

Developing Subannual Estimates of Health Insurance Coverage from the American Community Survey: Challenges and Promising Next Steps

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Introduction

Following the introduction of a question on health insurance coverage in 2008, the American Community Survey (ACS) has increasingly been used as a source for state-level health insurance estimates (e.g., RWJF, 2012 a, b; Long et al., 2010; Lynch et al., 2010; Boudreaux et al., 2011; Kenney et al., 2011; Mancini et al., 2011; Kenney et al., 2012; Rodean, 2012; CMS 2012). This reflects a number of key advantages of the ACS, including a survey design that supports state representative estimates for all states (and many substate areas²) and the large size of its public use sample relative to the other national surveys that track health insurance coverage.³ As a result, the ACS yields relatively precise state-level estimates of health insurance coverage for the overall population, for key population subgroups and for substate areas in each state. Consistent with these advantages, the Census Bureau currently recommends that those seeking state-level estimates for a number of measures, including health insurance coverage, rely on the ACS instead of the Current Population Survey (CPS) (DeNavas-Walt et al., 2011).

With the recent enactment of the *Patient Protection and Affordable Care Act (ACA)* and its multiyear implementation schedule, monitoring state-level estimates of health insurance coverage is even more important. The ACA is intended to bring about widespread transformation of the nation's health care system, with many of the changes being implemented by the states, building on the existing variation in state policies, programs and health systems. In 2009 just prior to the passage of the ACA, the uninsurance rate ranged from 4.2 to 23.8 percent across states, with substantial state-level variation also found in rates of both private and public coverage (American FactFinder). The ACA's significant expansion of public coverage, the creation of health insurance exchanges, and new subsidies for exchange coverage are expected to lead to a substantial increase in insurance coverage at the national level (CBO, 2011), particularly among states adopting the ACA's Medicaid expansion.

The ACS will likely be a critical component of monitoring efforts, including those by the Assistant Secretary for Planning and Evaluation (ASPE), particularly with regard to state-level estimates of health insurance coverage before and after the implementation of key provisions

² The ACS is based on an address-based sampling frame that includes households from each county in the country, which improves its representativeness for state and substate estimates.

³ For instance, the ACS public use sample for 2009 included over 700,000 children, compared to about 62,000 children in the Current Population Survey's Annual Social and Economic Supplement (CPS-ASEC) and even fewer in the National Health Interview Survey (NHIS). Although not as large as the ACS, the Behavioral Risk Factor Surveillance System (BRFSS) also has large state sample sizes of adults; however, the health insurance question in that survey does not currently capture information on type of coverage, limiting its value for tracking insurance coverage over time. In addition, its traditional reliance on a random digit dial sample frame based on landline telephone numbers raises concerns about the representativeness of its sample. The current effort to expand the sample frame to include cell phones is beginning to address the latter issue.

of the ACA.⁴ However, the ACS has the potential to provide even more useful information for supporting tracking efforts through subannual estimates. Such subannual estimates, whether monthly, quarterly, or semi-annual, would further enhance the value of the ACS to policy, research, and government audiences, as well as to the media and public, by providing more timely updates on health insurance coverage. Subannual estimates would provide a closer link between the timing of state decisions and insurance outcomes, which is particularly important for understanding the relationships between state policy choices under the ACA and health insurance coverage—a key research area of interest to ASPE. In addition, subannual ACS estimates would support a more in depth understanding of state-level insurance trends within and across years.

While the Census Bureau has explored creating subannual estimates from the ACS (e.g., King et al., 2009), there are currently no plans for producing such estimates at the Census Bureau. The Census Bureau’s constricting budget makes it extremely challenging to entertain any change in its operations or expansions in its responsibilities. However, the production of subannual ACS estimates could further increase demand for Census products and data and, thereby, increase support for ACS funding. We believe that there is tremendous potential benefit from the production of subannual ACS estimates for the states. We focus on two possible pathways to releasing subannual ACS estimates with respect to release timing:

- A schedule where subannual state-level estimates would be released ***in advance of the annual ACS estimates***. Given that the ACS releases and fields monthly replicate samples continuously throughout the year, at least in principle there exists a potential for producing quarterly or other subannual estimates with a shorter lag, analogous to the quarterly national estimates released by the National Health Interview Survey (NHIS) (NHIS, 2012). A more contemporaneous release of subannual estimates would provide rapid feedback on trends to support policy and program refinements under the ACA at the state level. Of the national surveys, the NHIS currently produces the most timely subannual estimates (for the first quarter of the year with a six-month lag) on health insurance, although the quarterly NHIS data do not currently support state-level estimates due to the survey’s small state sample sizes.
- A release of subannual state-level estimates ***at or around the same regular release schedule of the annual ACS estimates***. This schedule would provide retrospective information on state-level subannual changes that, while less timely for feedback on policy decisions than contemporaneous estimates, would nonetheless be quite valuable. These retrospective estimates would allow for stronger monitoring of the effects of

⁴ See, for example, the ACA analyses that would use the ACS in the *Design of an Evaluation of the Affordable Care Act (ACA) Medicaid Expansion* (Kenney et al., 2012).

policies and programs that are sensitive to subannual time periods like the ACA, where implementation is occurring at different times across the states and lagged impacts are expected. Retrospective estimates would also facilitate monitoring the effects of the progression of an economic crisis and associated policies to combat its impact on the public. For instance, a quarterly ACS product would provide important insights on the direction and magnitude of changes in insurance coverage, employment, income and other estimates at the state level throughout the year as opposed to a single average for the prior year.

In this paper, we identify key procedural and methodological challenges associated with making valid subannual ACS estimates under the two alternative release schedules outlined above, and explore potential approaches for overcoming these challenges. While the focus here is on developing subannual state-level estimates of health insurance coverage, the strategies developed here could also apply to other measures (e.g., employment, family income, and housing arrangements) and more generally to the ACS data system as a whole.⁵

The remainder of this paper is composed of five sections. The first two sections provide an overview of our study methods and findings from our ‘industry scan’ of federal surveys that explores how federal statistical agencies have grappled with similar issues in their surveys and discussions with experts at the Census Bureau focused on their previous research on subannual ACS estimates and on the opportunities and barriers to their production in the ACS context. The third section provides an overview of key design elements of the ACS, along with their implications to the development of subannual estimates. We then turn to the methodological challenges that would need to be addressed in developing subannual ACS estimates. We close with a summary of recommendations for next steps, including a brief discussion of potential estimation methods and related research that appear promising, especially for producing subannual estimates for smaller subgroups within states (e.g., population subgroups or substate areas).

I. Study Methodology

We employed a qualitative research approach that began with a scan of the literature, internet searches, information requests from appropriate listserves (e.g., AAPORnet), along with an ‘industry scan’ with respect to the ACS and other federal statistical surveys that currently produce annualized estimates and subannual estimates. This was followed by interviews with

⁵ Different issues may need to be addressed for creating valid subannual estimates of outcomes that are defined for the prior calendar year as opposed to at the time of the survey.

key informants at the Census Bureau, elsewhere in the federal statistical system and in the private sector (e.g., users of ACS and other federal survey data that provide subannual estimates). In the summer of 2012 key informants were contacted by email, telephone and in-person (at the 2012 Joint Statistical Meetings in San Diego). We asked key informants about the methodology for their respective survey and the availability of any documentation regarding the development of subannual estimates and weights. The conversations with ACS experts also addressed prior efforts by the Census Bureau to explore the feasibility of generating subannual estimates using the ACS, and ACS procedural and operational issues related to generating subannual estimates. In each conversation, we also requested referrals to other individuals knowledgeable about these issues.

This list of contacted individuals included:

- Robert Groves, Provost, Georgetown University, and former U.S. Census Bureau Director
- Deborah Griffin, Special Assistant to the Chief of the American Community Survey Office, U.S. Census Bureau,
- Alfredo Navarro, Assistant Division Chief for ACS Statistical Design, U.S. Census Bureau, American Community Survey
- Ralph Folsom, Chief Scientist for Statistical, Survey, and Computing Sciences, RTI; Senior Sampling Scientist for the Substance Abuse and Mental Health Services Administration's National Survey on Drug Use in Households
- Brian J. O'Hara, Chief, Health and Disability Statistics Branch, Social Economic and Housing Statistics Division, U.S. Census Bureau
- Stephen Blumberg, Senior Scientist, National Center for Health Statistics, Early Release Program, National Health Interview Survey
- Robin Cohen, Statistician, National Center for Health Statistics, Early Release Program, National Health Interview Survey
- Andy Peytchev, Survey Methodologist, RTI; Lead Statistician for the National Center for Injury Prevention and Control's National Intimate Partner and Sexual Violence Survey
- Bob Fay, Senior Mathematical Statistician, Westat, and former Senior Survey Statistician at the Census Bureau
- Adam Safir, Branch Chief of Research and Program Development for CES, Bureau of Labor Statistics, Consumer Expenditure Survey
- Steve Henderson, Economist, Bureau of Labor Statistics, Consumer Expenditure Survey
- Heather Contrino, Program Manager, Federal Highway Administration, National Household Travel Survey

II. Findings on Subannual Estimates from the ACS and Other Federal Surveys

The key findings from our qualitative research on the feasibility of subannual estimates from the ACS and other federal surveys are summarized below. We consider factors related to both contemporaneous subannual estimates and retrospective subannual estimates, focusing on issues related to developing subannual weights.

We reviewed six annual federal surveys that collect continuous data, and all generated subannual estimates except for the ACS. The five surveys that provide subannual estimates use conventional approaches in the production of subannual estimates: over the course of a year, distinct samples are fielded, each covering a specific time of the year (e.g., a month or a quarter). Each time period can then be processed as its own time-specific national survey, thus allowing the generation of subannual estimates using the usual estimation approaches afforded to any sample survey.⁶ And the distinct samples can be pooled and processed to create an annual analytic survey data set, thus allowing the production of annual estimates using conventional methods. The federal surveys that do this include the following:

- National Health Interview Survey (NHIS),
- Consumer Expenditure Survey (CES-Diary portion),
- National Household Travel Survey (NHTS),
- National Survey on Drug Use in Households (NSDUH), and
- National Intimate Partner and Sexual Violence Survey (NISVS).

Virtually all of the key informants for these surveys with whom we spoke reported that separate documentation on the development of subannual estimation weights was not available but generally followed the survey's annualized weighting methodology, albeit applied to a subset of cases. For example, the NHIS, which produces contemporaneous subannual estimates, reported that they process data on a flow basis over the course of the year which allows the weighting process to be undertaken for subannual periods. Other surveys, such as NSDUH and NHTS, do not produce contemporaneous subannual estimates but process their survey data to allow for quarterly as well as annual estimation by building an equal spread of the population across months or quarters (collapsing months to quarters if necessary) in the final post-stratification adjustment. Thus, these surveys provide retrospective subannual estimates as part of the production of their annual estimates.

⁶ However, the surveys do not necessarily implement their full data processing procedures in generating the subannual estimates and do not necessarily generate subannual estimates for all measures. Data editing and imputation procedures, for example, may be based on the annual data files rather than the files for each month or quarter.

The Census Bureau has explored the feasibility of generating subannual estimates using a simple extrapolation of annual methods in the ACS; however, the Census Bureau concluded that that effort did not produce sufficiently stable estimates. King and colleagues (2009) tested a quick, inexpensive method for generating subannual ACS estimates based on the current weighting methodology used to produce annual ACS estimates. This experience indicates that a simple extrapolation of the current weighting methodology to produce subannual estimates would not be sufficient to produce stable subannual ACS estimates given the optimization of the weighting procedure for generating annual estimates. A different weighting approach would be needed that better reflects the sample design of the ACS and the post-stratification population totals needed for producing accurate subannual estimates.

Notwithstanding the earlier effort, key informants considered it possible to generate stable subannual state-level estimates in the ACS. While the method explored by King and colleagues (2009) for generating subannual estimates was not successful, key informants inside and outside the Census Bureau reported that stable estimates were likely feasible using methods that address core design issues in the ACS, including issues related to survey design, survey fielding, data processing, and the development of subannual survey weights.

The Census Bureau's current system of data collection and data processing of the ACS could not support contemporaneous subannual estimates. However, it would be possible to create retrospective subannual estimates under the current system. It is also possible to make data processing changes that could support contemporaneous subannual estimates. For the most part, ACS data are not currently processed until two months after the conclusion of the respective ACS reporting calendar year—commencing in February and proceeding through May. Given the current budget pressures at the Census Bureau to “do more with less,” the requisite resources needed to re-engineer the ACS data processing program to support contemporaneous subannual estimates are not available, at least under current priorities. However, the Census Bureau is exploring the use of real-time editing and estimation procedures to improve the ACS data processing, which, if implemented, could assist in the development of contemporaneous subannual estimates. Retrospective subannual estimates could, in theory, be generated as part of the process of generating the existing annual ACS release. Presently, there are no plans to do so.

While the Census Bureau is not currently planning to generate subannual ACS estimates, there are alternate strategies that could be used to obtain subannual ACS estimates. While the production of subannual estimates is not supported by current ACS funding levels, the key informants at the Census Bureau recognize the public value of such estimates. Although there are no guarantees, they suggested consideration of the Census Bureau's Special Tabulations Program as a potential mechanism for obtaining subannual state estimates of health insurance

coverage. It is also theoretically possible for nongovernmental researchers to access ACS microdata containing the paradata necessary to develop subannual estimates through one of the Census Bureau's Research Data Centers (RDCs) and conduct analyses using those data within the RDC. However, there is concern that it would be difficult and time-consuming for outside researchers to develop the familiarity with ACS data processing and weighting protocols necessary to develop appropriate subannual weights, and that the required review of that work by Bureau staff would also be difficult and time-consuming. Therefore, requesting the construction of the subannual weights via the Census Bureau's Special Tabulations Program takes advantage of the expertise of the Census Bureau in developing the weights and the internal review necessary to instill confidence in the product. Once constructed, researchers could, with Census Bureau approval, use those weights in analyses using ACS microdata within an RDC to support the research needs of ASPE and other government entities.

Synthesis. Overall, our qualitative exploration suggests that the ACS is unique in collecting continuous data throughout the year without the ability to easily produce subannual estimates under its current sample design, data processing regimen and schedule. Our industry scan did not identify strategies that are being used for subannual estimation in other surveys that could be readily applied to the ACS to generate contemporaneous subannual estimates (short of re-engineering the ACS post survey data processing protocol). However, if the Census Bureau were to modify its procedures and accelerate its post-survey data processing time frame, it could also be possible to introduce procedures to construct contemporaneous subannual estimates. Moreover, there appears to be the potential for generating retrospective subannual estimates in conjunction with the production of the annual ACS estimates in the context of the current ACS data processing protocol. Further, there appears to be a strategy for moving forward that would maximize the ability of ASPE to use the ACS to monitor the ACA by combining the request for subannual weights via the Census Bureau's Special Tabulations Program with on-site research at a Census RDC to support ASPE's research agenda. For the remainder of this paper we focus on methodological issues and challenges that would arise in generating subannual estimates from the ACS.

III. Review of Key ACS Design Elements of Relevance to Subannual Estimates

In this section we identify and discuss a subset of ACS design elements that are most relevant to the generation of subannual estimates in conjunction with the annual ACS estimates—sample design, survey fielding, and the development of survey weights. We focus on issues related to the sample of housing units only. Details on the survey design, including a discussion of the sample of group quarters, can be found at the Census Bureau ACS Methodology web page: http://www.census.gov/acs/www/methodology/methodology_main/.

Sampling. Each year the ACS collects about 2 million completed household interviews from a sample of just under 3 million addresses spread across every state in the union plus the District of Columbia and Puerto Rico. The annual sample of housing units is selected from the Census Bureau’s Master Address File (MAF) which contains virtually all known existing housing units (HUs) with addresses in the U.S. The sample is allocated in equal shares to calendar months (e.g., monthly sample replicates) for continuous fielding of the survey over the year.⁷

Survey Fielding. Data for a given month’s ACS sample is collected over the course of a three-month data collection period:

- **First month of sample release (Month 1):** Households are contacted through the mail and encouraged to complete an interview and return it through the mail;
- **Second month after sample release (Month 2):** Households that do not respond via mail are contacted by telephone and asked to participate in a telephone interview; and
- **Third month after sample release (Month 3):** Households that do not respond via mail or telephone are subsampled at a rate of about 1 in 3, with the subsample contacted by field staff for in-person interviews.

Information in the survey is collected as of the month of interview. In 2007, 48 percent of the interviews were completed by mail (Month 1) and 10 percent were completed by telephone (Month 2), while 42 percent were represented by in-person interviews (Month 3). However, inevitably there will be variation in this distribution of the sample by survey mode across the year, reflecting temporal factors and the fact that no two random samples perform exactly the same due to sampling variation.⁸ For example, King and colleagues (2009) report that the share of interviews conducted by mail in 2006 and 2007 ranged from 49 to 55 percent. There will also be variation in survey mode across the states, as Griffin and Hughes (2010) report that the share of the ACS sample responding by mail ranged from 38 to 55 percent in 2007.

Survey weighting. Since the ACS survey obtains information about the household *at the time of interview*, data for a given month’s sample release will span three months. ACS processes for

⁷ The State of Alaska is the sole exception. Chapter 7 of the ACS methodology web site states: “In order to allow... adequate time to resolve some of the transportation and logistical challenges associated with conducting interviews in Remote Alaska areas, the normal period for interviewing is extended from 1 month to 4 months. There are two 4-month interview periods every year in Remote Alaska. The first starts in January and stops at the end of April. The second starts in September and stops at the end of December.” All interviews in Remote Alaska are conducted in person, with some remote areas assigned to only one of the two interview periods. Remote Alaska accounts for 7 – 8 percent of the Alaskan population.

⁸ The Chapter 11 ACS Methodology documentation states: “Because of seasonal variations in response patterns, the number of HUs in tabulation months may vary, thereby over-representing some months and under-representing other months...”

weighting the survey sample are based on the *interview month* (i.e., the reference period for survey responses), not the sample release month.

The ACS generates both household and person-level weights for annual estimates.

The ***household weights*** incorporate five components:

- A sampling weight that reflects the household selection probability
- A monthly response variation adjustment
- An non-response adjustment
- An interview mode adjustment
- A final post-stratification adjustment to align the ACS data to household totals from Census Population Estimates.

The *basic sampling weight* is a conventional base weight that reflects the probability that the household was selected for the survey. The *monthly response variation* adjustment is a smoothing of the natural monthly variation in the numbers of responding households across the three modes. It is applied at the county level.⁹

The third weight adjustment addresses *survey non-response* and includes two factors: (1) a conventional nonresponse adjustment (called NIF1) applied within the cells formed by a cross-tabulation of census tract and building type (i.e., single vs. multi-unit structure); and (2) an additional adjustment (called NIF2) that uses the first factor for creating a nonresponse adjustment by building type and month of interview.

The fourth adjustment is called the *mode bias noninterview factor* (MBF). It corrects for the fact that all household nonrespondents are (by design) generated from the in-person CAPI nonresponse follow-up subsample. As such, household nonrespondents may be more similar to CAPI respondents than they are to respondents participating via mail or CATI modes. This adjustment is made within cells of a cross tabulation¹⁰ of tenure (three categories: housing unit owned, rented, or temporarily occupied), tabulation month (twelve categories), and marital status of the householder (three categories: married/widowed, single, or unit is temporarily occupied).

The household *post-stratification* weighting adjustment aligns the housing unit counts so that they equal the official housing projections from the Census Bureau's Population Estimates

⁹ The Chapter 11 ACS Methodology documentation states "This adjustment factor is computed within each of the 2,005 ACS single-year weighting areas (either a county or a group of less populous counties)."

¹⁰ Chapter 11 of the ACS documentation adds: "If a cell has fewer than 10 interviewed HUs, the cells with the same tenure and month are collapsed across all marital statuses. If there are still fewer than 10 interviewed HUs, the cells with the same tenure are collapsed across all months."

Program¹¹ (PEP) corresponding to July 1 of the relevant ACS year. This is done at a subcounty level of analysis.¹² This factor is set so that the estimate of the number of housing units agrees with the PEP estimate of the number of housing units. This weight (called WHPF) is used as the starting point for the person level analytic weight (discussed below).

The final ACS Housing Unit weight is actually determined after the final person level weight is calculated: the final person level weight of the householder is assigned as the final weight for the housing unit. A householder is defined as the household reference person, one of the persons who rents or owns the housing unit. After the development of the final person weight discussed below, a final adjustment is made to the household weights that incorporates information from the householder (one reference person resident is designated for each household). This minor adjustment slightly biases housing unit counts (typically within 0.1 percent of the PEP estimates at the county level) but allows consistency.

The *person-level weights*¹³ build off of the household weight WHPF, with further post stratification conducted to insure that the ACS person level data reflect overall population characteristics from the PEP. The adjustment yields person level weights that sum to population estimates in each sub-county area according to total population counts of married and unmarried partners, and a cross classification of sex, age group (13 categories: 0–4, 5–14, 15–17, 18–19, 20–24, 25–29, 30–34, 35–44, 45–49, 50–54, 55–64, 65–74, and 75+ years), and race-Hispanic origin (6 categories: Non-Hispanic White; Non-Hispanic Black; Non-Hispanic American Indian and Alaskan Native; Non-Hispanic Asian; and Non-Hispanic Native Hawaiian or Pacific Islander; and Hispanic). As with the household weights, the post-stratification counts are based on PEP projections for July 1 of the relevant year.

Synthesis. Of relevance for subannual state-level estimates from the ACS, the current annual ACS household and person weights do not incorporate the month of the interview in the post-stratification process as they are intended to support annual estimates only. Creating subannual weights would require using the underlying paradata (e.g., month of interview) and the components used in the different weighting steps that adjust the combined base (sampling) and nonresponse weight components to match (via post-stratification) subannual respondent profiles based on demographic population projections (by state). If feasible, it would be

¹¹ For details on the PEP, see <http://www.census.gov/popest/index.html>.

¹² Chapter 11 of the ACS documentation states: "... the basic units for forming the sub-county areas are the county / MCD / place intersections or parts where the "balance of county" is also considered as another fundamental subcounty area.... These subcounty areas are then combined until all subcounty areas within a county have a total population of 24,000 or greater. If it is not possible to partition a county into two or more subcounty areas of this size then the subcounty area is simply coexistent with the county."

¹³ Person level nonresponse adjustments and mode effects adjustments are not necessary because information is gathered from all household residents by virtue of household participation.

desirable for the weights to be constrained so that the average of the subannual coverage estimates for a given year equals the annual average.

IV. Challenges Associated with Developing Subannual ACS Estimates

Given that the ACS was not designed to provide subannual estimates, there are several challenges associated with developing such estimates. The first three issues involve potential biases in the subannual estimates related to the design of the ACS, whereas the fourth issue concerns the precision of the estimates. First, as noted above, the ACS data collection protocol releases monthly replicate samples into the field, with data collected from the households in those samples over a three-month period by mail (Month 1), telephone (Month 2) or in-person interview (Month 3). Information is collected for the month of interview (called the ‘tabulation month’ in ACS documentation). Data are processed based on the month of interview rather than the sample replicate month. For instance, as shown in Figure 1, the interviews completed in the first quarter of a year (i.e., January through March), and therefore used for first quarter estimation, would include:

- In-person surveys from the **November** sample release;
- Telephone and in-person surveys from the **December** sample release;
- All completed interviews (mail, telephone, and in-person surveys) from the **January** sample released;
- Mail and telephone surveys from the **February** sample release; and
- Mail surveys from the **March** sample release.

Figure 1: Example of Timing of Interview Month Relative to Sample Release Month for the ACA

	Interview Month			
Sample Release Month	Jan. 2012	Feb. 2012	Mar. 2013	Apr. 2012
Nov. 2011	In-person			
Dec. 2011	Telephone	In-person		
Jan. 2012	Mail	Telephone	In-person	
Feb. 2012		Mail	Telephone	In-person
Mar. 2012			Mail	Telephone

This poses issues for subannual estimates in the ACS since a given month's interview sample does not represent that month's released replicate sample.¹⁴ Developing weights for subannual estimates will require addressing the timing of survey fielding and data collection.

Second, the survey relies on three data collection modes—mail, telephone, and in-person interviews, with the potential for response bias by interview mode. If there is differential reporting by mode and shifts in the frequency of mode of response over the course of the year, subannual comparisons could be biased. Note that this source of variation is reduced for estimates using longer time periods, with more potential for bias in monthly estimates relative to quarterly or semi-annual estimates. By incorporating data for all months of the year, the annual estimates are not subject to bias due to changes in the timing of responses over the course of the year. Developing subannual estimates will require considering the potential for bias due to variation in response mode.

Third, the current weighting procedures rely on post-stratification adjustments to housing and population totals for July 1 of the relevant year. Rather than relying on only one reference period for the population control totals, changes in the housing stock and population over the course of the year would need to be incorporated in the weighting process for subannual estimates. This, in turn, has implications for the post-stratification of the annual estimates.

Fourth, subannual estimates are less precise than annual estimates by virtue of their smaller sample size. Thus, even if the issues described above are successfully addressed, instability could nonetheless be observed for state-based subannual estimates due to the greater statistical imprecision associated with smaller sample sizes. However, the sample sizes for state-level subannual estimates in the ACS will still be larger than those available for annual state-level estimates from many national surveys. Moreover, to some degree, statistical smoothing methods could be invoked to mitigate these fluctuations. But such smoothing could undermine the value of the derived statistics for their intended purpose: the ability to make meaningful inferences about observed temporal changes in the underlying phenomena.

Beyond these issues, there may well be other factors that would need to be addressed in developing subannual estimates in the ACS, including data processing procedures that may introduce smoothing of the data over time. This could include, for example, data editing or imputation procedures that do not take month of interview into account (e.g., imputation of employment status that does not account for seasonal variation in employment patterns). Understanding the role such factors may play in generating subannual estimates will be an important part of assessing any estimates that are obtained.

¹⁴ This is different from the usual issue caused by a lag between the time of sample release and time of interview. Usually, all interviews from a survey sample are analyzed together, regardless of the month of the interview. Here, nonrespondents to the mail survey are analyzed with the sample from the month when they finally answer.

V. Next Steps

The ACS currently serves an important role in tracking health insurance coverage in the nation and across the states by providing annual coverage estimates. With the recent passage of national health reform legislation, the *Patient Protection and Affordable Care Act (ACA)*, state-level subannual estimates of health insurance coverage from the ACS would address a clear gap in the data from the federal statistical system in monitoring the impacts of the ACA. Such estimates could play a significant role in expanding ASPE's ability to evaluate the impacts of the ACA, including efforts to disentangle the effects of different state policy choices (Kenney et al., 2012).

While the ACS employs a design that is amenable to the creation of subannual estimates, such estimates are not currently produced by the Census Bureau. The main methodological barrier to developing reliable subannual ACS estimates lies in the apparent optimization of the weighting methods for the generation of *annualized estimates*. The implication is that separate sets of weights must be developed for monthly, quarterly or semiannual estimates. In addition, developing contemporaneous subannual estimates would require changes to the current ACS processing schedule and procedures. As indicated, retrospective subannual estimates would not require any fundamental change to the ACS post-survey processing procedures and they could support the evaluation of key elements of the ACA as part of ASPE's research agenda. In particular, it appears that such estimates could be requested through the Census Bureau's Special Tabulations Program, with the Census Bureau developing the subannual weights needed to support such estimates. A Special Tabulations Request for subannual ACS estimates has been drafted by the authors of this paper as a starting point for discussions with the Census Bureau about the feasibility and costs of such a request (for example, fewer tabulations could be requested of Census and the additional tabulations could be done by external researchers at an RDC utilizing the subannual weights developed under the Special Tabulations Request).

Under such a Special Tabulations request, Census would need to develop and test a new set of weights to produce, for example, reliable quarterly estimates. The subannual weights and related estimates generated under the draft Special Tabulations Request could provide the basis for a series of policy briefs and reports by ASPE on trends in health insurance coverage over time and across states.

If the Census Bureau is able to develop the subannual weights needed to support reliable subannual estimates through the Special Tabulations Program, there is potential for substantial additional analyses within the Census Bureau's RDC to support ASPE's evaluation of the ACA. This would include stronger modeling efforts to address state differences in the impacts of the ACA than are currently possible with the ACS public use files, along with detailed analyses of trends over time at the state and substate levels. In addition, methodological projects could be

conducted to expand the value of the ACS for state and substate analyses related to health reform. We describe two such potential projects that could be conducted with the subannual weights that we believe would be worth pursuing as initial analyses.

Analyzing the Effects of the Patient Protection and Affordable Care Act Using Subannual

Data. Aggregate state-level subannual estimates of health insurance coverage would be a valuable resource for tracking changes over time under the ACA, including reporting on trends in coverage overall and for key population groups by state. The availability of the subannual data for individuals for research projects would offer the potential for an even richer understanding of the ACA, as those data would support multivariate analyses of the variation in the impacts of the ACA within states and across the states, and of the factors driving that variation. There are several analyses that would be particularly valuable to support ASPE's research agenda for evaluating the ACA. For instance, the timing of state-level ACA policy changes could be linked to changes in individual health insurance coverage, providing a stronger assessment of the relative impacts of different state choices, a core issue to understanding the efficacy of the ACA. Having subannual ACS data for individuals would also allow for more precise controls for other temporal factors (e.g., the unemployment rate in the individual's community) in the analysis. This could help disentangle the effects of the ACA from other policies that might influence the individual's decision on whether to acquire health insurance. Finally, an especially important issue for ASPE's planned evaluation of the ACA is the need to examine the effects of individual components of the ACA, such as the expansion of Medicaid coverage. Subannual data for individuals would allow for multivariate analyses using stronger quasi-experimental designs as part of ASPE's evaluation research (i.e., analyzing before and after effects the implementation of specific components of the ACA via a quasi-experimental design).

Using Small Area Estimation Methods to Improve Subannual Estimates for Smaller States or Population Subgroups.

While subannual weights would provide a major advance in the value of the ACS in monitoring the impacts of the ACA on health insurance coverage across and within the states, it is likely that subannual ACS estimates for some areas will be relatively imprecise given smaller sample sizes (e.g., estimates for smaller states or for PUMAs). The precision of subannual estimates would also be more of an issue for smaller population subgroups, such as racial/ethnic subgroups or narrow age groups (e.g., young adults) within a state. Small area estimation methods¹⁵ could be used to obtain more precise subannual

¹⁵ Small area estimation is often used when the sample available for a geographic area does not support the production of accurate and stable estimates. A variety of methods fall under the small area estimation rubric, but what they have in common is the building of a predictive model using data for larger areas (e.g., state for county-level estimates or region for state-level estimates) and then applying the coefficients from that model to obtain estimates for smaller areas, with the estimates for smaller areas often combining information from both the direct estimates and the predicted estimates. Applying the methods to time periods would be analogous as data for

coverage estimates for smaller areas or smaller population groups. Using such methods to generate subannual estimates of health insurance coverage for smaller areas or smaller population groups would build upon current work by the Census Bureau that already uses such methods to generate substate health insurance estimates for the ACS through its Small Area Health Insurance Estimates (SAHIE) program (U.S. Bureau of Census, 2012) and methods used to generate substate estimates in other surveys.

The method used by Blumberg and colleagues (2009) at the National Center for Health Statistics seems particularly promising. In that work, which is used to generate subannual state and substate estimates of cell-phone usage based on the NHIS, time-specific and location-specific factors are used to obtain estimates with lower variance than direct estimates based on the survey. Extending those methods to subannual estimates of health insurance coverage in the ACS would expand ASPE's ability to track the impacts of the ACA for key population subgroups and substate areas.

Synthesis. The ACS represents a valuable resource for tracking health insurance coverage in the nation and across the states. Developing weights for subannual ACS estimates (monthly, quarterly or semiannual) would address ASPE's interest in monitoring the impacts of the ACA over time, across policy relevant subpopulations, and across the states. It could also increase the use of the ACS for a broad array of purposes, beyond monitoring health insurance coverage, and enhance support for the ACS as a policy resource. Subannual estimates are potentially feasible but require the expertise of Census Bureau staff. The Census Bureau's Special Tabulations Program provides a promising route for developing the subannual weights needed for the subannual estimates. The Special Tabulations mechanism could also provide the Census Bureau with the financial resources needed to develop and evaluate the subannual weights. Once such weights have been constructed, there is the potential for substantial additional analyses using those data within a Census Bureau RDC for a stronger and more in-depth assessment of the ACA in support of ASPE's research agenda than is currently possible. While contemporaneous subannual ACS estimates would require additional processing changes over and above what would be needed to produce retrospective subannual estimates, they would permit a real-time assessment of changes in health insurance coverage at the state and local level, which would address an important gap in the current federal data system.

longer periods could be used to build predictive models for shorter periods (e.g., annual data for quarterly estimates).

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