Survey Design and Questionnaire for a Household Survey on Occupational Injuries and Injuries

Household Survey Design Report (Deliverable #9)

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Executive Summary

The Bureau of Labor Statistics is seeking to develop a household survey on nonfatal occupational injuries and illnesses (HSOII) to provide information on the level of underestimation of incidence rates from the Survey of Occupational Injuries and Illnesses and to provide information relative to the potential reasons for the underestimates. This report provides NORC's recommendations for survey design options intended to meet, to the extent possible, requirements in terms of sample representativeness, data quality, timeliness, and cost for a HSOII.

The option identified as best meeting the multiple aims of sample representation, data quality, timeliness, and cost (Option 1) is to conduct the HSOII through use of supplemental questions following the Current Population Survey (CPS) Annual Social and Economic Survey (ASEC, sometimes referred to as the CPS March Supplement) for those sample persons identified as meeting the HSOII eligibility requirements. Using the ASEC for eligibility screening and framing of the reference period would result in the lowest respondent burden and cost for the HSOII. Although roughly one-third of sample persons would not need to be asked any HSOII questions and almost all the remaining sample would be asked only a few injury/illness screener questions, the key disadvantage to this option is extended respondent burden for the roughly 3% of sample persons that would be asked the full HSOII questionnaire after the CPS and ASEC questionnaires.

Given potential issues with cumulative respondent burden associated with adding HSOII supplemental questions to the CPS March Supplement, or to the CPS in January or February when other supplements are already fielded, a second option (Option 2) is to add supplemental questions to the CPS in June or July, when there is no major supplement conducted every year, is also presented. Although slightly more costly than the ASEC option and entailing slightly more screening and respondent burden, this option does meet the HSOII aims of sample representation, data quality, timeliness, and cost.

Finally, should adding supplemental questions to the CPS not be operationally feasible, an option (Option 3) that uses American Community Survey (ACS) respondents as a sampling frame for selecting the HSOII sample is presented. This alternative, while incurring much higher respondent burden and costs, offers flexibility in terms of sample design and stratification to allow targeting selected industries and occupations which is not possible with the CPS options.

Both Option 1 and Option 2 with expected numbers of completed interviews ranging from 51,000 to 57,000 can be expected to have budgets less than $1 million. The sample size for Option 3 is flexible

based upon budget; however, keeping budget below $1 million would likely limit number of completed interviews to less than 50,000.

1. Introduction

The Survey of Occupational Injuries and Illnesses (SOII) is the primary source of information on nonfatal workplace injuries and illnesses in the U.S. Existing research points to an underestimate of injuries and illnesses in the SOII attributed to a variety of factors including an employer/employee incentive to underreport these occurrences.

One way to avoid the filtering effect of collecting establishment data on employee injuries and illnesses is to collect data directly from workers in a household survey. In such a survey, workers eligible for the survey would be identified and interviewed outside the sphere of the employer. The Bureau of Labor Statistics (BLS) has contracted with NORC at the University of Chicago (NORC) to provide assistance in the development of a survey design and questionnaire for a household survey on nonfatal occupational injuries and illnesses (referred to here as HSOII).

The sample design for the HSOII must result in a nationally representative household survey of workers that allows estimates by employment relationship (employee vs. self-employed), sector (private vs. government), industry, and occupation, and meeting publishability/quality and timing criteria for the HSOII.

In an earlier NORC report[1], the CPS and American Community Survey (ACS) were identified as the most suitable options for providing the sample frame for the HSOII because they provide sufficient sample size to allow both national estimates and estimates by selected groups, and because information collected in each of these surveys would be available to ease the identification of eligible respondents. This report provides details as to recommended sample design options from the CPS (Option 1 and Option 2) and ACS (Option 3).

This report provides NORC's recommendations for survey design options intended to meet, to the extent possible, requirements in terms of sample representativeness, data quality, timeliness, and cost. The option identified as best meeting the multiple aims of sample representation, data quality, timeliness, and cost is to conduct the HSOII through use of supplemental questions following the Current Population Survey (CPS) Annual Social and Economic Survey (ASEC, sometimes referred to as the CPS March Supplement) for those sample persons identified as meeting the HSOII eligibility requirements. Given potential issues with adding HSOII supplemental questions to the CPS March Supplement, or to the CPS in January or February when other supplements are already fielded, an alternative approach that uses

[1] Survey Design and Questionnaire for a Household Survey on Occupational Injuries and Illnesses: Report on Suitability of Existing Surveys and Frames, December 14, 2015.

supplemental questions to the CPS in June or July, when there is no major supplement conducted every year, is also presented. Finally, should adding supplemental questions to the CPS not be operationally feasible, an alternative approach that uses American Community Survey (ACS) respondents as a sampling frame for selecting the HSOII sample is presented. This alternative, while much more costly, offers flexibility in terms of sample design and stratification to allow targeting selected industries and occupations which is not possible with the CPS options.

2. HSOII as Supplemental Module to CPS

The survey design option identified as best meeting the multiple aims of sample representation, data quality, timeliness, and cost is to conduct the HSOII as a supplement to the Current Population Survey (CPS) in March of each year, following completion of the Annual Social and Economic Supplement (ASEC). Given potential logistical and respondent burden issues associated with fielding the HSOII supplemental questions following a major CPS supplement, an alternative would be to field the HSOII during June or July when there is no major supplement.

The key advantages to adding supplemental HSOII questions to the CPS are that the CPS offers sufficient sample size for the HSOII, provides at least partially screening of the CPS sample for HSOII eligibility, and allows reduced data collection costs through the CPS location, contact, and participation process. Depending upon which CPS month the HSOII questions are included, there will be some potential cognitive issues associated with discrepant reference periods between CPS and HSOII. Additionally, the CPS ASEC provides full screening of the CPS sample for HSOII eligibility, through the Work Experience series of questions, thereby minimizing respondent burden among possible CPS alternatives for including supplemental HSOII questions. The ASEC also serves to reorient respondents to thinking in terms of job and economic experience the prior calendar year as opposed to the prior week as is the case for the core CPS. For these reasons, fielding HSOII in March is the preferred alternative.

2.1 CPS Sample Design and Collection Periodicity

The CPS utilizes a national and state-based sample design with (per the BLS Handbook of Methods[2]) approximately 72,000 housing units (HUs) selected from 754 geographically defined PSU's being identified for interviewing each month. Of the 72,000 HUs, approximately 60,000 are eligible, with approximately 110,000 persons aged 16 years and older interviewed each month. 2015 CPS data provided to NORC by BLS show slightly higher HU sample counts and somewhat lower response rates, as shown in Table 2.1.1.

[2] BLS Handbook of Methods: Chapter 1, Labor Force Data Derived from the Current Population Survey, http://www.bls.gov/opub/hom/pdf/homch1.pdf.

Table 2.1.1: CPS monthly sample sizes

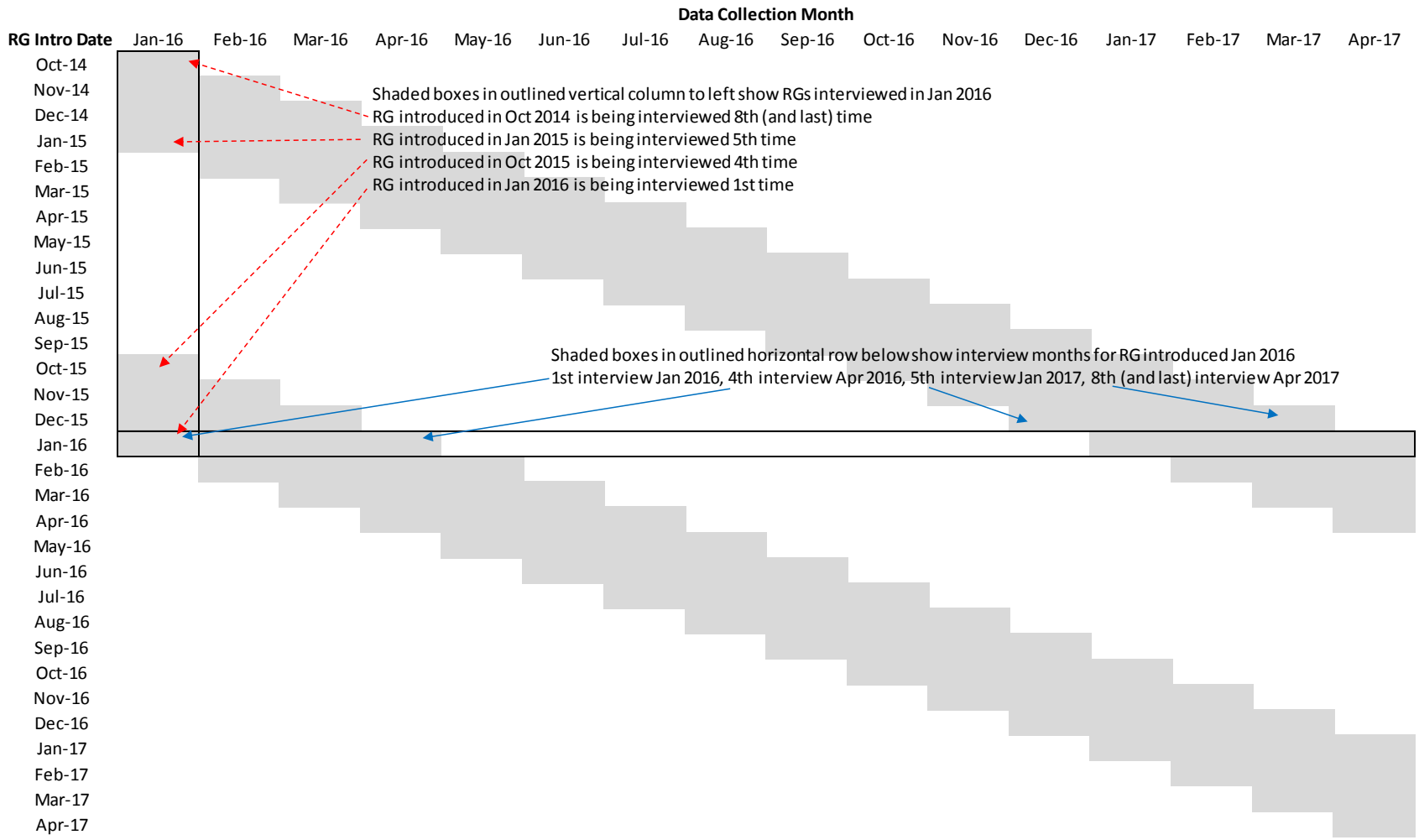
CPS Sample Counts			
		Monthly	
		BLS Handbook of Methods	2015 Monthly Average
HUs	Total	72,000	73,744
	Eligible	60,000	61,117
	w/ Interview[1]	55,500	53,320
Persons	16+	110,000	104,000

[1] Interview rates 92%-93% (BLS Handbook of Methods), 87.2% (2015 Monthly Average)

The CPS monthly sample is organized into eight rotation groups (RGs), with approximately 9,000 sampled HUs in each RG, with each RG being a nationally representative sample of HUs under the same sample design and yielding approximately 13,000 completed CPS questionnaires for persons aged 16+ at more than 6,500 occupied HUs. Each RG is included in the active sample for four consecutive months (referred to as months in sample 1 to 4, or MIS-1 to MIS-4), then rested (i.e., not included in the active sample) for eight months, then returned to the active sample for a final four consecutive months (referred to as MIS-5 to MIS-8, and corresponding to the same four calendar months as initially included in the active sample). CPS estimates for a given calendar month are comprised of sample data from the eight RGs in the active sample for the month. The CPS rotation scheme is visualized as in Figure 2.1.1.

For example, the RG introduced in Jan, 2016 will be in the active sample (following horizontally in the outlined row of Figure 3.1.1) Jan, Feb, Mar, and Apr of 2016 (MIS-1 to MIS-4 for the RG), and again Jan, Feb, Mar, and Apr of 2017 (MIS-5 to MIS-8 for the RG). In Jan, 2016 the RG introduced in Jan, 2016 is in the active sample for its first month in sample (MIS-1) along with (following vertically in the outlined column of Figure 3.1.1) RGs introduced in Oct, Nov, and Dec of 2015, and completing their respective MIS-4, MIS-3, and MIS-2 in active sample, respectively, as well as RGs introduced in Oct, Nov, and Dec of 2014 and Jan 2015, and completing their respective MIS-8, MIS-7, MIS-6, and MIS-5 in active sample.

Figure 2.1.1: Illustration of CPS rotation group (RG) collection schedule



COMMENTS:

1) Sample HUs in a RG are interviewed for four consecutive months (referred to as MIS-1 to MIS-4), then again the same four consecutive months the following year (referred to as MIS-5 to MIS-8)

2) In each month, sample HUs from 8 RGs are included in the active sample, with the RGs encompassing MIS-1 to MIS-8

The CPS yields in the order of 1.25MM annual interviews with persons aged 16 years and older. Given the RG structure, however, with the same HUs being in active sample for multiple months, the CPS annually interviews on the order of 350,000 unique individuals aged 16 years and older in roughly 180,000 occupied HUs. Given the proportion of persons 16+ who worked at least one day of the year (~65.1% based on data from the ACS), the CPS annually interviews approximately 230,000 unique workers eligible for HSOII. Table 2.1.2 provides data relative to CPS sample numbers.

Table 2.1.2: CPS sample counts by month, RG, and year

CPS Sample Counts (Based on 2015 Monthly Average)					
		Monthly	RG[1]	Annual	
				Total	Unique[2]
HUs	Total	73,744	9,218	884,928	248,886
	Eligible	61,117	7,640	733,404	206,270
	w/ Interview	53,320	6,665	639,840	179,955
16+	Interviewed	104,000	13,000	1,248,000	351,000
	Workers[3]	67,687	8,461	812,245	228,444

[1] RG is comprised of 1/8 of the monthly sample

[2] 27 unique RGs are in the active CPS sample at least one month in the year

[3] Based on data from ACS and CPS, an estimated 65.1% of persons 16+ worked at least one week in the prior year

In each calendar year, there are sample units from a total of 27 RGs in active sample for at least one month in the year. Of these, 18 RGs are in active sample for four consecutive months in the year – nine for their first through fourth months in active sample, and nine for their fifth through eighth months. There are another three RGs in active sample for four non-consecutive months in the year, and six RGs in active sample for less than four months in the year.

2.2 CPS-HSOII Survey Design

A HSOII that is a supplemental module or set of questions to the CPS could be designed as one of three alternatives: A) include module in all of the RGs in the active sample in one specific month of the year, as is the case with current CPS supplements; B) include module in all or a specified subset of the RGs in the active sample in several specific months of the year; and C) include module in a specified subset of the RGs in the active sample in all months of the year.

Alternatives B and C, while operational feasible, introduce logistical issues due to the need to coordinate with multiple CPS supplements and the potential for differing context effects in fielding the HSOII

following different introductory questions sets from the different CPS supplements. Thus, two options have been identified for fielding HSOII as a supplemental module or set of questions to the CPS.

The sampling frame for HSOII under both Option 1 and Option 2 will consist of sample HU's selected for the CPS within designated RGs for a specified month. The sample for HSOII Option 1 will consist of all CPS sampled HUs in all RGs active in March, while the sample for HSOII Option 2 will consist of all CPS sampled HUs in all RGs active in either June or July.

Under both Option 1 and Option 2, all sample HUs within all RGs in active sample in one specified month would be included in the HSOII sample. Respondents would be asked to report on injuries and illnesses for a 12 month period, whether the prior calendar year (Option 1) or the most recent 12 month (Option 2) period.

From a recall error perspective, while January would be the most desirable month for the HSOII, due to being able to collect data for the preceding calendar year with the smallest time gap between the end of the reference period and data collection, March is recommended for a different reason – the March Annual Social and Economic Supplement obtains employment status within the prior calendar year, and thus already collects the screening data for the HSOII. The HSOII supplement could be conducted in other months, but the reference period would be the prior 12 months rather than a calendar year, which is less desirable.

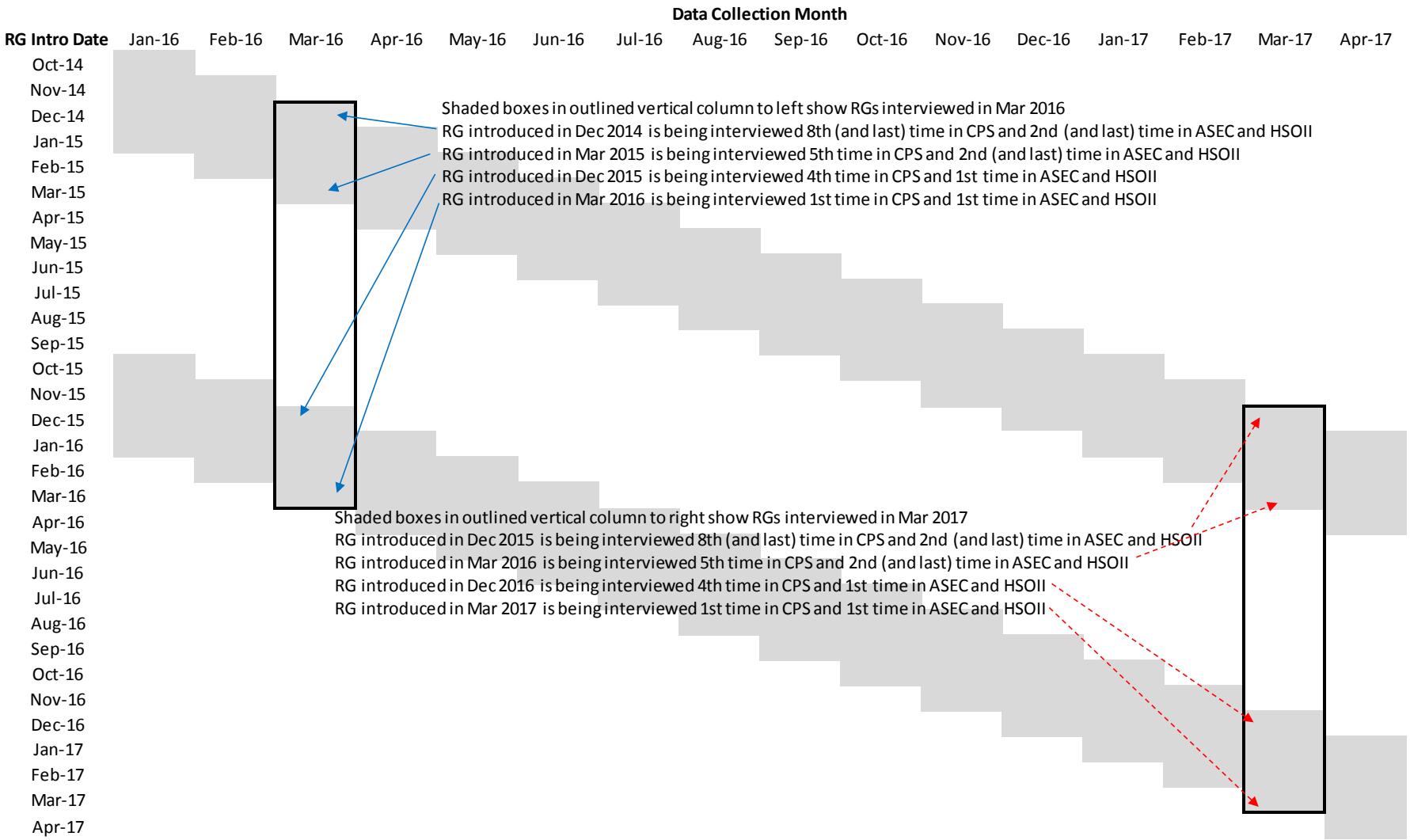
2.2.1 Option 1 for HSOII Survey Design: Supplemental questions included in CPS every March, following ASEC

NORC's preferred survey design option for the HSOII is to conduct it annually in conjunction with the March CPS and Annual Social and Economic (ASEC) Supplement. Among other information, this supplement collects information on worker status for the past calendar year. The content and structure of this supplement blends well with the HSOII because it sets up the prior calendar year as the reference period for the respondent and identifies those HU members who are in the eligible age range and who worked in the last calendar year. Since the ASEC supplement would collect the necessary eligibility screening, no screening questions will be needed for the HSOII. Rather, data collected during ASEC as to work status during the prior calendar year will be used to determine whether to field HSOII questions for individual CPS sample persons. Based upon prior ACS and CPS estimates, roughly 35% of CPS sample persons did not work at least one week in the prior year and thus would be asked no HSOII questions. For the roughly 65% of CPS sample persons that are eligible for HSOII, based upon prior ESOII estimates, roughly 95% would be asked only one or a small number of questions to determine they had no HSOII-qualifying event within the prior calendar year. Thus, it is expected that approximately 3% of the

CPS sample persons would be asked the full HSOII set of questions to collect data on their injury and/or illness event(s). Given data from ACS on worker status, we would expect just over one-third of CPS/ASEC respondents would not be asked any HSOII questions, as they would not have worked in the prior year.

Given the CPS rotation scheme, each HU would be interviewed as part of the HSOII for two consecutive years in March. Each time, they would recall work-related injuries and illnesses for the prior calendar year (January through December); data on injuries and illnesses would thus be collected for a total 24-month period. However, only the second of the two interviews would be a bounded interview. As illustrated in Figure 2.2.1.1, in March 2016, the RGs that entered the sample between December 2015 and March 2016 would be interviewed for the Household SOII for the first time in March 2016; these groups would be interviewed for a second time in March of 2017.

Figure 2.2.1.1: Illustration of HSOII Option 1 collection schedule: Annual collection in March, prior calendar year reference period



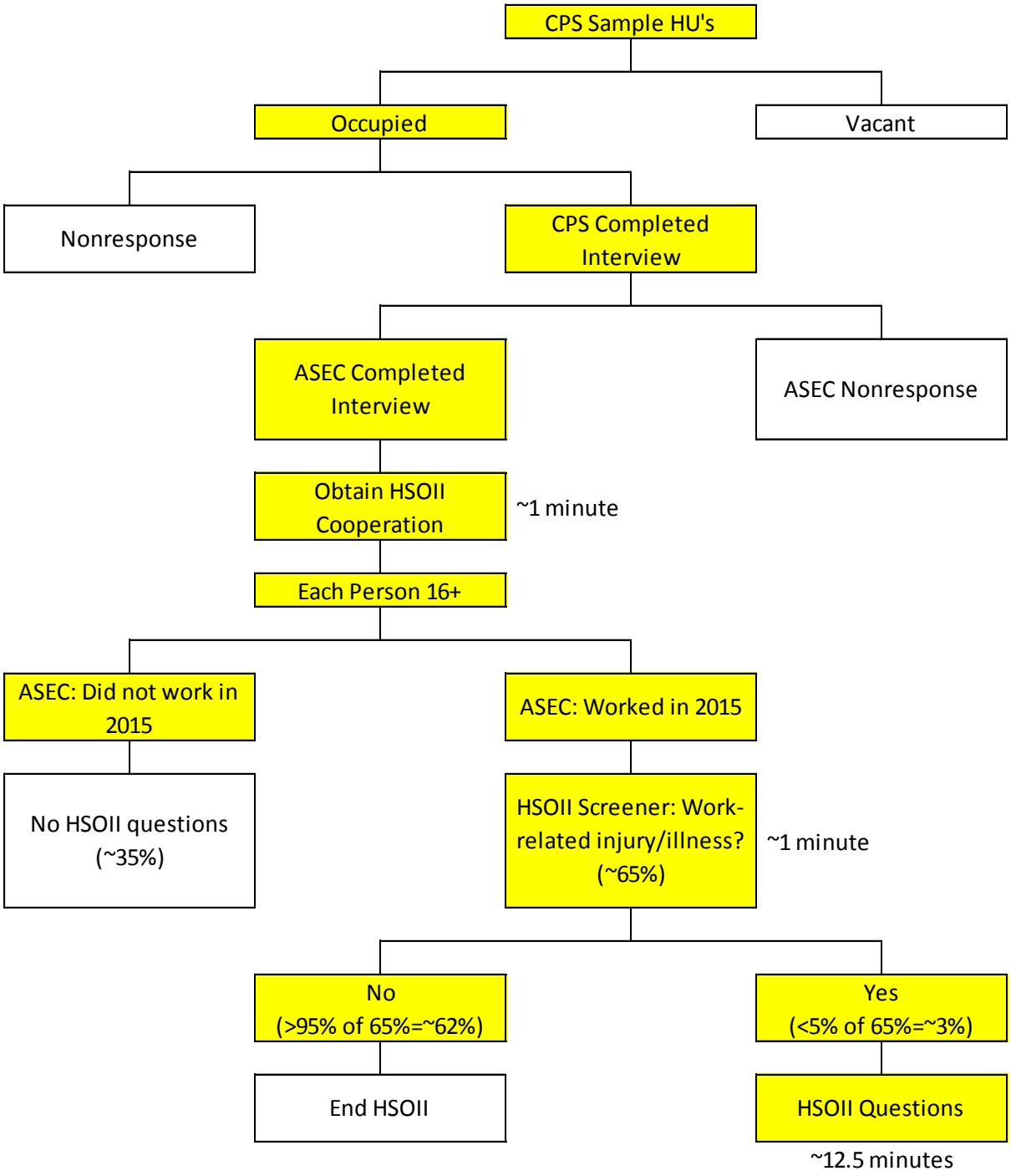
Note, however, that since the CPS is a sample of HUs, not of household members, there will be instances in which members of the HU will have moved between Household SOII interviews. In this case, the new HU members would be interviewed if they meet eligibility criteria, without use of a bounding interview.

An advantage of Option 1 is the utility of conducting the interview in conjunction with the ASEC; using the ASEC for eligibility screening and framing of the reference period will ease the burden for the HSOII. However, the reference period for the survey would be the prior calendar year, which begins up to 15 months prior to the date of the March interview. The longer reference period and more distant beginning of the reference period present issues for recall of relevant incidents. This issue is ameliorated to some degree by the fact that the ASEC asks questions about the prior calendar year and thus the respondent has been keyed in prior to HSOII on thinking in terms of the prior calendar year.

Another advantage of Option 1 is the cost savings which can be realized through a CPS supplement, wherein sample location, contact, and participation is carried out through the CPS process.

A disadvantage to the ASEC is extending respondent burden. Typically the CPS takes less than 8 minutes to complete. However, the ASEC adds 24 minutes to the survey time. The addition of the HSOII would make the survey even longer for respondents who experienced illness or injury, by roughly 10-15 minutes. However, roughly a third of the sample persons would have no additional response burden (the roughly 35% not working in the prior calendar year) and just over 60% would have minimal additional response burden (of the roughly 65% of sample persons working in the prior calendar year, over 95% would only be asked whether they experienced a work-related injury or illness (calculations in this report assume an average of 1 minute of respondent burden for HSOII injury/illness screening), and would answer in the negative, thus incurring only one minute of additional response burden, based upon data from the Establishment SOII). Any sizable increase in respondent burden would be incurred by roughly 3% of the CPS sample persons, those answering affirmatively to the HSOII screening question. This additional response burden would be on the order of 10-15 minutes (calculations in this report assume an average of 12.5 minutes). See Figure 2.2.1.2 for an illustrative flowchart of the HSOII interview process and persons following each stream.

Figure 2.2.1.2: Illustrative flowchart of HSOII Option 1 data collection interview process

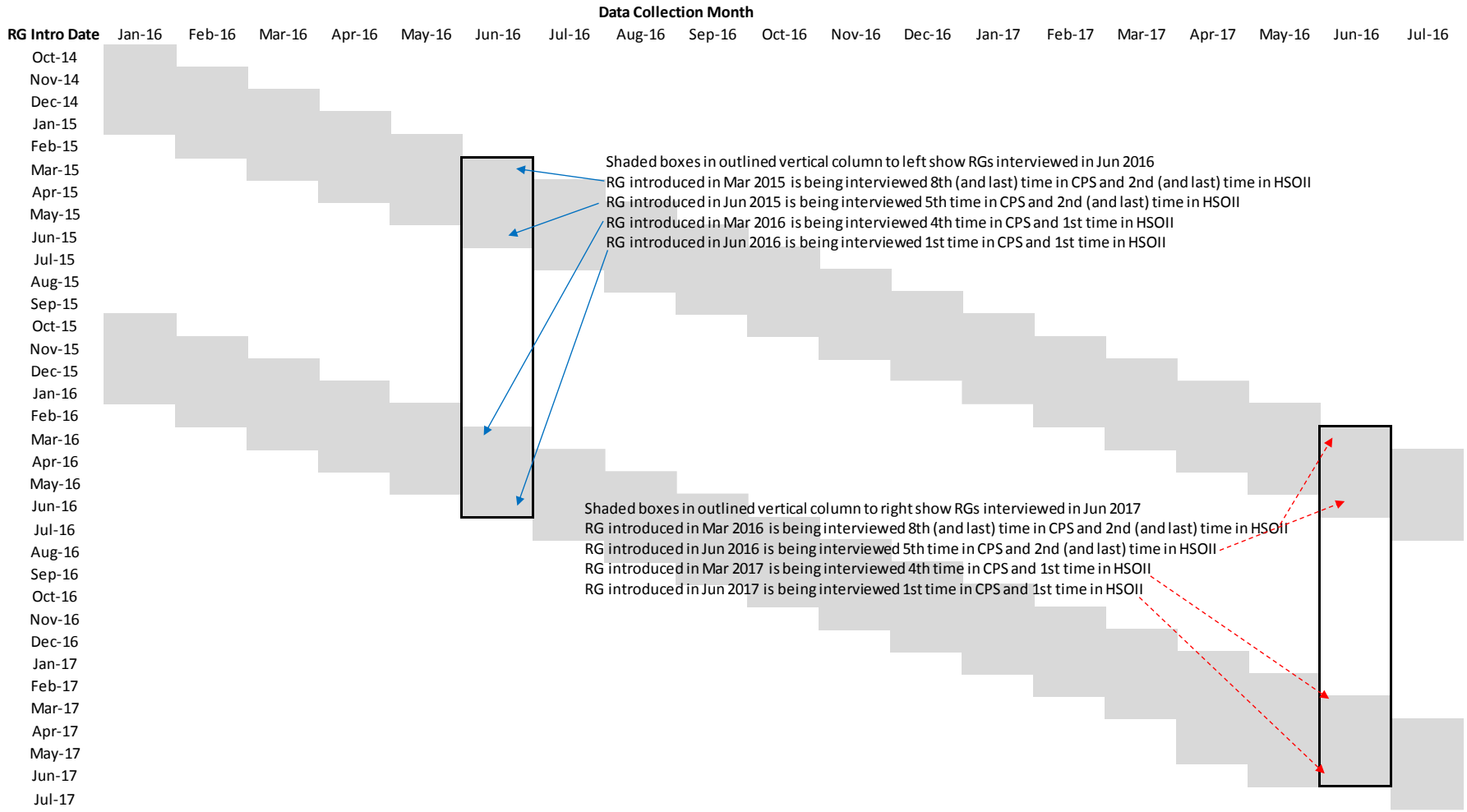


2.2.2 Option 2 for HSOII Survey Design: Supplemental questions included in CPS every June or July

Recognizing the potential logistical and respondent burden issues associated with Option 1, Option 2 proposes that HSOII be fielded as a set of supplemental questions following completion of the CPS each June or July. Screening questions will be required of all CPS sample persons not identified in the CPS interview as employed in the CPS reference or reporting having worked in the prior 12 months as part of the CPS unemployment questions. Although the number of screening questions should be small, they would be asked of the least the 35% of persons that ACS and CPS estimate as having not worked in the prior year. For the roughly 65% of CPS sample persons that are eligible for HSOII, they would be read an introductory statement to explain the time period for which questions are being asked to reframe their thinking to the prior 12 months. Roughly 95% of these persons would be asked only one or a small number of questions to determine they had no HSOII-qualifying event within the prior 12 months. Thus, it is expected that less than 5% of the CPS sample persons would be asked the full HSOII set of questions to collect data on their injury and/or illness event(s).

Given the CPS rotation scheme, each HU would be interviewed as part of the HSOII for two consecutive years in June or July. Each time, they would recall work-related injuries and illnesses for the prior 12 month period; data on injuries and illnesses would thus be collected for a total 24-month period for sample persons. However, only the second of the two interviews would be a bounded interview. As illustrated in Figure 2.2.2.1, in June 2016, sample HUs in the RGs that entered the sample between March and June 2016 would be interviewed for the HSOII for the first time in June 2016; these groups would be interviewed for a second time in June of 2017. Note that the persons interviewed in the overlapping RGs from one year to the next may not completely overlap, although this will be a small minority. First, as CPS is a sample of HUs and not persons, households may have moved from one year to the next. Second, HUs interviewed in one year may be nonrespondents the next year, and vice versa.

Figure 2.2.2.1: Illustration of HSOII Option 2 collection schedule: Annual collection in June, prior 12 months reference period

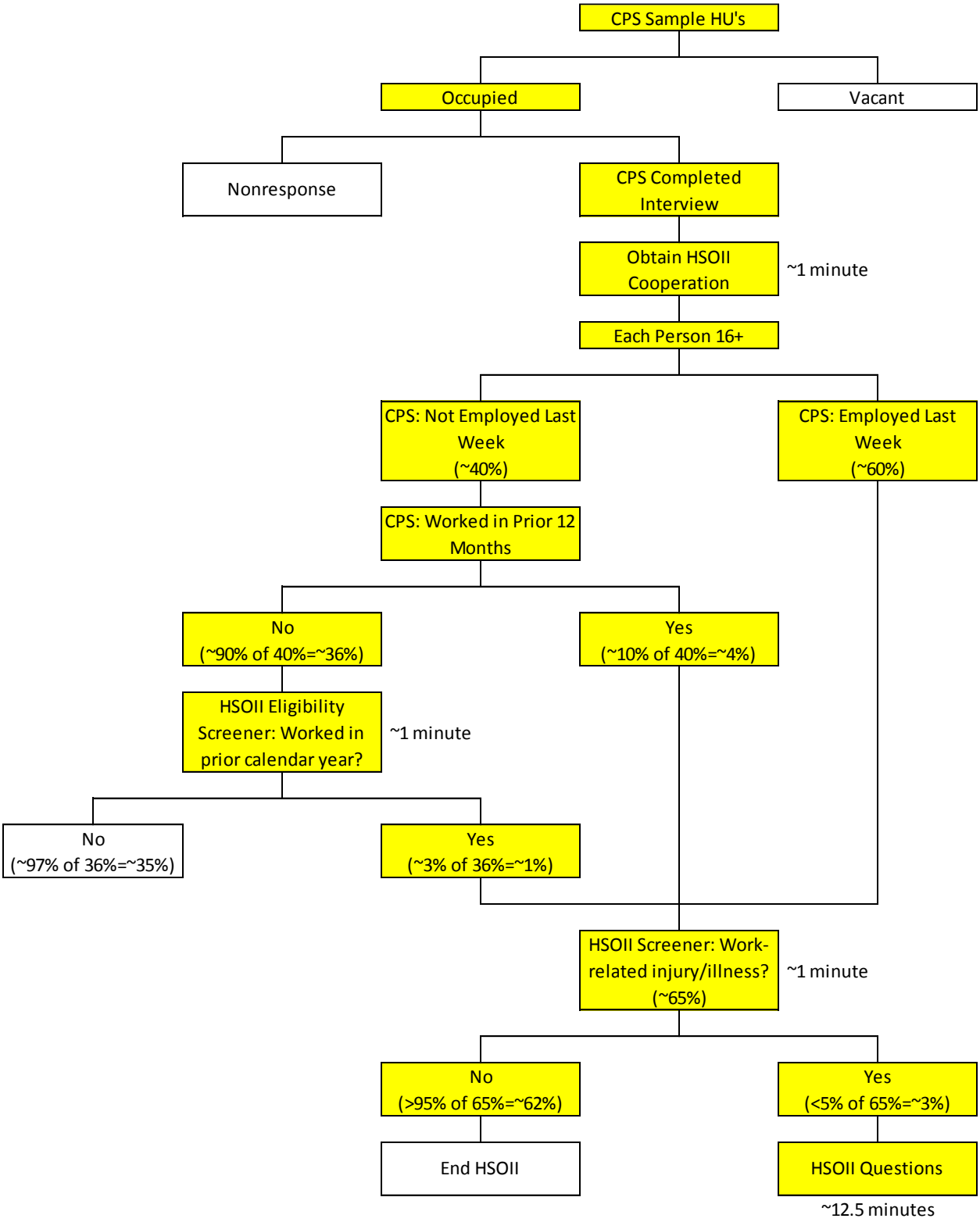


Note, however, that since the CPS is a sample of HUs, not of household members, there will be instances in which members of the HU will have moved between Household SOII interviews. In this case, the new HU members would be interviewed if they meet eligibility criteria, without use of a bounding interview.

A key advantage of Option 2 is the utility of conducting the interview in conjunction with the CPS, i.e., the cost savings which can be realized through a CPS supplement, wherein sample location, contact, and participation is carried out through the CPS process.

A disadvantage of Option 2 is the potential for recall error when asking respondents to report any work-related injury/illness events that occurred in the 12 months prior to the date of the interview. Not only will the respondent be asked to recall events from the prior 12 months, but they will also be implicitly asked to change their frame of reference from the prior week or month, which is the basis for most of the CPS questions, to the prior 12 months. A secondary disadvantage of Option 2 is the need for an eligibility question for any sample persons for which it has not been determined whether they worked in the prior 12 months. For persons determined through the CPS questions to be currently employed, it is known that they are eligible for HSOII. Similarly, for some categories of persons not classified as employed, there are CPS questions that may determine the persons to have worked in the prior 12 months and therefore eligible for HSOII. However, for all others, it will be necessary to ask a HSOII eligibility screener question (calculations in this report assume an average of 1 minute of respondent burden for HSOII eligibility screening). Figure 2.2.2.2 provides an illustration of the process flow for HSOII under Option 2. Proportions for stream under CPS: Worked in Prior 12 Months are assumptions based upon CPS data available from Employment Situation tables.

Figure 2.2.2.2: Illustrative flowchart of HSOII Option 2 data collection interview process



2.2.3 CPS-HSOII Sample Size and Precision

The interviewed sample size for Option 1 could be expected to be smaller than that for Option 1, due to the impact of conditional nonresponse to ASEC in addition to conditional nonresponse for HSOII. For Option 1, consideration could be given to including the ASEC supplemental samples of 6,500 Hispanic HUs and 19,000 CHIP HUs[3] which, based upon CPS response rates and ACS worker rates, could add an additional 23,406 sample persons eligible for HSOII. However, these ASEC supplemental samples are carried out under an extended collection period (Feb-Apr rather than just Mar), which may not be advisable for HSOII. As indicated in Table 3.1.2, an expected 67,687 CPS sample persons, less ASEC nonresponse[4] under Option 1, would be eligible for the HSOII in any given month. See Table 2.2.3.1 for expected sample sizes for Option 1 (both using only the March CPS sample and adding in the ASEC Hispanic and CHIP supplemental samples) and Option 2.

Table 2.2.3.1: HSOII expected sample counts under Option 1 and Option 2

	HSOII Expected Sample Counts				
	Option 1: March ASEC Supplements				Option 2: June or July
Eligible Workers	CPS	Hispanic	CHIP	Total	
CPS Interviews	67,687	N/A	N/A		67,687
ASEC Interviews	57,534	5,966	17,439	80,940	N/A
HSOII Interviews*	51,781	5,370	15,696	72,846	57,534

*HSOII conditional response rate assumed to be 90% following CPS+ASEC, 85% following CPS

While the CPS utilizes a state-based sample design, for purposes of discussion, it is reasonable to assume that eligible workers in the CPS or combined CPS/ASEC sample will be distributed by industry and occupation as is the full population. In the Sampling Frame Report[5], we recommended collapsing across industry groups given the sample size associated with CPS. Table 2.2.3.2.a shows a collapsed seven industry grouping based on industry size and 2014 estimated injury/illness incidence rate, while Table 3.2.3.3 shows a collapsed six occupation grouping based on occupation size and 2014 estimated days away from work incidence rate. Industry and occupation sizes are based upon 2016 Current Employment Statistics (CES) estimates.

[3] Current Population Survey, 2015 ASEC Technical Documentation (http://www2.census.gov/programs-surveys/cps/techdocs/cpsmar15.pdf).

[4] 2013 ASEC conditional nonresponse was 10.13% (http://www.lisdatacenter.org/wp-content/uploads/our-lis-documentation-by-us13-survey.pdf). Information conveyed by BLS to NORC indicates 2015 ASEC conditional nonresponse was ~15%. For Table III.C.1, a 15% conditional nonresponse for ASEC was used.

[5] Report on Suitability of Existing Surveys and Frames, December 14, 2015

Table 2.2.3.2: Sizes, incidence rates by 7-industry grouping

Industry Group	Feb 2016 Employment Count	Feb 2016 Employment Proportion	2014 Incidence Rate Group	2014 Incidence Rate 2 digit Min	2014 Incidence Rate 2 digit Max
Agriculture & Goods-producing[1]	22,096	15.4%	3.8	3.6	5.5
Retail Trade & Transportation[2]	20,742	14.5%	>3.6	3.6	4.8
Professional & Business Services	20,019	14.0%	1.5	0.9	2.6
Health Care and Social Assistance	18,977	13.3%	4.5	N/A	N/A
Leisure & Hospitality	15,435	10.8%	3.6	3.5	4.2
Other Service-producing[3]	26,653	18.6%	<2.9	0.7	2.9
State & Local Government	19,273	13.5%	5.0	4.1	5.4
Total	143,195	100.0%	3.4		

[1]Agriculture & Related Industries (employment from CPS), Mining, Construction, Manufacturing

[2]Retail Trade, Transportation

[3]Wholesale Trade, Utilities, Information, FIRE, Education, Other Services

Table 2.2.3.3: Sizes, incidence rates by 6-occupation grouping

Occupation Grouping	Feb 2016 Employment Count	Feb 2016 Employment Proportion	2014 Incidence Rate for Days Away from Work Group	2014 Incidence Rate for Days Away from Work Occ Min	2014 Incidence Rate for Days Away from Work Occ Max
Technical[1]	14,134	10.5%	<0.2	0.08	0.19
Management, Science & Arts[2]	9,680	7.2%	<0.5	0.37	0.48
Office, Sales & Education[3]	44,323	32.8%	<0.6	0.50	0.59
Healthcare & Services[4]	26,217	19.4%	<1.1	0.95	1.10
Production, Construction & Installation[5]	19,916	14.7%	<2.1	1.37	2.03
Support, Maintenance, Protection & Transportation[6]	20,858	15.4%	>2.2	2.21	2.99
Total	135,128	100.0%	1.07		

[1]Computer/Mathematical, Legal, Business/Financial Operations, Architecture/Engineering

[2]Management, Life/Physical/Social Science, Arts/Design/Entertainment/Sports/Media,

[3]Office/Administrative, Sales/Related, Education/Training/Library

[4]Community/Social Services, Food Preparation/Serving Related, Healthcare Practitioners/Technical, Personal Care/Service

[5]Production,Farming/Fishing/Forestry, Construction/Extraction, Installation/Maintenance/Repair

[6]Healthcare Support, Building/Grounds Cleaning/Maintenance, Protective Service, Transportation/Material Moving

Assuming eligible workers in the CPS sample were distributed as the full population, Table 2.2.3.4 and Table 2.2.3.5 provide expected HSOII interviews by industry and occupation grouping for Option 1 (using only March CPS ASEC respondents) and Option 2.

Table 2.2.3.4: Expected interviewed sample sizes by 7-industry grouping under Option 1 and Option 2

Industry Group	Feb 2016 Employment		Expected HSOII Interviews	
	Count	Proportion	Option 1	Option 2
Agriculture & Goods-producing[1]	22,096	15.4%	7,990	8,878
Retail Trade & Transportation[2]	20,742	14.5%	7,500	8,334
Professional & Business Services	20,019	14.0%	7,239	8,043
Health Care and Social Assistance	18,977	13.3%	6,862	7,625
Leisure & Hospitality	15,435	10.8%	5,581	6,202
Other Service-producing[3]	26,653	18.6%	9,638	10,709
State & Local Government	19,273	13.5%	6,969	7,744
Total	143,195	100.0%	51,781	57,534

[1]Agriculture & Related Industries (employment from CPS), Mining, Construction, Manufacturing

[2]Retail Trade, Transportation

[3]Wholesale Trade, Utilities, Information, FIRE, Education, Other Services

Table 2.2.3.5: Expected interviewed sample sizes by 6-occupation grouping under Option 1 and Option 2

Occupation Grouping	Feb 2016 Employment		Expected HSOII Interviews	
	Count	Proportion	Option 1	Option 2
Technical[1]	14,134	10.5%	5,416	6,018
Management, Science & Arts[2]	9,680	7.2%	3,709	4,121
Office, Sales & Education[3]	44,323	32.8%	16,984	18,871
Healthcare & Services[4]	26,217	19.4%	10,046	11,163
Production, Construction & Installation[5]	19,916	14.7%	7,632	8,480
Support, Maintenance, Protection & Transportation[6]	20,858	15.4%	7,993	8,881
Total	135,128	100.0%	51,781	57,534

[1]Computer/Mathematical, Legal, Business/Financial Operations, Architecture/Engineering

[2]Management, Life/Physical/Social Science, Arts/Design/Entertainment/Sports/Media,

[3]Office/Administrative, Sales/Related, Education/Training/Library

[4]Community/Social Services, Food Preparation/Serving Related, Healthcare Practitioners/Technical, Personal Care/Service

[5]Production,Farming/Fishing/Forestry, Construction/Extraction, Installation/Maintenance/Repair

[6]Healthcare Support, Building/Grounds Cleaning/Maintenance, Protective Service, Transportation/Material Moving

To determine precision associated with the expected sample sizes, we first estimate the effective sample sizes. The design effect associated with national level estimates of the Civilian Labor Force (analogous to workers) for the CPS sample is 0.794[6]. With the additional impact of nonresponse, we assume the design effect for HSOII equals 1.0, and thus the expected sample sizes in Table 2.2.3.4 and Table 2.2.2.5 are equivalent to the effective sample sizes.

[6] Technical Paper 66: Design and Methodology, Current Population Survey (https://www.census.gov/prod/2006pubs/tp-66.pdf)

Sample interviews will take place with both full-time and part-time workers, and with workers employed all 52 weeks of the year and those employed for less time. Table 2.2.3.6 presents 2014 ACS data on work status, from which estimates of FTEs for the HSOII sample interviews can be derived.

Table 2.2.3.6: 2014 ACS distributions for weeks worked, usual hours worked for persons aged 16-64 years

Population 16 to 64 years		
	Total	**Workers**
WEEKS WORKED		
Worked 50 to 52 weeks	55.1%	73.8%
Worked 40 to 49 weeks	5.6%	7.5%
Worked 27 to 39 weeks	4.7%	6.3%
Worked 14 to 26 weeks	4.0%	5.4%
Worked 1 to 13 weeks	5.3%	7.1%
Did not work	25.3%	
USUAL HOURS WORKED		
Usually worked 35 or more hours per week	56.7%	75.9%
40 or more weeks	50.6%	67.7%
50 to 52 weeks	47.1%	63.1%
Usually worked 15 to 34 hours per week	14.4%	19.3%
40 or more weeks	8.9%	11.9%
50 to 52 weeks	7.1%	9.5%
Usually worked 1 to 14 hours per week	3.6%	4.8%
40 or more weeks	1.3%	1.7%
50 to 52 weeks	1.0%	1.3%
Did not work	25.3%	

The data in 2.2.3.6 represent persons aged 16-64. It is reasonable to assume that persons aged 65+ are less likely to work full-time and less likely to work all weeks in the year. For purposes of this analysis, we assumed that the proportion of workers aged 65+ working full-time is half that of workers aged 16-64, with the difference equally allocated across part time status categories, and that the proportion of workers aged 65+ working 50 to 52 weeks is half that of workers aged 16-64, with the difference equally allocated across weeks worked categories. The result, along with distribution for total workers aged 16+ is provided in Table 2.2.3.7.

Table 2.2.3.7: Estimated distributions for weeks worked, usual hours worked for persons aged 16+ years

Workers			
	16-64	65+	Total
WEEKS WORKED			
Worked 50 to 52 weeks	73.8%	36.9%	71.5%
Worked 40 to 49 weeks	7.5%	16.7%	8.1%
Worked 27 to 39 weeks	6.3%	15.5%	6.9%
Worked 14 to 26 weeks	5.4%	14.6%	5.9%
Worked 1 to 13 weeks	7.1%	16.3%	7.7%
USUAL HOURS WORKED			
Usually worked 35 or more hours per week	75.9%	38.0%	73.6%
40 or more weeks	67.7%	26.2%	65.2%
50 to 52 weeks	63.1%	15.7%	60.1%
Usually worked 15 to 34 hours per week	19.3%	38.3%	20.5%
40 or more weeks	11.9%	18.0%	12.3%
50 to 52 weeks	9.5%	12.6%	9.7%
Usually worked 1 to 14 hours per week	4.8%	23.8%	6.0%
40 or more weeks	1.7%	9.4%	2.2%
50 to 52 weeks	1.3%	8.5%	1.8%

Based on the distributions by weeks worked and usual hours worked, the average FTE across the worker population is 0.80. Assuming this relationship holds across industry, the effective sample size of worker years from Option 1 and Option 2, along with expected standard errors and expected relative standard errors for estimated injury/illness incidence rates are represented in Table 2.2.3.8 and Table 2.2.3.9. Expected standard errors were derived assuming HSOII estimated incidence rates for an industry grouping will be 25% higher than those from ESOII.

Table 2.2.3.8: Estimated distributions for weeks worked, usual hours worked for persons aged 16+ years

	Expected HSOII Worker Years		Estimated Injury/Illness Incidence Rate		Expected Standard Error for Incident Rate		Expected Relative Standard Error for Incident Rate	
Industry Group	Option 1	Option 2	2014 ESOII	HSOII	Option 1	Option 2	Option 1	Option 2
Agriculture & Goods-producing[1]	6,392	7,102	3.8	4.8	0.27	0.25	7.0	5.3
Trade & Transportation[2]	6,000	6,667	~3.9	4.9	0.28	0.26	7.1	5.4
Professional & Business Services	5,791	6,435	1.5	1.9	0.18	0.17	11.9	9.0
Health Care and Social Assistance	5,490	6,100	4.5	5.6	0.31	0.30	6.9	5.2
Leisure & Hospitality	4,465	4,961	3.6	4.5	0.31	0.29	8.6	6.5
Other Service-producing[3]	7,710	8,567	~1.8	2.3	0.17	0.16	9.4	7.1
State & Local Government	5,575	6,195	5.0	6.3	0.32	0.31	6.5	4.9
Total	41,425	46,027	3.4	4.3	0.10	0.09	2.9	2.2

[1]Agriculture & Related Industries (employment from CPS), Mining/Logging, Construction, Manufacturing

[2]Wholesale Trade, Retail Trade, Transportation

[3]Utilities, Information, FIRE, Education, Other Services

Table 2.2.3.9: Estimated distributions for weeks worked, usual hours worked for persons aged 16+ years

Occupation Group	Expected HSOII Worker Years		Estimated Injury/Illness Incidence Rate[7]		Expected Standard Error for Incident Rate		Expected Relative Standard Error for Incident Rate	
	Option 1	Option 2	2014 ESOII	HSOII	Option 1	Option 2	Option 1	Option 2
Technical[1]	4,333	4,814	0.4	0.6	0.11	0.11	25.4	19.3
Management, Science & Arts[2]	2,967	3,297	1.2	1.5	0.23	0.21	18.4	14.0
Office, Sales & Education[3]	13,587	15,097	1.6	2.1	0.12	0.12	7.4	5.6
Healthcare & Services[4]	8,037	8,930	3.2	4.0	0.22	0.21	6.9	5.2
Production, Construction & Installation[5]	6,105	6,784	5.3	6.6	0.32	0.30	6.0	4.6
Support, Maintenance, Protection & Transportation[6]	6,394	7,105	8.6	10.8	0.39	0.37	4.5	3.4
Total	41,425	46,027	3.4	4.3	0.10	0.09	2.9	2.2

[1]Computer/Mathematical, Legal, Business/Financial Operations, Architecture/Engineering

[2]Management, Life/Physical/Social Science, Arts/Design/Entertainment/Sports/Media

[3]Office/Administrative, Sales/Related, Education/Training/Library

[4]Community/Social Services, Food Preparation/Serving Related, Healthcare Practitioners/Technical, Personal Care/Service

[5]Production,Farming/Fishing/Forestry, Construction/Extraction, Installation/Maintenance/Repair

[6]Healthcare Support, Building/Grounds Cleaning/Maintenance, Protective Service, Transportation/Material Moving

[7]Incidence Rates derived using ratio of injury/illness incidence rates to days away from work incidence rates (3.13) for industry

For comparison purposes, Table 2.2.3.10 presents relative standard errors from the 2014 ESOII for selected industries.

Table 2.2.3.10: Estimated distributions for weeks worked, usual hours worked for persons aged 16+ years

Industry Group	Estimated Injury/ Illness Incidence Rate 2014 ESOII	Relative Standard Error for Incident Rate 2014 ESOII
Natural Resources & Mining	3.8	2.9
Construction	3.6	2.4
Manufacturing	4.0	0.8
Trade, Transportation & Utilities	3.6	0.9
Information	1.4	4.4
Finance, Insurance & Real Estate	1.2	4.2
Professional & Business Services	1.5	2.6
Educational & Health Services	4.2	0.8
Leisure, Entertainment & Hospitality	3.6	1.4
Other Services	2.5	4.1
State & Local Government	5.0	1.6
Total	3.4	0.5

As can be seen, relative standard errors for the HSOII will be larger than those for thee ESOII. However, for the suggested industry and occupation groupings and assumed HSOII estimated incidence rates, the sample size is sufficient to power 95% one-sided tests of differences between ESOII and HSOII incidence

rates, at the 0.80 level, for all with the exception of the occupation groupings with estimated ESOII incidence rates less than 1.5.

3. HSOII Sample Selected from ACS

If it is determined to not be feasible to include the HSOII as a supplement to the CPS, the preferred alternative approach would be to select sample from American Community Survey (ACS) respondents and conduct the HSOII as a standalone follow-on survey. The key advantages of the ACS as a sampling frame for a standalone HSOII are its sample size and the data available from the ACS data collection for use in HSOII sample design stratification. In particular, ACS data provides information as to each person's work status, industry, occupation as of the date of the ACS interview. The key disadvantage is cost, as HSOII would incur all data collection costs, from location, to contact, to participation, and respondent burden, as screening and profile information would need to be obtained from all sample.

3.1 ACS Sample Design and Collection

The ACS utilizes a county/county-equivalent level sample design to select roughly 3.54MM HUs and 200,000 persons in group quarters (GQs) each year for interviewing. HU sample is released monthly, with data collection occurring over a three month period through a combination of mail, web, telephone, and personal visit. Personal visit followup occurs in the third month with a sample of residual nonrespondents. GQ data collection varies depending on type of GQ, but with a similar annual sample design.

The ACS collects data on worker status in the prior 12 months, along with industry and occupation data and other demographic and socioeconomic characteristics of interest for stratification of the HSOII. As a result, sample size targets could be established by industry group and occupation group, with oversampling of specified groups (whereas in the CPS option, sample size distributions by industry and occupation groups would be expected to be similar to those seen in the general population).

Given average occupancy data for HUs, total annual sample sizes from ACS are represented in Table 3.1.1. As can be seen, the ACS sample interviews include roughly 2.3MM workers.

Table 3.1.1: ACS sample sizes

	2014 ACS Sample Size	
	HU Sample	GQ Sample
HUs Selected	3,540,532	N/A
Final HU Interviews	2,322,722	N/A
Occupied HUs	1,881,261	N/A
Persons Selected	N/A	207,403
Final Person Interviews	4,513,063	165,116
16+	3,535,344	162,694
Workers	2,271,962	35,793

As with the CPS sample, it is reasonable to assume that the distribution of workers in the ACS sample is similar to that in the total population. Thus, any industry which constitutes at least 0.5% of the total workforce would be expected to have at least 10,000 sample cases in the ACS.

3.2 Option 3 for the HSOII Survey Design: Standalone Survey using ACS Sample

Under Option 3, the ACS would serve as a sampling frame from which a subsample of HUs and GQs would be selected for interview. The design would be stratified by employment relationship, industry, and occupation to provide minimally sufficient sample sizes to meet estimation requirements. In addition, work status would also be used as a stratifier to improve the efficiency of the design. Although sector is the one other dimension of interest for estimates, it is implicitly treated as a stratifier given the proposed industry grouping treats state/local government as a separate grouping.

Given the time lag between ACS data collection and likely availability of the ACS data file for use in HSOII sampling, the ACS information will have aged and will be out of date for some persons (e.g., HU members moved, changes in employment status). The HSOII sample would have to include sample from ACS HUs in which there were no workers at the time of the ACS, to ensure full coverage of the target population, although at much lower sampling rates. Many of these latter sample would result in finding no eligible persons for the HSOII, and thus reduce the efficiency of the sample design.

Stratification for the sample design would look like the layout in Table 3.2.1. ACS HUs and GQs would be designated to strata based upon the characteristics of the persons aged 16+ within the HU at the time of the ACS interview. Most HUs would have more than one person aged 16+, and thus a hierarchy for classifying HUs to strata must be developed. Several approaches could be considered, such as classifying the HU based on a hierarchy established among the strata, using the relative population sizes of the strata

to assign HUs to the smallest stratum for which they qualify, or identifying a reference person for each HU and classifying the HU based upon that person's characteristics (e.g., youngest, first person listed).

Table 3.2.1: Estimated distributions for weeks worked, usual hours worked for persons aged 16+ years

		Employment Relationship					
		Employee					
		Work Status					
		Full-time		Part-time			
Industry	Occupation	All Weeks	Partial Weeks	All Weeks	Partial Weeks	Self-Employed	Not a Worker
Overall							
Ind 1	Occ 1						
	Occ 2						
	…						
	Occ m						
Ind 2	Occ 1						
	Occ 2						
	…						
	Occ m						
…							
Ind n	Occ 1						
	Occ 2						
	…						
	Occ m						

As recommended in the Sampling Frame Report, the number of industry and occupation groupings should be limited to five to seven, with effective sample sizes of 5,100 for each industry grouping, occupation grouping, and self-employed stratum, given the data collection costs associated with a standalone survey. As opposed to Option 1 and Option 2, the industry groupings for Option 3 can be defined as preferred for purposes of the HSOII analysis. For example, industries (occupations) with the highest estimated incidence rates of with the highest likelihood of incidence rate underestimation could be defined as strata, keeping one stratum as a residual industry (occupation).

The sample size designated for the stratum consisting of HUs with no reported worker from the ACS would be small, allowing HSOII to represent the full population of workers, but controlling costs as a very small proportion of sample from this stratum would be expected to yield eligible person.

Total selected sample sizes would be derived based upon expected design effect, response rates, persons interviewed per HU, workers per HU, and FTE per worker. Given differential sampling rates across strata and the extremely small sampling rate for the Not a Worker stratum, we can expect design effects to be relatively large, perhaps on the order of 1.5 to 2.0. Response rates could be expected to be in the 50%

to 75% range. Average number of workers interviewed per HU will be on the order of 1.4 to 1.6. FTE per worker should be at least as great as that in the general population, perhaps 0.8 to 0.85.

Translating these data into selected sample sizes to yield effective sample sizes of 5,100 at the industry group, occupation group, and self-employed level is represented in Table 3.2.2. As can be seen, the selected sample size of HUs for each industry grouping, occupation grouping, and self-employed could range from 7,500 to 18,214 depending on the actual parameters. With 5 industry groupings and 5 occupation groupings, this would translate into roughly 38,500 to 91,000 selected HUs, plus some number of HUs selected from the Not a Worker stratum.

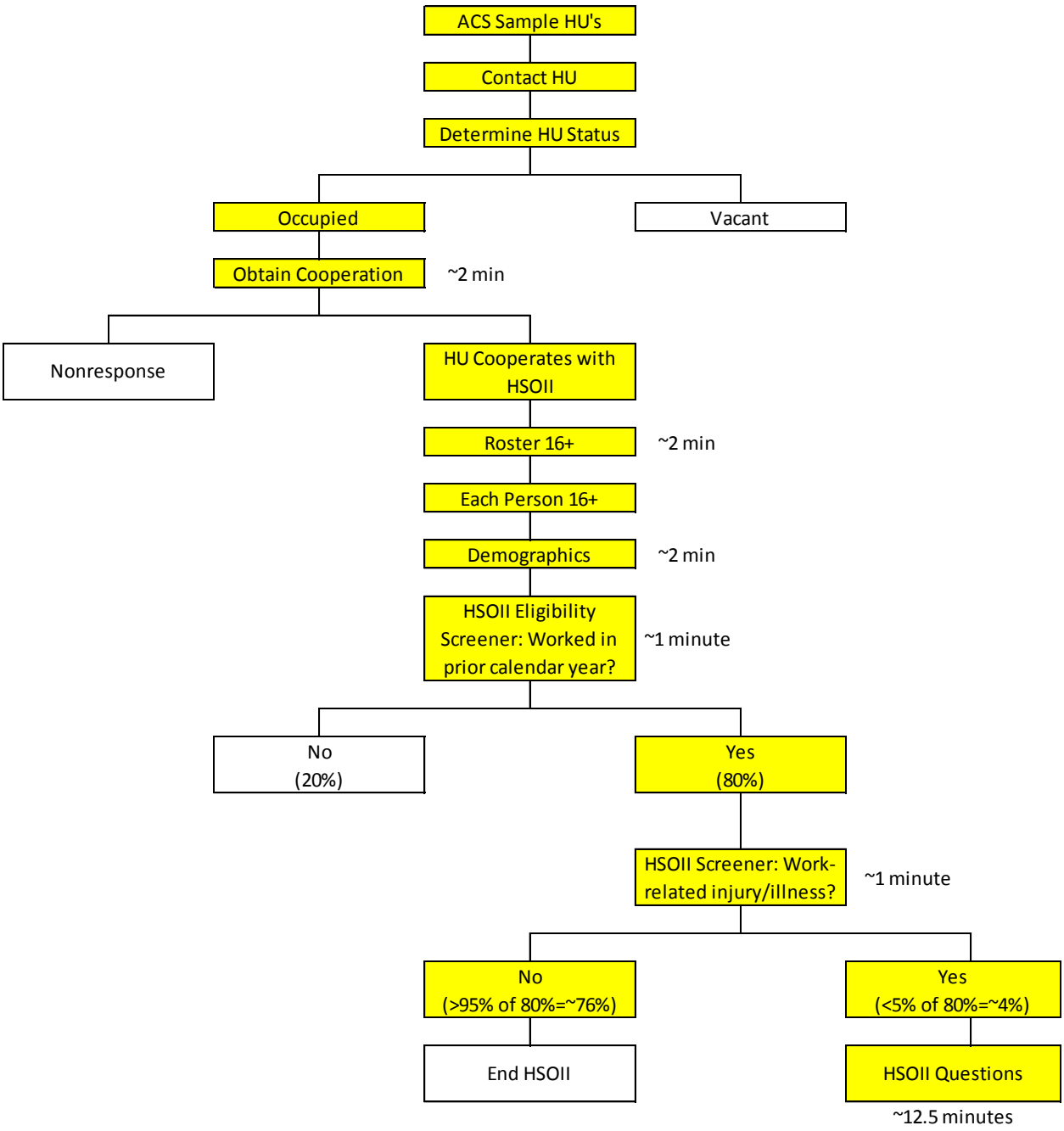
Table 3.2.2: Estimated distributions for weeks worked, usual hours worked for persons aged 16+ years

Selected HU Sample	13,661	18,214	12,857	17,143	11,953	15,938	11,250	15,000	9,107	12,143	8,571	11,429	7,969	10,625	7,500	10,000
Response Rate	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
HU Interviews	6,830	9,107	6,429	8,571	5,977	7,969	5,625	7,500	6,830	9,107	6,429	8,571	5,977	7,969	5,625	7,500
Workers per HU	1.4	1.4	1.4	1.4	1.6	1.6	1.6	1.6	1.4	1.4	1.4	1.4	1.6	1.6	1.6	1.6
Worker Interviews	9,563	12,750	9,000	12,000	9,563	12,750	9,000	12,000	9,563	12,750	9,000	12,000	9,563	12,750	9,000	12,000
FTE Rate	0.8	0.8	0.85	0.85	0.8	0.8	0.85	0.85	0.8	0.8	0.85	0.85	0.8	0.8	0.85	0.85
FTE Interviews	7,650	10,200	7,650	10,200	7,650	10,200	7,650	10,200	7,650	10,200	7,650	10,200	7,650	10,200	7,650	10,200
Design Effect	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0	1.5	2.0
Effective Sample	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100	5,100

The overall the costs of conducting the HSOII as a standalone survey would be much higher than conducting it as a CPS supplement, since it will not be possible to take advantage of an existing data collection mechanism. In addition, given the outdated information on worker status, some sample HUs would yield no HSOII eligible persons while still incurring the cost of contact and screening. Should there be any plans for some type of personal visit nonresponse followup, it would be advantageous to utilize a PSU design, perhaps overlapping with CPS PSUs to take advantage of experienced Census interviewers.

Figure 3.2.1 provides an illustration of the process flow for HSOII under Option 2. Prior to beginning the HSOII interview, several steps not required for Option 1 or Option 2 will need to be completed: a) obtaining cooperation at the HU (calculations in this report assume an average of 2 minute of respondent burden for HSOII cooperation); b) rostering individuals in the HU aged 16+ years (calculations in this report assume an average of 2 minute of respondent burden for rostering); and c) collecting demographic information for persons aged 16+ years (calculations in this report assume an average of 2 minute of respondent burden for collecting demographics). Note that, the proportion of HSOII-eligible individuals is assumed to be 80% as opposed to the 65% population average. This is due to the ability to stratify the ACS sample into HUs assumed to have HSOII-eligible persons with undersampling of HUs assumed to have no HSOII-eligible persons.

Figure 3.2.1: Illustrative flowchart of HSOII Option 2 data collection interview process



In a standalone survey, it could be possible to reduce survey cost by including data collection via self-administered questionnaire (SAQ). Survey respondents could be provided with a mail or Web questionnaire to complete independently. Given the screening effort required to identify individuals who worked during the survey reference period, and the small percentage of workers who will have experienced a workplace injury or illness, conducting some initial screening via SAQ prior to interviewer contact could increase efficiency. It would require pretesting to determine whether an initial screening

via SAQ would work and whether respondents can report accurately to the employment, injury and illness questions that would be included.

4. Summary

Table 4.1 profiles the three Options relative to survey design components, preliminary estimated respondent burden, and preliminary estimated data collection cost per completed interview.

Table 4.1: Comparison of Option 1, Option 2, and Option 3 in terms of survey design components

Component	CPS-based Option 1	CPS-based Option 2	ACS-based Option 3
Max completed interviews	51,781 (could add ~20,000 if utilize ASEC supplemental sample)	57,534	up to ~1.5MM
Ability to stratify by I/O	No	No	Yes
Incur cost for sample unit locating, contact, participation	No	No	Yes
Need for HSOII eligibility screening	No	Yes-some	Yes-all
Reference Period	Calendar year	Recent 12 months	Recent 12 months
Need to reorient respondent to reference period	No - already done with ASEC	Yes	No
Number of years HU in HSOII	2	2	1*
Average respondent burden	~1.8 min	~2.2 min	~7.4 min
Breakout of burden			
Obtain cooperation	100% (ASEC completes) @ 1 min	100% (CPS completes) @ 1 min	100% (sample HUs) @ 2 min
Roster 16+ in HU	none	none	100% (participating HUs) @ 2 min
Demographics	none	none	100% @ 2 min
HSOII eligibility screener	none	36% @ 1 min	100% @ 1 min
HSOII injury/illness screener	65% @ 1 min	65% @ 1 min	80% @ 1 min
HSOII injury/illness questions	3% @ 12.5 min	3% @ 12.5 min	4% @ 12.5 min
Estimated data collection cost per complete	$5.70-$6.75	$5.70-$6.75	$15-$25

*Sample design could have year-to-year overlap

Preliminary estimated respondent burden is based upon assumed respondent burden for required components of the HSOII data collection as listed in the illustrative flowcharts for the three Options. Preliminary estimated data collection cost per completed interview for Option 1 and Option 2 was determined assuming interviewer time would be equal to estimated respondent burden plus 5 minutes per interview for review and administrative activities along with an assumed four hour per interviewer training in preparation for the HSOII, and that fully loaded interviewer costs are on the order of $30-$35 per hour. Preliminary estimated data collection cost per completed interview for Option 3 was assumed to be on the order of $15-$25 per completed interview by mail or web, based upon similar NORC experience and depending upon level of incentives offered.

Option 1 (HSOII implemented following March CPS ASEC supplement) provides the lowest expected data collection cost (on the order of $300k-$350k) and average respondent burden (~1.8 min), as it

utilizes existing sample and data collection processes. Collected data would be relative to a calendar year. Costs would be related to the cost of the add-on module, questionnaire modifications to accommodate the supplemental HSOII questions, and post-survey data processing for the HSOII.

Option 2 (HSOII implemented following June or July CPS) would avoid the issue of conducting the HSOII in the same month as a Jan, Feb, or Mar CPS supplement. This option would entail an additional screening step for persons not identified as HSOII eligible through the CPS, and thus somewhat higher average respondent burden (~2.2 min) and greater data collection cost (on the order of $350k-$400k) than Option 1. Collected data would be relative to the 12 months prior to June or July.

Option 3 (HSOII selected from ACS and conducted as a standalone survey) provides the most flexibility in terms of stratification and establishing sample sizes for specific industries and occupations. However, the average respondent burden associated with Option 3 (~7.4 min) would be roughly three to four times greater than that of Option 1 and Option 2. In addition, data collection costs for Option 3 (on the order of $15-$25 per completed interview) would be much greater than those for Option 1 and Option 2, due to the need for more screening and additional questions under an independent survey environment. Thus, under Option 3, between 40,000 and 66,000 completed interviews would incur data collection costs on the order of $1 million. In addition, Option 3 would incur costs associated with activities not required under Option 1 and Option 2 (sample selection, collecting household roster and demographic data, and sample unit locating, contact, and participation). Collected data would be relative to the 12 month period prior to the collection period, which could be timed somewhat to BLS preference.