indicate the nature of the allocation
- The final part of the variable name, “REST,” is descriptive and, in this case, refers to how well-rested the respondent felt when he woke up.

Not all WB Module variables are on the files. When there is an edited variable, the corresponding unedited variable is usually omitted from the files. If an unedited variable is included on the files, an edited version does not exist.

**Allocation Flags**

For every edited variable (or all “E” variables), there is a corresponding allocation flag whose second character is “X.” All remaining characters of the two variables’ names are the same. For example, WXGENHHTH is the allocation flag for WEGENHHTH.

All allocation flags have the following list of possible values:

- 0 Value – no change
- 1 Blank – no change
- 2 Don’t know – no change
- 3 Refused – no change
- 10 Value to value
- 11 Blank to value
- 12 Don’t know to value
- 13 Refused to value
- 20 Value to longitudinal value
- 21 Blank to longitudinal value
- 22 Don’t know to longitudinal value
- 23 Refused to longitudinal value
- 30 Value to allocated longitudinal value (unused)
- 31 Blank to allocated longitudinal value (unused)
- 32 Don’t know to allocated longitudinal value (unused)
- 33 Refused to allocated longitudinal value (unused)
- 40 Value to allocated value
- 41 Blank to allocated value
- 42 Don’t know to allocated value
- 43 Refused to allocated value
- 50 Value to blank
- 52 Don’t know to blank
- 53 Refused to blank

Each digit of these valid values identifies how and why edited variables were allocated.

The first digit indicates how the allocation was made to the “E” (or edited) variable.

<b>First Digit</b>	
0 or Blank	No change between “U” variable and “E” variable
1	“E” variable changed to a value
2	“E” variable changed to a longitudinal value (the corresponding value from the CPS data)
3	“E” variable changed to an allocated longitudinal value (the corresponding allocated value from CPS data) - unused
4	“E” variable changed to allocated value
5	“E” variable changed to a blank

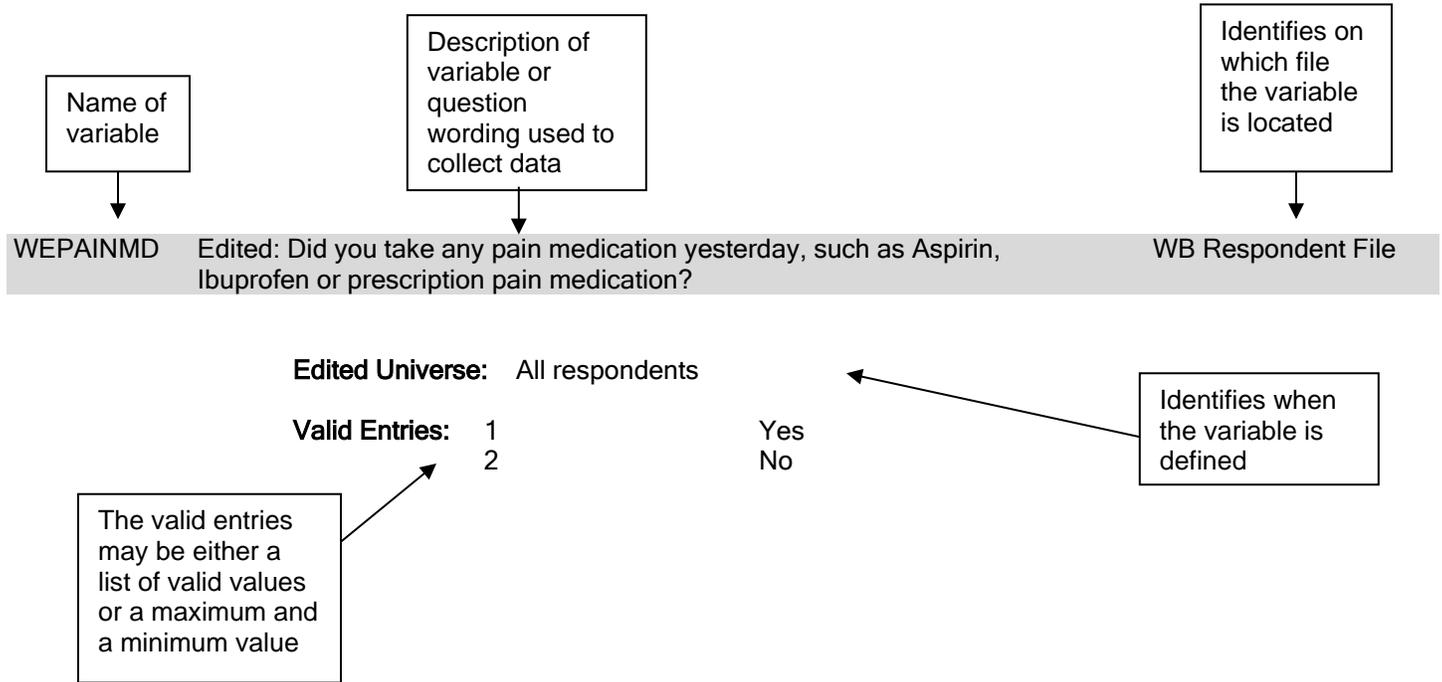
The second digit indicates why the “U” variable was allocated, whether the value was an unacceptable one, missing, don’t know, or refused.

<b>Second Digit</b>	
0	“U” variable was equal to some value
1	“U” variable was blank (or -1)
2	“U” variable was don’t know (or -2)
3	“U” variable was refused (or -3)

**Organization of the Data Dictionary**

Variables are listed in the data dictionary in alphabetical order.

Below is a sample entry from the ATUS Well-being Module data dictionary:



**Valid Values**

Each variable has a number of valid values or a range of valid values. For example, the variable WEGENHTH (general health) has five valid values: 1 for excellent, 2 for very good, 3 for good, 4 for fair, and 5 for poor. The variable WRTEGIG (total time spent in all eligible activities), on the other hand, has a range of valid values – any entry between 5 and 1440 is considered valid. Individual valid values or a range of valid values are listed under each variable in the data dictionary.

Many ATUS variables have the following possible valid values:

Value	Description
-1	Blank
-2	Don't know
-3	Refused

Since so many variables have these possible values, they are not shown as valid entries for each variable.

TUCASEID, the primary identification number for ATUS, does not have either a list of valid values or a range of valid values.

### Linking WB Module files to other ATUS Data Files

Each of the WB Module data files contains useful information, but in order to produce most estimates, the files must be linked to other ATUS files. All of the data files contain the variables TUCASEID, which is the ATUS identification number. Two other variables that can be used for linking in conjunction with TUCASEID are TULINENO (person line number) and TUACTIONITY\_N (activity line number).

File	Linking Variables
<b>WB Module data files</b>	
WB Respondent file	TUCASEID TULINENO (always equal to 1 on the WB Respondent file)
WB Activity file	TUCASEID TUACTIONITY_N
WB Respondent-level Replicate Weights file	TUCASEID
WB Activity-level Replicate Weights file	TUCASEID TUACTIONITY_N
<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
Eldercare Roster file	TUCASEID TULINENO
ATUS-CPS file	TUCASEID TULINENO
Activity Summary file	TUCASEID
<b>Additional ATUS data files</b>	
Case History file	TUCASEID
Call History file	TUCASEID
Replicate Weights file	TUCASEID

The ATUS files can also be linked to CPS files. More information is available in the ATUS-CPS data dictionary, available online at [www.bls.gov/tus/dictionaries.htm](http://www.bls.gov/tus/dictionaries.htm).

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Name	Description	File
TRWBELIG	Flag identifying activities eligible for the Well-being Module	Activity File
	<b>Edited Universe:</b> All activities	
	<b>Valid Entries:</b> 0 Activity not eligible for selection in the Well-being Module	
	1 Activity eligible for selection in the Well-being Module	
	<b>*Note</b> Activities with codes of 0101xx, 0102xx, 0104xx, 500105, or 500106 or with durations less than 5 minutes are not eligible	
Name	Description	File
TRWBMODR	Well-being Module respondent	Respondent File
	<b>Edited Universe:</b> All respondents	
	<b>Valid Entries:</b> 0 Did not respond to Well-being Module	
	1 Responded to the Well-being Module	
	<b>*Note</b> The 2021 Well-being Module was conducted from March 1, 2021 through December 31, 2021. All individuals on the Respondent file with TUMONTH > 02 were selected to be interviewed for the Well-being Module. Cases with TUMONTH = 01 or 02 will have values of -1 for TRWBMODR	
Name	Description	File
TUACTIVITY_N	Activity line number	Activity File, Who File, WB Activity File
	<b>Valid Entries:</b> 1 Min Value 91 Max Value	
Name	Description	File
TUCASEID	ATUS Case ID (14-digit identifier)	All Files
Name	Description	File
TULINENO	ATUS person line number	ATUS-CPS File, Respondent File, Roster File, Who File, WB Respondent File, EC Roster File
	<b>Valid Entries:</b> 1 Min Value 30 Max Value	
	<b>*Note</b> The person selected to be interviewed for ATUS is always TULINENO = 1	

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Name	Description	File	
WECANTRIL	Edited: Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. If the top step is 10 and the bottom step is 0, on which step of the ladder do you feel you personally stand at the present time?	WB Respondent File	
	<b>Edited Universe:</b>	All respondents	
	<b>Valid Entries:</b>	0	Min Value
		10	Max Value
Name	Description	File	
WEGENHTH	Edited: Would you say your health in general is excellent, very good, good, fair, or poor?	WB Respondent File	
	<b>Edited Universe:</b>	All respondents	
	<b>Valid Entries:</b>	1	Excellent
		2	Very Good
		3	Good
		4	Fair
		5	Poor
Name	Description	File	
WEHBP	Edited: In the last five years, were you ever told by a doctor or other health professional that you have hypertension, also called high blood pressure, or borderline hypertension?	WB Respondent File	
	<b>Edited Universe:</b>	All respondents	
	<b>Valid Entries:</b>	1	Yes
		2	No
Name	Description	File	
WEPAINMD	Edited: Did you take any pain medication yesterday, such as Aspirin, Ibuprofen or prescription pain medication?	WB Respondent File	
	<b>Edited Universe:</b>	All respondents	
	<b>Valid Entries:</b>	1	Yes
		2	No

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Name	Description	File
WEREST	Edited: When you woke up yesterday, how well-rested did you feel? Did you feel very rested, somewhat rested, a little rested, or not at all rested?	WB Respondent File
	<b>Edited Universe:</b> All respondents	
	<b>Valid Entries:</b> 1 Very	
	2 Somewhat	
	3 A little	
	4 Not at all	
Name	Description	File
WETYPICAL	Edited: Thinking about yesterday as a whole, how would you say your feelings, both good and bad, compared to a typical [FILL=DAY]? Were they better than a typical [FILL=DAY], the same as a typical [FILL=DAY], or worse than a typical [FILL=DAY]?	WB Respondent File
	<b>Edited Universe:</b> All respondents	
	<b>Valid Entries:</b> 1 Better	
	2 The same	
	3 Worse	
	<b>*Note</b> The FILL is the day of the week about which the respondent was being interviewed. For example, if the diary day was a Tuesday, the respondent was asked how his feelings yesterday compared to a typical Tuesday.	
Name	Description	File
WRTELIG	Total time spent in all activities eligible to be selected for Well-being module	WB Respondent File
	<b>Edited Universe:</b> All Well-being respondents	
	<b>Valid Entries:</b> 5 Min Value 1440 Max Value	
	<b>*Note</b> Includes time spent in all activities with duration 5 minutes or more, except 0101xx, 0102xx, 0104xx, 500105, and 500106	
Name	Description	File
WUFINLWGT	Well-being module respondent weight	WB Respondent File
	<b>Valid Entries:</b> 0 Min Value 9999999999 Max Value	
Name	Description	File
WUFNACTWT	Well-being module activity weight	WB Activity File
	<b>Valid Entries:</b> 0 Min Value 9999999999 Max Value	
	<b>*Note</b> For each activity, if the data were missing, or the respondent refused to answer or reported "don't know" to 4 or more of the affect questions (WUHAPPY, WUPAIN, WUSAD, WUSTRESS, and WUTIREDD), meaningful (WUMEANING), or interaction (WUINTERACT) question, a value of 0 was assigned to the activity weight for that activity.	

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Name	Description	File	
WUHAPORD	Order of WUHAPPY	WB Activity File	
	<b>Valid Entries:</b>	1 5	Min Value Max Value
	<b>*Note</b>	For each respondent to the Well-being module, the order of the affect questions (WUHAPPY, WUPAIN, WUSAD, WUSTRESS, and WUTIREDD) was assigned randomly. For each WB respondent, the order of the affect questions was the same for each selected activity.	
Name	Description	File	
WUHAPPY	From 0 to 6, where a 0 means you were not happy at all and a 6 means you were very happy, how happy did you feel during this time?	WB Activity File	
	<b>Valid Entries:</b>	0 6	Min Value Max Value
Name	Description	File	
WUINTERACT	Were you interacting with anyone during this time, including over the phone?	WB Activity File	
	<b>Valid Entries:</b>	1 2	Yes No
Name	Description	File	
WUMEANING	From 0 to 6, how meaningful did you consider what you were doing?  0 means it was not meaningful at all to you and a 6 means it was very meaningful to you.	WB Activity File	
	<b>Valid Entries:</b>	0 6	Min Value Max Value
Name	Description	File	
WUPAIN	From 0 to 6, where a 0 means you did not feel any pain at all and a 6 means you were in severe pain, how much pain did you feel during this time if any?	WB Activity File	
	<b>Valid Entries:</b>	0 6	Min Value Max Value
Name	Description	File	
WUPNORD	Order of WUPAIN	WB Activity File	
	<b>Valid Entries:</b>	1 5	Min Value Max Value
	<b>*Note</b>	For each respondent to the Well-being module, the order of the affect questions (WUHAPPY, WUPAIN, WUSAD, WUSTRESS, and WUTIREDD) was assigned randomly. For each WB respondent, the order of the affect questions was the same for each selected activity.	

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Name	Description	File
WUSAD	From 0 to 6, where a 0 means you were not sad at all and a 6 means you were very sad, how sad did you feel during this time?	WB Activity File
	<b>Valid Entries:</b> 0 6	Min Value Max Value
Name	Description	File
WUSADORD	Order of WUSAD	WB Activity File
	<b>Valid Entries:</b> 1 5	Min Value Max Value
	<b>*Note</b> For each respondent to the Well-being module, the order of the affect questions (WUHAPPY, WUPAIN, WUSAD, WUSTRESS, and WUTIRED) was assigned randomly. For each WB respondent, the order of the affect questions was the same for each selected activity.	
Name	Description	File
WUSTRESS	From 0 to 6, where a 0 means you were not stressed at all and a 6 means you were very stressed, how stressed did you feel during this time?	WB Activity File
	<b>Valid Entries:</b> 0 6	Min Value Max Value
Name	Description	File
WUSTRORD	Order of WUSTRESS	WB Activity File
	<b>Valid Entries:</b> 1 5	Min Value Max Value
	<b>*Note</b> For each respondent to the Well-being module, the order of the affect questions (WUHAPPY, WUPAIN, WUSAD, WUSTRESS, and WUTIRED) was assigned randomly. For each WB respondent, the order of the affect questions was the same for each selected activity.	
Name	Description	File
WUTIRED	From 0 to 6, where a 0 means you were not tired at all and a 6 means you were very tired, how tired did you feel during this time?	WB Activity File
	<b>Valid Entries:</b> 0 6	Min Value Max Value
Name	Description	File
WUTRDORD	Order of WUTIRED	WB Activity File
	<b>Valid Entries:</b> 1 5	Min Value Max Value
	<b>*Note</b> For each respondent to the Well-being module, the order of the affect questions (WUHAPPY, WUPAIN, WUSAD, WUSTRESS, and WUTIRED) was assigned randomly. For each WB respondent, the order of the affect questions was the same for each selected activity.	
Name	Description	File
WXCANTRIL	WECANTRIL: allocation flag	WB Respondent File
	<b>*Note</b> See introduction for allocation flag values.	
Name	Description	File
WXGENHHTH	WEGENHHTH: allocation flag	WB Respondent File
	<b>*Note</b> See introduction for allocation flag values	

2021 ATUS Data Dictionary: Public Well-being module Data

Name	Description		File
WXHBP	WEHBP: allocation flag		WB Respondent File
	<b>*Note</b>	See introduction for allocation flag values	
Name	Description		File
WXPAINMD	WEPAINMD: allocation flag		WB Respondent File
	<b>*Note</b>	See introduction for allocation flag values	
Name	Description		File
WXREST	WEREST: allocation flag		WB Respondent File
	<b>*Note</b>	See introduction for allocation flag values	
Name	Description		File
WXTYPICAL	WETYPICAL: allocation flag		WB Respondent File
	<b>*Note</b>	See introduction for allocation flag values.	

## Appendix A

### Determination of Well-being Module respondents

Some ATUS respondents are not counted as Well-being (WB) Module respondents. To be counted as a completed interview for the WB Module, the respondent had to meet the following criteria:

1. Answer at least 4 of the 7 questions about the activity for at least 1 of the 3 activities selected, where the 7 questions include the 5 affect, the meaningful, and the interaction questions
2. Answer at least 1 of the final 4 general health questions

For each activity, if the respondent did not provide answers for at least 4 of the 7 questions about the activity, the Well-being activity weight was assigned a value equal to 0. If all 3 activities had activity weights equal to 0, the case was not counted as a completed interview for the WB Module, and no information about the respondent was included on any of the WB Module files.

A simplified example of the Well-being activity file appears below. This illustrates the assignment of a Well-being activity weight when fewer than 4 of the 7 questions about the activity were answered. For TUCASEID equal to 20210301100605, and TUACTIONITY\_N equal to 5, the only questions receiving answers were WUSAD, WUTIRED, and WUSTRESS. The remaining questions for that activity have values of -3 (Refused). Consequently, this activity received a weight (WUFNACTWT) equal to 0. Note that the other activities for which this respondent provided answers had values for all of the 7 questions, and the activity weights have non-zero values.

Well-being Activity file

TUCASEID	TUACTIONITY_N	WUMEANING	WUINTERACT	WUHAPPY	WUSAD	WUTIRED	WUPAIN	WUSTRESS	WUFNACTWT
20210301100605	2	6	2	3	0	0	0	0	1470923.444
20210301100605	3	6	2	0	0	0	4	0	5264193.967
20210301100605	5	-3	-3	-3	0	3	-3	0	0
20210311090591	3	6	2	6	0	6	0	5	172341.003
20210311090591	6	-3	-3	-3	0	-3	0	-3	0
20210311090591	10	-3	-3	-3	-3	-3	-3	-3	0
20211111101356	8	0	1	6	0	3	0	2	23338814.54
20211111101356	10	6	1	6	0	3	0	0	1018962.593
20211111101356	24	2	1	4	0	4	0	4	5834707.548
20211211101424	3	-2	2	6	0	0	0	0	118679.8366

20211211101424	6	-2	2	5	0	0	0	0	474715.4537
20211211101424	14	-3	-3	-3	-3	-3	-3	-3	0
20211211102463	5	-3	-3	6	0	0	-3	0	193741.6322
20211211102463	8	-3	-3	-3	-3	-3	-3	-3	0
20211211102463	9	-3	-3	-3	-3	-3	-3	-3	0

A simplified example of the Well-being respondent file is shown below for the same cases. This file includes responses to the final 4 health questions (WEPAINMD, WEGENHTH, WEHBP, WEREST), WECANTRIL and WETYPICAL. However, the file presents the edited versions of these variables only. Thus, one cannot determine with these variables whether the respondent provided an answer to at least 1 of the final 4 health questions. The values for the allocation flags (WXPAINMD, WXHBP, WXREST, and WXGENHTH are shown below) can identify which questions have original responses, and which ones were assigned allocated values (See page 9). A value of 0 indicates that no change was made to the unedited response and a value of 43 indicates that the value was changed from Refused (-3) to a value. While some of these cases show that allocations were made for some of the final 4 health questions, none of the cases had allocated values for all of the final 4 health questions. All of these cases are considered completed interviews and information about the respondent and the affects for these activities are included on the Well-being files.

Well-being Respondent file

TUCASEID	WEPAINMD	WEGENHTH	WEHBP	WEREST	WXPAINMD	WXHBP	WXREST	WXGENHTH	WUFINLWGT
20210301100605	1	5	1	2	0	43	0	0	4040229.077
20210311090591	2	2	2	2	0	0	0	0	1587197.1
20211111101356	2	3	2	2	0	0	0	0	8414713.307
20211211101424	2	3	1	3	43	43	0	43	1602012.479
20211211102463	1	5	1	1	0	0	0	0	3971670.711

## Appendix B

This appendix gives more details on the construction and justification for the original activity weights  $WUFNACTWT$  and how they relate to average levels of affect for person-based and time-based measures of well-being.

The formula for  $WUFNACTWT$  for respondent  $i$  for selected activity  $k$  is:

$$WUFNACTWT_{ik} = WUFINLWGT_i ELIGACT_i f_{ik}$$

where  $ELIGACT_i$  is the number of activities in respondent  $i$ 's diary eligible for the well-being module and  $f_{ik}$  is the fraction of total time in eligible activities that was spent in activity  $k$ . The presence of the  $ELIGACT_i$  and  $f_{ik}$  terms can be explained as follows. The term  $ELIGACT_i$  accounts for the probability that an activity was selected for the module's affect questions; a maximum of 3 activities were sampled from each respondent's time diary. As each eligible activity had an equal chance of being selected conditional on the respondent,  $ELIGACT_i$  is proportional to the inverse probability of selection for an activity<sup>1</sup>. Regarding  $f_{ik}$ , taking the average level of pain as an example, note that the average level of pain respondent  $i$  experiences during eligible activities is

$$\bar{P}_i = \sum_{j=1}^{ELIGACT_i} P_{ij} f_{ij}$$

summing over all eligible activities. Thus the  $f_{ik}$  term is necessary to properly weight by time.

The population average is  $\bar{P} = \sum_{i=1}^N \bar{P}_i / N$ , where  $N$  is the population size. Note that the population  $\bar{P}$  is person-day based; each person gets an equal weight regardless of the amount of time the person spent in eligible activities.

The time-based average  $\bar{P}^*$  can be expressed as

$$\bar{P}^* = \frac{\sum_{i=1}^N \sum_{j=1}^{ELIGACT_i} P_{ij} t_{ij}}{\sum_{i=1}^N \sum_{j=1}^{ELIGACT_i} t_{ij}}$$

where  $t_{ij}$  is the time spent in activity  $j$  by person  $i$ . As explained earlier in the data dictionary, one would use  $\bar{P}^*$  to calculate the average level of affect during a minute. It will usually make sense to restrict attention to a given activity such as paid work, so the formula becomes:

<sup>1</sup> Cases that had fewer than 3 eligible activities used a multiplier of 3 instead of the number of eligible activities ( $ELIGACT_i$ ) to reflect 3 times the inverse probability of selection.

$$\bar{P}^* = \frac{\sum_{i=1}^N \sum_{j=1}^{ELIGACT_i} P_{ij} I_{ij} t_{ij}}{\sum_{i=1}^N \sum_{j=1}^{ELIGACT_i} I_{ij} t_{ij}}$$

where  $I_{ij}$  is an indicator that activity  $j$  for person  $i$  is the activity of interest. Note that each person contributes to  $\bar{P}^*$  in proportion to their time spent in eligible activities, rather than equally. By construction, the estimate will represent an average minute the population spends in the activity and thus people who spend more time doing the activity will have greater representation.

There is no way to obtain from single-day diaries (as we have in the ATUS) a person-weighted average of affect during an activity (the affect the average participant has during a minute of the activity). This is because the ATUS collects only single-day time diaries from respondents and calculation of a person-weighted average of affect during an activity (the affect the average participant has during a minute of the activity) requires collecting more than one time diary from each respondent. For example, one cannot use the WB activity weights to estimate how happy the average person felt while shopping. As an illustration, consider two people with different preferences for shopping: Person A doesn't mind shopping and so he shops on twice as many days per year as person B, who does not like to shop. On average, the ATUS data will pick up person A's shopping twice as often as person B's shopping. Without knowledge of how frequently respondents participate in a given activity (for example, how often person A and B shop), it is not possible to adjust for this difference in behavior; such an adjustment is needed to calculate how the average person felt while shopping. As also explained earlier in the data dictionary, an unbiased estimate of  $\bar{P}^*$  can be generated by modifying the WB activity weight by multiplying it by the total amount of time spent in eligible activities (WRTEELIG).

### Example - Use of Well-being activity weights

This example shows how to create estimates of the average level of pain across all activities for the following selection of employed respondents. It uses the person-day population average, equation (1) shown on page 6. The data shown here are from the following files: ATUS activity, Well-being respondent, and Well-being activity files. Each TUCASEID shows 3 selected activities, the level of pain experienced during those activities (WUPAIN) and the activity weight (WUFNACTWT). The weighted level of pain for each activity is shown in the last column. The sum of these weighted pain variables appears in the Total row located at the bottom of the table. The sum of all the activity weights for these activities also appears in the Total row. The average level of pain is then calculated as the ratio of the two – the result here is 1.75. This result differs from the result shown on page 7 because data from only a few employed respondents are used here, whereas the full set of employed WB Module respondents was used to calculate the result shown on page 7.

#### All Activities included

TUCASEID	WRTEBIG	TUACTIVITY_N	TUACTDUR24	TRTIER2	WUPAIN	WUFNACTWT	WUFNACTWT*WUPAIN
20210311090800	990	3	30	0202	0	2692030.67	0
20210311090800	990	8	10	1803	0	959972.47	0
20210311090800	990	10	10	1812	0	959972.47	0
20210504101233	915	3	15	1101	0	685460.85	0
20210504101233	915	6	30	1101	0	1370925.88	0
20210504101233	915	7	180	0501	0	7790556.36	0
20210504101244	1155	5	30	1101	3	5259637.60	15778913
20210504101244	1155	6	405	0501	3	67250196.04	201750588
20210504101244	1155	10	5	0701	3	876606.27	2629819
20210504101368	690	3	10	1102	0	984960.66	0
20210504101368	690	11	32	1805	2	4555599.50	9111199
20210504101368	690	12	198	0501	0	24622745.89	0
20210504101440	955	10	5	1805	1	362072.34	362072
20210504101440	955	11	205	0501	1	14059920.93	14059921
20210504101440	955	16	240	0501	1	16460394.11	16460394
Total						148891052.04	260152906
Average level of pain							1.75

Using the same employed respondents, this example illustrates the use of the time-based average, equation (2) shown on page 7, for estimating the average level of pain during the time spent participating in a specific activity. In this case, if the activity is working (TRTIER2=0501), an indicator variable ( $I_{ik}$ ) is set equal to 1 and is 0 otherwise. Multiplying the activity weights by WRTELIG, one can create estimates for the time-based average level of pain for this group of employed respondents during their time spent working. In this case, the average level of pain during this time is 2.00. This result differs from the result shown on page 7 because data from only a few employed WB Module respondents are used here.

**Work only (TRTIER2 = 0501)**

TUCASEID	WRTELIG	TUACTIVITY_N	TRTIER2	WUPAIN	WUFNACTWT	WUFNACTWT* WRTELIG	lik	lik*WUFNACTWT* WRTELIG*PAIN	lik*WUFNACTWT* WRTELIG
20210311090800	990	3	0202	0	2692030.667	2665110360	0	0	0
20210311090800	990	8	1803	0	959972.471	950372746	0	0	0
20210311090800	990	10	1812	0	959972.471	950372746	0	0	0
20210504101233	915	3	1101	0	685460.848	627196676.3	0	0	0
20210504101233	915	6	1101	0	1370925.878	1254397179	0	0	0
20210504101233	915	7	0501	0	7790556.359	7128359068	1	0	7128359068
20210504101244	1155	5	1101	3	5259637.597	6074881424	0	0	0
20210504101244	1155	6	0501	3	67250196.042	77673976429	1	233021929286	77673976429
20210504101244	1155	10	0701	3	876606.266	1012480237	0	0	0
20210504101368	690	3	1102	0	984960.661	679622856.2	0	0	0
20210504101368	690	11	1805	2	4555599.503	3143363657	0	0	0
20210504101368	690	12	0501	0	24622745.893	16989694666	1	0	16989694666
20210504101440	955	10	1805	1	362072.341	345779085.3	0	0	0
20210504101440	955	11	0501	1	14059920.927	13427224485	1	13427224485	13427224485
20210504101440	955	16	0501	1	16460394.113	15719676378	1	15719676378	15719676378
Total								262168830149	130938931026
Average level of pain for work activities only									2.00