Medicaid and CHIP Data Methodology for SAHIE Models

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Abstract

This work seeks to document the latest available Medicaid and CHIP data sources and to describe an updated Medicaid and CHIP data methodology for use in producing the U.S. Census Bureau's Small Area Health Insurance Estimates (SAHIE). SAHIE represent the only source of single-year health insurance coverage estimates for all counties in the United States; they are model-based estimates that enhance the American Community Survey (ACS) estimates by combining them with timely and informative administrative records data. During 2013 and 2014, many states opted to expand their Medicaid eligibility criteria under the Patient Protection and Affordable Care Act (ACA). With this policy change at hand, the historical one- or two-year Medicaid data lag in the SAHIE models seemed a bit long and potentially limiting. In response, the SAHIE program has developed methods to reduce the Medicaid time lag by updating its detailed Medicaid tallies (by age, sex, county, basis of eligibility) from the Medicaid Statistical Information System (MSIS) with up-to-date Medicaid growth rates based on Centers for Medicare and Medicaid Services (CMS) data and Kaiser Family Foundation (KFF) data. These new methods also utilize year-to-year growth rates from aggregated IRS 1040 data and ACS 1-year estimates in order to update the Medicaid tallies' county-level and demographic detail. In this work, we lay out conceptual differences between various Medicaid and Children's Health Insurance Program (CHIP) data sources, citing key assumptions and filters, and considering criteria for usage in modeling. We propose an approach for combining the lagged Medicaid MSIS data with other more timely data, and we study the differences between the resulting Medicaid predictions and the lagged MSIS Medicaid data. Finally, we compare summary results from modeling SAHIE using the proposed Medicaid data methods relative to using the prior Medicaid data methods.

Keywords
Medicaid; CHIP; SAHIE; ACS; ACA

1 Introduction

Medicaid enrollment rose sharply during 2013 and 2014 in many states, especially among states that expanded their Medicaid eligibility criteria under provisions of the Patient Protection and Affordable Care Act (ACA) (CMS, 2015a). In this work, we study several Medicaid and Children's Health Insurance Program (CHIP) data sources, and we present methods to combine them with other data to predict the number of Medicaid and CHIP enrollees before the full detailed files are available. We analyze these predicted Medicaid and CHIP data, and we assess their potential impact in producing the Census Bureau's annual Small Area Health Insurance Estimates (SAHIE).

Detailed Medicaid microdata have, for many years, been available through the Medicaid Statistical Information System (MSIS) from the Centers for Medicare and Medicaid Services (CMS) (CMS, 2015b). More recently, summary Medicaid and CHIP data have become available from other timely data sources. The SAHIE program has historically used two-year lagged Medicaid tallies from the sum of MSIS enrollment and CHIP enrollment as a predictor in its annual health insurance coverage estimates. Given the Medicaid policy shift that took place over 2013 and 2014, SAHIE seeks a more up-to-date measure of Medicaid and CHIP enrollment for use in its models.

The layout of this work is as follows. Section 2 provides background information about the Medicaid program and SAHIE, and Section 3 discusses Medicaid and CHIP data and other sources. Section 4 reviews some related literature, and Section 5 presents our Medicaid and CHIP prediction methods. Section 6 presents our Medicaid and CHIP results, and Section 7 presents our related SAHIE results. Finally, Section 8 concludes.

All direct comparisons of survey estimates and model-based estimates cited in this text have been tested for significance at the 90-percent critical level, unless otherwise noted.

2 Background

In this section we discuss the Medicaid program and recent programmatic changes, and we describe the Census Bureau's SAHIE program.

2.1 Medicaid Program Changes

The ACA enacted major policy changes to the Medicaid program which went into effect during 2013 and 2014.[1] States could expand their Medicaid eligibility criteria to include nearly all nonelderly adults with income up to 138 percent of poverty, newly opening up eligibility to many childless adults (U.S. Congress, 2010). As of May 2015, 28 states had opted to expand their Medicaid eligibility criteria (CMS, 2015c).

Even states not expanding their Medicaid eligibility criteria faced Medicaid program changes related to the ACA. In particular, starting in 2014, Medicaid income eligibility is now based on the Modified Adjusted Gross Income (MAGI) concept (Kaiser Family Foundation (KFF), 2015), and asset requirements have been dropped in many cases. Also, a minimum level of 138 percent of poverty has been established for Medicaid eligibility of children under age 19 in all states, which, effectively, expanded child Medicaid eligibility in 21 states (KFF, 2014a).

Though not directly related to the Medicaid program, another key provision of the ACA was the creation of federal and state health insurance exchanges and the creation of subsidies for people with income between 138 percent and 400 percent of poverty to be used towards the purchase of insurance through these health insurance exchanges. The health insurance exchanges also provide children with additional coverage options.

In order to meet certain ACA requirements, many states have adopted new Medicaid eligibility and enrollment systems to process and approve applications, which could limit data comparability over time for some states. Further, since 2014, CMS has been transitioning its microdata system from MSIS to a new system, called Transformed MSIS (T-MSIS). The T-MSIS is proposed to have additional fields, more efficient reporting for states (i.e., better cost-effectiveness), and a shorter reporting lag relative to the current MSIS (CMS, 2013). The

[1] Seven states pursued early Medicaid expansions prior to January 1, 2014, including: CA, CO, CT, DC, MN, NJ, and WA (KFF, 2014b).

comparability of data values between T-MSIS and MSIS is not yet known, and some states may transition to T-MSIS earlier than others.

Taken together, the ACA-related policy changes and data system changes likely create the potential for larger shifts in Medicaid and CHIP enrollment data during 2013 and 2014.

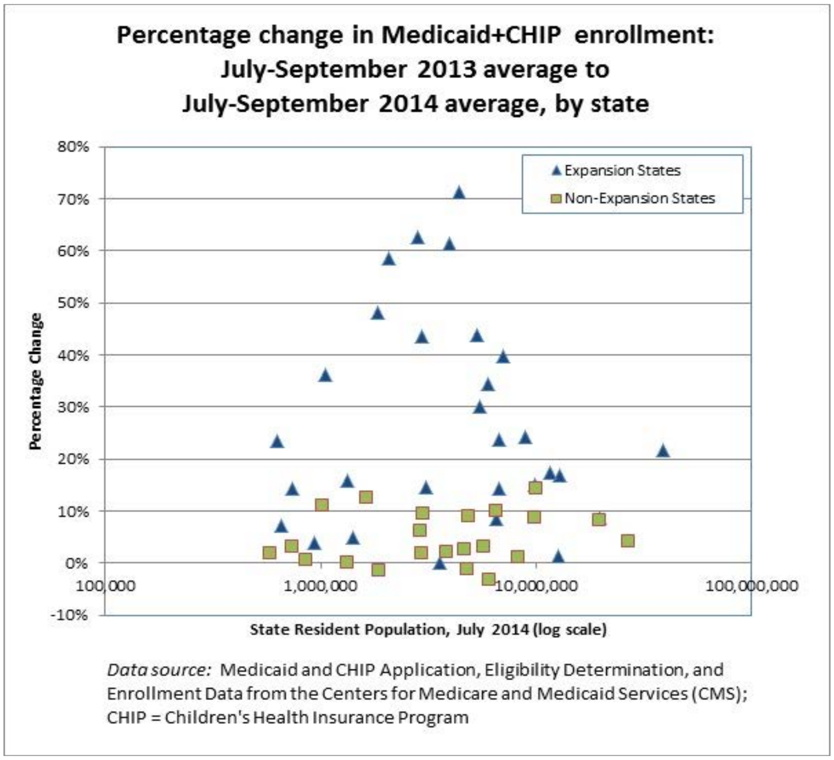

Figure 1: Growth in Medicaid+CHIP enrollment between July to September 2013 average and July to September 2014 average, by state

Figure 1, above, illustrates the growth in Medicaid+CHIP enrollment (i.e., the sum of Medicaid and CHIP enrollment) between 2013 and 2014, using July to September three-month averages, as measured by CMS' Medicaid and CHIP Application, Eligibility Determination, and Enrollment Data (MCAEDED). Overall, there is a wide range of variability in growth rates across states during these months of 2013 and 2014. In particular, the states which opted to expand their Medicaid eligibility tend to exhibit higher one-year growth (with some states as high as 60 percent or 70 percent) than do the states which opted not to expand their Medicaid eligibility (with some states showing declines). Note we have not tested for any causal relationships.

Figure 2, below, illustrates the monthly MCAEDED for two example states, one that expanded its Medicaid eligibility criteria, Kentucky, and one that did not expand its Medicaid eligibility criteria, Virginia. Note the Kentucky data start out at around 607,000 enrollees during the July to September 2013 base period, have a few volatile months, and then settle at a much higher level of between 1 million and 1.1 million enrollees thereafter into the start of 2015. This rise in Medicaid enrollment might be related to the expanded Medicaid eligibility criteria, though we have not tested for causation. In contrast, note the Virginia data start out at around 935,000 enrollees during the July to September 2013 base period, rise to around 1.07 million enrollees during February through June of 2014, and then fall back to about 959,000 enrollees thereafter into the start of 2015. Overall, there is little growth in this Virginia data series over these months.

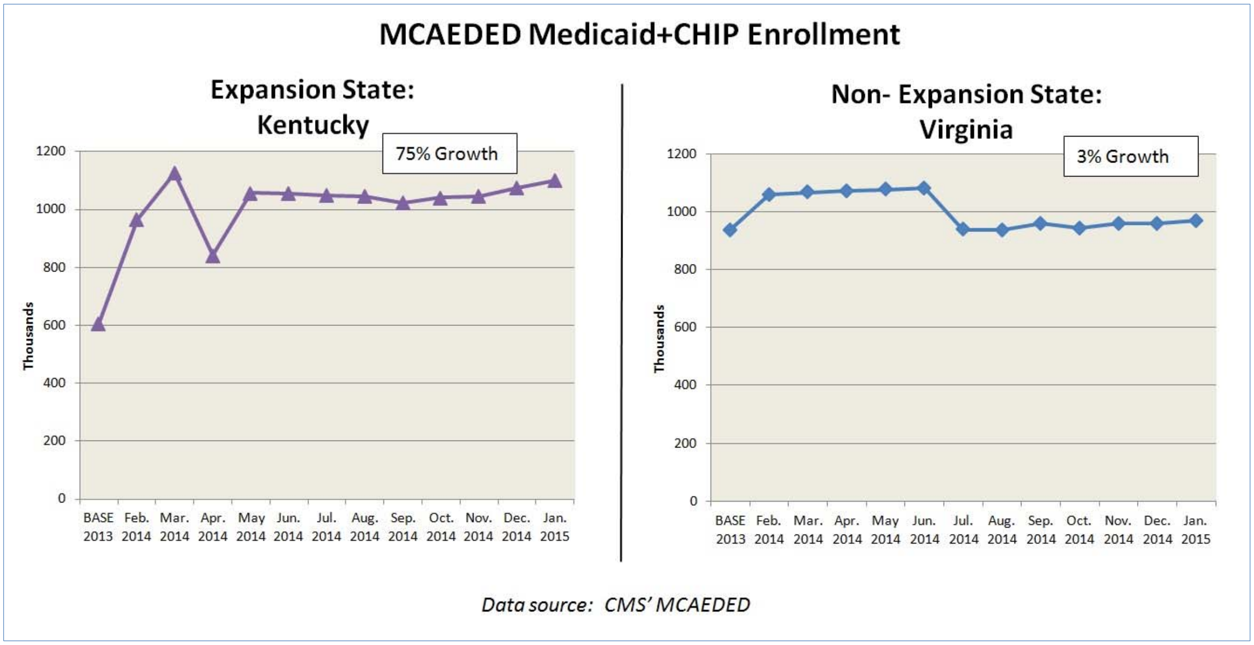

Figure 2: Medicaid+CHIP enrollment in two example states: one expanding Medicaid eligibility and one not expanding Medicaid eligibility

The upper line of Figure 3, below, shows the shares of aged 19-64 Medicaid enrollment, aggregated over the Medicaid expansion states, as measured in the American Community Survey (ACS) 1-year Medicaid estimates. These shares appear to be higher in 2013 and 2014 than they had been during 2010 through 2012. In contrast, the lower line shows the comparable shares, aggregated over the Medicaid non-expansion states. These shares exhibited only mild growth between 2011 and 2014. The rise in shares for expansion states could be related to the expanded Medicaid eligibility of childless adults, though we have not tested for causation. Overall, the distribution of Medicaid enrollment across expansion and non-expansion states may have shifted a bit over 2013 and 2014.

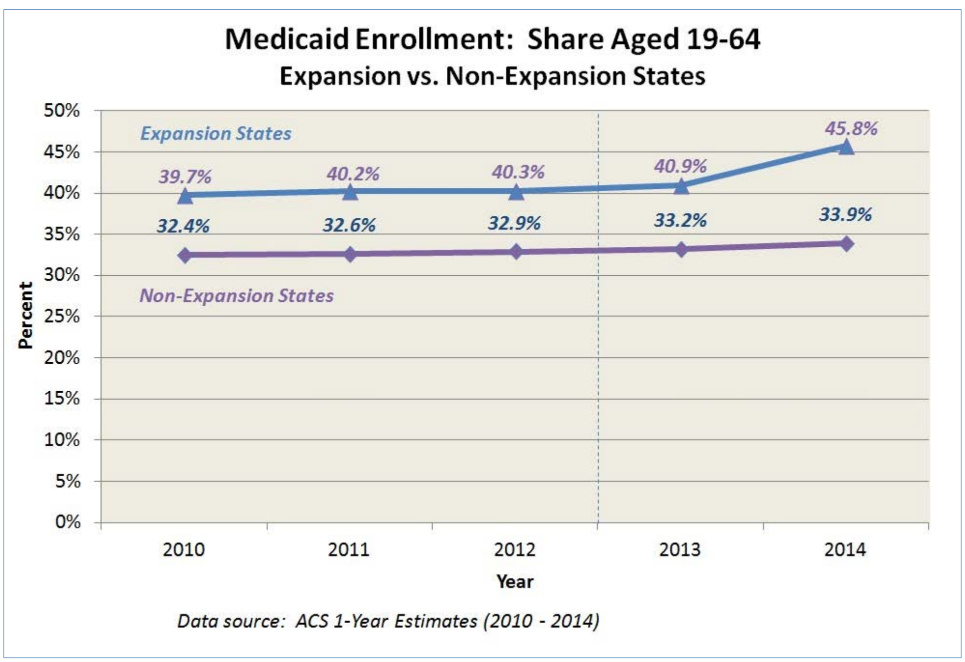

Figure 3: ACS 1-year estimates of Medicaid enrollment: Shares of Medicaid enrollment in the aged 19-64 group in expansion states vs. in non-expansion states

2.2 SAHIE

SAHIE are available annually for all U.S. counties across five age groups, six income groups, by sex, and by race/Hispanic origin (for states only). The income groups include 0-138 percent and 138-400 percent of poverty, making SAHIE a vital source for evaluating county-level health insurance coverage at the time ACA was being implemented, including during the Medicaid expansion and creation of health insurance exchanges. SAHIE are an enhanced version of the Census Bureau's ACS data, filling in data for the approximately 74 percent of U.S. counties lacking 1-year ACS estimates, and generally providing reduced margins of error.

The SAHIE models combine data from the ACS and other auxiliary data sources in order to produce detailed estimates of health insurance coverage. Medicaid plus CHIP enrollment is a key auxiliary variable in the SAHIE models. Since the Medicaid and CHIP programs provide people health insurance coverage, there is a correlation between Medicaid and CHIP enrollment and ACS health insurance coverage status, controlling for other factors.

In addition to Medicaid and CHIP, SAHIE uses the following data sources in its production: ACS 1-year estimates (for all counties, both published and unpublished) of the number of uninsured; ACS 5-year estimates; Census 2010 counts; population estimates; County Business Patterns (CBP); aggregated federal tax returns (Internal Revenue Service (IRS)); and Supplemental Nutrition Assistance Program (SNAP) participation records (Food and Nutrition Service (FNS)). Details on how these source data are combined in SAHIE are provided on the SAHIE program's methodology page, at the following location: http://www.census.gov/did/www/sahie/methods/index.html.

For its Medicaid data, SAHIE production historically uses tallies of MSIS microdata. Some advantages of the MSIS data are that they are available monthly, include data for all states, have county and ZIP code fields, and have sex and date of birth (for computation of age) fields, which are populated for most records. For CHIP, SAHIE has historically used state-level summary tallies from the Statistical Enrollment Data System (SEDS), downloaded from the CMS web site. In order to apportion these state CHIP tallies by county and by sex, SAHIE computes county and sex proportions of those aged 0-18 in MSIS and applies these proportions to the state-level CHIP tallies.

3 Data Sources

In this section, we discuss Medicaid and CHIP data sources, and we introduce auxiliary data to be used in our proposed Medicaid data methods for SAHIE.

3.1 Medicaid and CHIP

In addition to the MSIS data, the authors are aware of four other administrative records data sources that provide at least state-level Medicaid and/or CHIP enrollment data for recent years. Below, starting with MSIS, we list these data sources and some basic information for comparison.

- *CMS-MSIS: Medicaid Statistical Information System*
    - Available monthly, in quarterly files, since 1999
    - Typically released with a two- or three-year lag [For example, most 2011 data were released in 2014.]
    - Comprised of state-reported microdata; CHIP reporting is optional
    - Contains extensive list of microdata person and claims variables, allowing for detailed tabulations
    - Medicaid Analytic eXtract (MAX) is a related data source that is further edited and released later on
- *KFF: Medicaid and CHIP Enrollment Data Snapshot Report*
    - Available annually for 2001-2005 and for 2006-2013; also availably semiannually for some years
    - Provides Medicaid and CHIP data separately
    - Provides break-outs for three groups: Non-disabled, aged 0-18; Non-disabled, aged 19-64; Other
    - Based on responses from individual states to questionnaires administered by Health Management Associates using states' "off-the-shelf" enrollment reports
- *CMS-MCAEDED: Medicaid and CHIP Application, Eligibility Determination, and Enrollment Data*
    - Available monthly since January 2014; reported monthly
    - Pre-ACA baseline available for three-month average of July, August and September 2013
    - Separate child break-out available for most states

- Provides application, eligibility, and enrollment data
    - Produced through the Medicaid and CHIP Performance Indicator Project
- *CMS-MBES: Medicaid Enrollment Data Collected through the Medicaid Budget and Expenditure System*
    - Available monthly since February 2014; reported quarterly
    - CHIP data are not included
    - Separate adult break-out available for most states
    - Provides counts of unduplicated individuals enrolled in states' Medicaid programs
    - Measures people enrolled at any time during each month
- *CMS-SEDS: Statistical Enrollment Data System*
    - Available annually since at least 2005; available quarterly for many earlier years
    - These data are only of children under 19 years of age, which is the age range for CHIP eligibility
    - Provides Medicaid and CHIP summary data separately
    - Provides point-in-time unduplicated number of children "ever enrolled"

The availability of these Medicaid and CHIP data sources over time, as of October 2015, is summarized in Figure 4, below, in which an "X" indicates the data are available for that year and a blank indicates the data are unavailable.

Data Source	2011	2012	2013	2014	2015
CMS-MSIS	X	X			
KFF	X	X	X		
CMS-MCAEDED			X	X	X
CMS-MBES				X	X
CMS-SEDS	X	X	X	X	X

Figure 4: Medicaid+CHIP data source availability by year, as of October 2015

3.2 Criteria for Sources

For the purpose of the SAHIE modeling of Medicaid+CHIP data, ideally, the Medicaid+CHIP data source(s) would meet the following criteria:

- Exist at the county level or at least at the state level
- Be available as a time series for years 2011 through 2014, and have anticipated future releases
- Be available with a high frequency, ideally, monthly or quarterly
- Provide demographic breakdowns, including age and sex
- Be of high quality, by not missing data points, having low monthly volatility, and being accurate
- Utilize a reasonable data filter (i.e., the rule(s) for which types of records are included or not)
- Include both Medicaid and CHIP data on a consistent basis relative to one another

The main limitation for SAHIE's use of the existing MSIS data is the long reporting lag before all states submit their microdata to CMS, both for initial data and for subsequent additions and corrections. In recent years of production, SAHIE has had to use MSIS and CHIP data from as far back as two years earlier. For example, the 2012 SAHIE used May 2010 MSIS and fiscal-quarter-three 2010 CHIP data. But with ACA-related Medicaid expansions taking place in many states, there may be greater potential for rapid Medicaid enrollment changes during 2013-2014. This is one of the main reasons why the SAHIE program is currently seeking to reduce the Medicaid-SAHIE time gap.

For the purposes of SAHIE production, beyond the MSIS data, the MCAEDED are the most useful Medicaid data source because they are available monthly, are up-to-date, are published currently and likely into the future, include CHIP data, are available at the state level, have only a small number of missing and/or unreliable data points, and may in the future have reliable child break-out data. As will be described in Section 5, the growth rate in MCAEDED will be fundamental to our methods for updating the lagged Medicaid and CHIP data used by SAHIE.

Beyond MCAEDED, we also use the KFF Medicaid and CHIP data in order to incorporate the three demographic break-out groups that the KFF data provides. Further, the 2013 KFF data provide us a crucial bridge between the end of the MSIS data series in 2012 and the start of the MCAEDED series in 2013. We note it is currently not clear whether the KFF Medicaid and CHIP Enrollment Data Snapshot Report will be continued in future years.

3.3 Other Data Sources

Beyond the Medicaid and CHIP data, our proposed methods utilize the following additional data sources. Note that 2013 and 2014 are the years of SAHIE modeling studied in this work:

- CMS' official Medicaid income-eligibility thresholds for 2013, and then separately for 2014 (CMS, 2014)
- Numbers of exemptions on IRS 1040 tax returns with adjusted gross income in the ranges of Medicaid and CHIP eligibility, for filing year 2011 (tax year 2010) through filing year 2014 (tax year 2013)
- ACS 1-year estimates of Medicaid enrollment, specifically, "Medicaid, Medical Assistance, or any kind of government-assistance plan for those with low incomes or disability," for 2011 through 2014
- ACS 5-year estimates of the number of people with disabilities; and, separately, the number of people aged 65+ with income below 50 percent of poverty, for the 2010-2014 period

As will be discussed in Section 5, these above data sources are needed in order to make predictions of the demographic characteristics (age/sex) and of the county distribution, within the basic Medicaid and CHIP state total predictions we obtain from the MCAEDED and KFF data.

4 Related Literature

We consider four strands of literature related to Medicaid and CHIP enrollment during policy changes: state program implementation, characteristics and distribution of recipients, program take-up rates, [2] and enrollee undercount in survey data. First, several studies document that the Medicaid and CHIP programs are implemented somewhat differently across states, and that this is true even within the categories of expansion and non-expansion states (Jacobs and Callaghan, 2013; Allison, 2014; Cantor, et al., 2013; Ham, et al., 2014). Some of the state-to-state differences are related to public outreach, applicant facilitation, breadth of program benefits, costs of services, and provider reimbursement rates (KFF, 2013; Pew, MacArthur, 2014).

Second, expansions in Medicaid eligibility criteria are expected to cause changes in the demographic composition of the Medicaid population because more nonelderly adults without children are able to enroll in Medicaid, which would decrease the proportion of children in the Medicaid population (Buettgens, et al., 2013; Desai et al., 2013). Medicaid expansions are also expected to cause changes in the within-state geographic composition of the Medicaid population (Keeney, et al., 2014; Leavitt Partners, 2012; Pickens, et al., 2012). In particular, Kenny et al., 2013 projects that approximately 40 percent of total variation in Medicaid enrollment growth would occur *within* state boundaries, with the remaining 60 percent occurring across state boundaries. The overall reason for this is that changes in eligibility criteria would affect some local areas more than others, as demographic and socioeconomic characteristics vary substantially locally, and thus Medicaid eligibility rates would likewise vary locally.[3]

Third, several studies suggest that Medicaid take-up rates vary substantially across socioeconomic and demographic subgroups (Watson, 2014; Kenney, et al., 2012; De La Mata, 2012; Finkelstein, et al., 2015). Two key factors that likely influence program take-up rate are the insurance coverage rate of different groups at the baseline and the income levels of newly eligible people (Buettgens, et al., 2013; Desai, et al., 2013). Higher take-up rates may occur in states with a smaller share of population enrolled in Medicaid/CHIP at baseline and/or with a higher proportion of individuals with incomes below 138 percent of poverty at baseline (Kenny, et al., 2013).

Fourth, when attempting to measure Medicaid and CHIP enrollment using survey data, it is known that the ACS Medicaid estimates exhibit some degree of Medicaid undercount relative to the administrative records MSIS data (Boudreaux, et al., 2013). The CPS ASEC is also known to exhibit some degree of Medicaid undercount (Noon, 2013). However, to the extent that growth patterns between ACS Medicaid and MSIS totals have been fairly comparable over time, ACS Medicaid growth may still be a suitable benchmark for predicting MSIS growth.

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[2] By "take-up rate" we mean the share of people that actually apply and enroll in an aid program from among the people that are eligible for that aid program in theory.

[3] For example, the share of childless working-age adults may be higher in and near cities, and this could be associated with higher urban Medicaid enrollment growth under ACA as Medicaid eligibility was now opened up to many childless adults.

Taken together, these works emphasize the heterogeneity of Medicaid eligibility and take-up rates that exists across different groups and different areas. They suggest that Medicaid expansion-related changes in enrollee composition under the ACA could be substantial. Therefore, our Medicaid prediction methods should strive to account for such demographic and geographic variation.

5 Prediction Methods

Our proposed Medicaid+CHIP prediction methods combine data from several sources to produce estimates of 2013 and 2014 Medicaid enrollees. In this section, we explain these prediction methods.

5.1 Tabulations of MSIS and CHIP Data

The standard approach for SAHIE production is to use two-year lagged MSIS data plus SEDS CHIP data as the Medicaid and CHIP variable. Specifically, the 2012 SAHIE (released in March 2014) used 2010 MSIS plus SEDS CHIP data for fiscal year 2010, quarter 3. By that pattern, the 2014 SAHIE would then use 2012 MSIS[4] plus SEDS CHIP data for fiscal year 2012, fiscal quarter 2 (since fiscal quarter 3 SEDS CHIP state-level data were not available).

SAHIE historically uses MSIS data for the month of May within the fiscal third quarter (i.e., calendar second quarter) of a given year. We use both the original quarterly data submitted, as well as the data additions and corrections that may be provided in states' later quarterly submissions of MSIS data to CMS. We compute age between March 31st of the given year and the date of birth reported on the MSIS file. Regarding data filtering, we include only records for which the number of days of eligibility are nonzero, and we exclude most Medicaid beneficiaries who have only *restricted* Medicaid benefits that would not constitute full health insurance coverage. We do not include MSIS' CHIP records, since CHIP reporting in MSIS is optional for many states. Instead, we obtain CHIP data from SEDS, as described below.

Regarding CHIP data, SAHIE historically uses publicly-released summary tables at the state level from CMS-SEDS. These data have been available quarterly under an "ever enrolled" measure, meaning they are reported as the number of beneficiaries that were enrolled in any of the three months making up the quarter. In order to make these data comparable to the May single-month measure used for our MSIS tallies, we scale down the ever-enrolled CHIP figures by the ratio of the number of MSIS aged 0-18 in May to the number in April, May or June for the given data year. [5] Finally, we add these CHIP figures to the MSIS tallies to obtain the "Medicaid+CHIP" data.

5.2 Predictions at State Level

We start with the Medicaid MSIS plus SEDS CHIP data for 2011 and 2012 processed using the standard SAHIE methods described in Section 5.1 above. As described in Section 3.2, we use MCAEDED as the primary data source for state-level totals in our computations of growth benchmarks. For the 2013 MCAEDED we use the July through September 2013 three-month average figures (pre-ACA base), and for the 2014 MCAEDED we use the July through September 2014 three-month average figures. These months are intended to be close in time to the June KFF Medicaid data, since we use these KFF data to split the MCAEDED totals into three subcomponents (as per below).

Our overall strategy is to create a consistent state-level benchmark series from 2011 to 2014 and to then compute the two-year percentage change (for 2011-13 and 2012-14) off of this benchmark series, which we then apply, respectively, to our 2011 and 2012 MSIS plus SEDS CHIP bases, yielding our state-level 2013 and 2014 Medicaid+CHIP predictions.

In order to compute state growth benchmarks in total Medicaid+CHIP enrollment across 2011-13 and 2012-14, we must bridge across the KFF and MCAEDED series, since the KFF data ends in 2013, while the MCAEDED starts in 2013 (see Section 3.1, Figure 4). We do so by computing the percentage change, by state, between the 2013 and

[4] However, two states, Colorado and Idaho, are missing 2012 MSIS data, and so in our analysis, 2011 MSIS data are used in their place.
[5] In the future, these CMS-SEDS data may only be available annually. If so, then we would adjust our scale factors accordingly.

2014 MCAEDED totals, and applying this to the 2013 KFF Medicaid+CHIP totals, which produces a prediction of 2014 KFF Medicaid+CHIP totals by state. To complete this step for all states, we first impute the growth rates for a small number of unreliable MCAEDED totals for 2013 and/or 2014, as identified by high monthly volatility or inconsistency with other related data.[6]

Within the predicted KFF Medicaid+CHIP state total benchmarks, we are able to distinguish among three subcomponents published in the KFF data for 2013 and prior years: Non-disabled, aged 0-18; Non-disabled, aged 19-64; All others (i.e., disabled, aged 0-64; all aged 65+). Since 2014 KFF data do not exist, we instead update the 2013 KFF's three subcomponents for 2014 by applying 2013-14 growth trends in the ACS 1-year Medicaid estimates, for the corresponding three subcomponents, as an approximation. Here, the ACS growth rates come from the largest 25 states individually and within expansion/non-expansion aggregates among the other 25 states plus the District of Columbia. We then rake the summations of the three subcomponents to be consistent with the predicted 2014 KFF Medicaid+CHIP totals described in the preceding paragraph.

Further, within the non-disabled, aged 19-64 subcomponent of the KFF data, we further distinguish the Medicaid+CHIP percentage changes by aged 19-39, 40-49, 50-64 groups and by male/female groups. We take these differential percentage changes from the ACS (1-yr) Medicaid estimates within the largest 10 states and within expansion/non-expansion aggregates among the other 40 states plus the District of Columbia. We then rake the summations of the age/sex sub-detail to be consistent with the overall non-disabled, aged 19-64 subcomponent described in the preceding paragraph. As discussed at the end of Section 4, it is known that ACS Medicaid estimates have an undercount relative to the MSIS administrative records data. As we use ACS Medicaid estimates in our prediction methods, we do so with the assumption that the undercount is somewhat proportionally equal across years and across demographic groups.

Finally, to predict the state-level 2014 Medicaid+CHIP data for SAHIE production, we compute the two-year percentage change between the 2012 KFF Medicaid+CHIP data and our *predicted* 2014 KFF Medicaid+CHIP data, by state/age/sex/disability status. We then apply this two-year percentage change to the 2012 MSIS Medicaid plus 2012 SEDS CHIP data. Similarly, to predict the 2013 Medicaid+CHIP data for SAHIE production, we compute the two-year percentage change between the 2011 KFF Medicaid+CHIP data and the actual 2013 KFF Medicaid+CHIP data, by state/age/sex/disability status. We then apply this two-year percentage change to the 2011 MSIS Medicaid plus 2011 SEDS CHIP data. We conclude by aggregating the disability status detail, which leaves us with the predicted 2013 and 2014 Medicaid+CHIP data, by state/age/sex, for use in our SAHIE modeling.

5.3 Predictions at County Level

We start with the state-level Medicaid+CHIP totals and demographic subcomponents generated under the methods described in Section 5.2 above. We update the county distributions within state as follows: We apply CMS' state-specific Medicaid and CHIP income-eligibility criteria to the reported adjusted gross income from IRS 1040 tax returns. For the 2013, 2012, and 2011 computations, the same pre-2014 Medicaid+CHIP income-eligibility criteria are used. For the 2014 computations, the 2014 Medicaid+CHIP income-eligibility criteria are used. These later income-eligibility criteria are substantially different from the pre-2014 income-eligibility criteria due to policy changes from the ACA (CMS, 2014). We aggregate the resulting data up to the county level in order to approximate the number of people, by county, who would be eligible for Medicaid or CHIP if they applied in a given year.

We then compute and apply the two-year growth rate in these approximated numbers of Medicaid+CHIP income-eligible people at the county level. Specifically, for the 2014 Medicaid+CHIP computations, we compute the growth rate between the filing-year 2012 and filing-year 2014 tax data. We apply these county-level growth rates to the 2012 MSIS+CHIP data, creating a prediction of the 2014 Medicaid+CHIP figures at the county level. Similarly, for the 2013 computations, we compute the growth rate between the filing-year 2011 and filing-year 2013 tax data. We apply these county-level growth rates to the 2011 MSIS+CHIP data, creating a prediction of the 2013 Medicaid+CHIP figures at the county level.

[6] Our few state-level MCAEDED imputations are done by applying the percentage change in ACS 1-year estimates of Medicaid enrollment (by state or expansion/non-expansion aggregates) to either the KFF figures or to income-eligible Medicaid estimates from aggregated IRS 1040 data.

The above Medicaid+CHIP predictions are done separately for the three KFF demographic subcomponents discussed in Section 5.2. Specifically, we use the following three concepts to drive our predictions:

- For the non-disabled aged 0-18 Medicaid predictions, we use child tax exemptions
- For the non-disabled aged 19-64 Medicaid predictions, we use non-senior, non-child tax exemptions
- For the disabled aged 0-64 or aged 65+ Medicaid predictions, we use the sum of ACS 5-year estimates of the number disabled and ACS 5-year estimates of aged 65+ with income less than 50 percent of poverty

These subcomponents allow us to estimate some demographic sub-detail within our county-level predictions.

We finish by controlling the sums (by state) of the county-level Medicaid predictions to equal the state-level Medicaid predictions for each demographic cell. We thus have the 2013 and 2014 predicted Medicaid+CHIP data to be used in our SAHIE modeling, to be discussed in Section 6 below. We note that our tax-based approximations (of the numbers of people income-eligible for Medicaid and CHIP) cover only those who are included on tax returns. As we use these income-eligible approximations in our prediction methods, we do so with the assumption that the proportions of tax non-filers are somewhat equal across years and across counties within state.

6 Prediction Results

We here review the results of our 2013 and 2014 Medicaid+CHIP predictions, which are based on growth rates in updated Medicaid+CHIP data and in auxiliary data, as described in Section 5.

6.1 Summary

Overall, we find substantial growth in the Medicaid+CHIP enrollment data for many states between the actual 2012 figures and the predicted 2014 figures. For the aged 19-64 group, the predicted enrollment growth is much more pronounced in Medicaid expansion states, while in Medicaid non-expansion states there are even some predicted enrollment declines. At the state level, the percentage changes between the Medicaid+CHIP actual 2012 data and the predicted 2014 data range from roughly -20 percent to +200 percent, with the bulk of changes occurring in the 0 percent to +50 percent range. In contrast, for the aged 0-18 group, the percentage changes are more subdued, ranging from roughly -5 percent to +15 percent, at the state level.

At the county level, we, likewise, find substantial growth in the Medicaid+CHIP enrollment data for a large share of counties between the actual 2012 figures and the predicted 2014 figures. Further, the county-level growth rates are typically clustered around the corresponding state-level growth rates. This may be expected, since the counties within state have some common state-specific effects, such as expanding Medicaid eligibility criteria or not during 2013 and 2014. Still, there remains much county-level variation in the growth rate even within state, and sometimes counties with large enrollment growth are located right beside counties that have much less growth or even enrollment declines. Upon subtracting out the state-level percentage changes, the remaining county-level percentage changes range from roughly -20 percent to +20 percent for the aged 19-64 group, and from roughly -10 percent to +10 percent for the aged 0-18 group.

In particular, for counties with small population size (roughly less than 10,000), for the aged 0-18 group, we find a slight reduction in the 2014 mean and median within-state shares of the Medicaid+CHIP predicted data compared to those in the 2012 actual data. Similar patterns appear when we examine differences in participation rates instead of ratios of shares. Essentially, this is a prediction that Medicaid+CHIP aged 0-18 enrollment expanded to a greater degree in larger counties than in smaller counties, reducing smaller counties' shares of Medicaid+CHIP enrollment. For the aged 19-64 group we see similar predicted effects for small counties, though they are much dampened.

As expected, results from an intermediate case that uses only updated *state-level* Medicaid+CHIP predictions (i.e., does not use county-level updates) generally are in between the results from the fully lagged Medicaid+CHIP data (i.e., the prior SAHIE approach) and the results from the fully predicted Medicaid+CHIP data. Note this intermediate case was produced by just scaling the original county-level MSIS plus SEDS CHIP data proportionally with the updated state-level Medicaid+CHIP predictions by demographic cell.

Finally, the corresponding 2011-13 Medicaid+CHIP results are similar to the 2012-14 results discussed above, but the state-level growth rates were much less pronounced over these years, and the county-level growth rates were also smaller. Even upon subtracting out the state-level growth rates, the resulting county-level growth rates were smaller in 2011-13 than in 2012-14.

6.2 Validation

At the state level, across years 2011-13 and years 2012-14, our predicted Medicaid+CHIP data exhibit growth (i.e., percentage-change) patterns that are broadly consistent with those in the MCAEDED totals and those in the KFF Medicaid and CHIP three subcomponents. This is expected since the MCAEDED and KFF totals are the main driver data for our predicted Medicaid+CHIP totals and three subcomponent updates. Regarding the further sub-detail within the aged 19-64 subcomponent, the 2011-13 and 2012-14 growth patterns by age (for aged 19-39, 40-49, 50-64) and by sex (for male, female) generally match those in the corresponding ACS 1-year Medicaid estimates. This is expected since the ACS Medicaid estimates, sometimes for individual states and sometimes aggregated over states, are the main driver data for our Medicaid+CHIP aged 19-64 sub-detail updates.

At the county level, across both years 2011-13 and 2012-14, the growth rate (i.e., percentage change) in our predicted Medicaid+CHIP data are often clustered in value around the state growth rate, indicating that a sizable portion of the county-level growth is state specific. This is not unexpected, especially during 2013-14 when some states opted to expand their Medicaid eligibility criteria while others did not. Filtering out the state-level effects, we find that our county-level Medicaid+CHIP growth rates generally match the growth rates of our driver county-level IRS income-eligibility data, as expected.

As a validation exercise, we ran our Medicaid+CHIP prediction methods on some prior years of source data, including for 2010-based predictions of 2012 Medicaid+CHIP data and for 2009-based predictions of 2011 Medicaid+CHIP data. Comparing these prior predicted enrollment totals with the actual MSIS Medicaid plus SEDS CHIP data for that same time period (which were already reported by now), we found our Medicaid+CHIP predictions to be reasonably accurate. In particular, the actual Medicaid+CHIP values were closer to our Medicaid+CHIP predictions than they were to simply the lagged Medicaid+CHIP values.

As a further validation exercise, for a handful of states that publish Medicaid data on their public websites, we compared these state-reported data to our predicted Medicaid+CHIP enrollment totals for like concepts. We found that the county-level *shares* of state Medicaid data were broadly consistent with our corresponding Medicaid+CHIP shares, both for the predicted data (2013 and 2014) and for the lagged data (2011 and 2012). We utilized county-level *shares* because the timing and data filters applied (i.e., the rules by which records are included in the tallies) for the state-reported Medicaid data vary by state and do not always match the concepts in our own Medicaid+CHIP data; such differences would naturally cause differences in the absolute levels of the data.

7 SAHIE Results

We here discuss our SAHIE modeling results from utilizing the predicted Medicaid+CHIP data for years 2013 and 2014 relative to utilizing the standard lagged Medicaid+CHIP data.

7.1 Summary

We will refer to the 2014 SAHIE that uses the predicted 2014 Medicaid+CHIP data as the "2014 predicted-Medicaid SAHIE," and we will refer to the 2014 SAHIE that uses the lagged 2012 Medicaid+CHIP data as the "2014 lagged-Medicaid SAHIE." Similarly, we will refer to the 2013 SAHIE that uses the predicted 2013 Medicaid+CHIP data as the "2013 predicted-Medicaid SAHIE," and we will refer to the 2013 SAHIE that uses the lagged 2011 Medicaid+CHIP data as the "2013 lagged-Medicaid SAHIE."

Overall, we observe modest improvement in the 2014 predicted-Medicaid SAHIE as compared to the 2014 lagged-Medicaid SAHIE. At the state level, there are minimal effects from using the 2014 predictions, both for the point estimates and for the standard errors. This is expected since, for states, the ACS 1-year state health insurance coverage estimates usually have very large influence on SAHIE due to their large sample sizes.

At the county level, the 2014 predicted-Medicaid SAHIE point estimates are shifted around a bit, but they are not drastically different than under the 2014 lagged-Medicaid SAHIE. In particular, most of the predicted-Medicaid SAHIE and the lagged-Medicaid SAHIE are within overlapping confidence intervals of one another. Also, the standard errors and coefficients of variation are roughly flat between the predicted-Medicaid SAHIE and the lagged-Medicaid SAHIE. Taking two examples: for the aged 19-64 group, with income less than 200 percent of poverty, the 2014 predicted-Medicaid SAHIE point estimates are generally within +/- 5 percent of those from 2014 lagged-Medicaid SAHIE; for the aged 0-18 group, with income less than 200 percent of poverty, the 2014 predicted-Medicaid SAHIE point estimates are generally within +/- 10 percent of those from 2014 lagged-Medicaid SAHIE.

In particular, for the aged 0-18 group, among counties with population size less than 10,000, we find an average increase in the within-state shares of SAHIE uninsured estimates for the 2014 predicted-Medicaid SAHIE compared to the 2014 lagged-Medicaid SAHIE. This finding correlates negatively with the earlier finding of an average decrease in the within-state shares of predicted Medicaid+CHIP input data for the same age group and population-size class (see Section 6.1). This may be expected since survey respondents who indicate they have Medicaid or CHIP benefits would be considered insured in the ACS measures of health insurance coverage. Further, the corresponding SAHIE average raw residuals (i.e., differences between ACS uninsured estimates and SAHIE) and standardized residuals are reduced. This indicates that on average the SAHIE data are closer to the ACS estimates for this group. Taken together, this suggests that the new Medicaid data methods offer a small improvement in consistency between the SAHIE and the ACS data for the aged 0-18 group among counties with small population size.

As expected, SAHIE results from an intermediate case that uses only updated *state-level* Medicaid+CHIP input data (i.e., does not use county-level Medicaid+CHIP updates), generally are in between the results from the fully lagged-Medicaid SAHIE (i.e., prior SAHIE approach) and the results from the fully predicted-Medicaid SAHIE.

Finally, the corresponding 2013 SAHIE results, regarding the impact of using updated Medicaid+CHIP data, are very similar to the 2014 results discussed here, though a bit less pronounced likely due to the smaller amount of Medicaid+CHIP enrollment growth that occurred between 2011 and 2013 than occurred between 2012 and 2014.

7.2 Discussion

Overall, we find the impact on SAHIE of modeling more up-to-date Medicaid+CHIP data to be fairly small. We discuss some likely reasons for this below.

First, the Medicaid+CHIP auxiliary data set is just one of many auxiliary data sets used in producing SAHIE, and so each auxiliary data set has only limited influence in the SAHIE models, as kind of a ‘diversification’ effect. Second, in areas with large ACS sample sizes (especially for states and for large counties), the SAHIE modeling gives much weight to the ACS health insurance coverage estimates and thus less weight to the SAHIE regression predictions. As a result, counties with small population size, for which we found some effects on SAHIE from using the predicted Medicaid data (as per Section 7.1), are the only areas that really had the potential for sizable impact from using the predicted Medicaid data relative to the lagged Medicaid data.

Third, Medicaid and CHIP are only two sources of health insurance coverage among many others that people can have. For instance, other sources mentioned in the ACS questionnaire include: Insurance through a current or former employer or union; Insurance purchased directly from an insurance company; Medicare; TRICARE or other military health care; Veterans Administration; Indian Health Service; and others (U.S. Census Bureau, 2014).

Fourth, individual Medicaid and CHIP participation is closely correlated with peoples’ income levels, likely because income criteria are central to program eligibility. But income levels already have a strong influence in the standard SAHIE models via the IRS and ACS (5-year) income-to-poverty ratio measures. These correlating variables limit the potential for the Medicaid and CHIP variable to have a large and unique effect on SAHIE.

Finally, we note that the standard SAHIE already features a material improvement in average coefficient of variation relative to the ACS 1-year health insurance estimates. So, any benefits from using the predicted Medicaid and CHIP data would have to exist on top of these already significant improvements obtained from the standard SAHIE modeling.

The arrival of CMS' MCAEDED provided an opportunity for the SAHIE program to reduce the two-year lag of the detailed MSIS data that SAHIE has historically used as a model input. Despite the limited effect on SAHIE from using updated Medicaid and CHIP data, the routine testing we have done is crucial for documenting the size of the effect, and, at minimum for being sure that no harm would be done by making such a data change.

8 Concluding Remarks

In this work we discussed the arrival of CMS' MCAEDED, which provides monthly Medicaid+CHIP totals for all states, and which presented SAHIE with an opportunity to reduce its two-year CMS MSIS data lag. We studied characteristics of the KFF Medicaid/CHIP data and other sources of Medicaid/CHIP data. We proposed methods to predict Medicaid and CHIP enrollment by utilizing the MCAEDED and KFF data together with other auxiliary data, including ACS 1-year Medicaid estimates and aggregated IRS 1040 tax data. Finally, we reviewed SAHIE modeling results from running 2013 and 2014 estimation using these predicted Medicaid+CHIP data.

Regarding our Medicaid+CHIP predictions, they show substantial state-to-state variation in enrollment growth rates (i.e., percentage change) over 2011-13 and, especially, over 2012-14. The larger Medicaid+CHIP growth rates over 2012-14 tend to occur among states that expanded their Medicaid eligibility criteria, however, we have not tested for any causal relationship(s). Further, we observe differing growth rates across demographic groups and differing growth rates among counties within state. Our Medicaid+CHIP predictions show clustering in county-level growth rates around their state-level growth rates, which is expected if some state factors have systematic influence across counties within state. We note there are, on average, slightly reduced Medicaid+CHIP predictions for counties with population size less than 10,000, for the aged 0-18 group, relative to the lagged Medicaid+CHIP data.

Regarding our SAHIE modeling results, we find the benefits from incorporating more up-to-date Medicaid+CHIP data to be modest. At the state level, the effects on the point estimates and margins of error are very small. At the county level, there is some shifting in the point estimates, but most data are within the confidence intervals of the original data, and the resulting SAHIE margins of error are roughly flat between the original and modeled versions. Still, we measure, on average, slightly reduced SAHIE model residuals (i.e., ACS estimates minus SAHIE) for counties with population size less than 10,000, for the aged 0-18 group. We interpret this group's greater consistency with the ACS estimates to be a small improvement, since SAHIE strives to match the ACS values on average.

We believe that the primary reasons for the small impact of the updated Medicaid+CHIP data on SAHIE include: Medicaid plus CHIP enrollment is only one of many input data sets used in SAHIE; Medicaid and CHIP enrollment is closely correlated with other income measures already included in SAHIE; there are many other sources of health insurance coverage in addition to government programs like Medicaid and CHIP; and the ACS estimates have substantial weight in the SAHIE estimation, especially for areas with large sample size.

Our exploration of updated Medicaid+CHIP data methods in this work is one example of how SAHIE continually strives to improve its data inputs and production methodology, employing the latest available and reliable data sources and statistical methods each release year. We continue to follow the latest developments in related source data and literature, and we welcome any public feedback on SAHIE at any time.

Looking ahead, regarding the SAHIE source data, first, we expect to study CMS' upcoming T-MSIS data relative to the standard MSIS data that we have been using. Second, we will continue reviewing the child enrollment sub-detail within MCAEDED for possible future use. Third, we expect to request approvals to study the statistical benefit for SAHIE to utilize aggregated IRS data from form 1040 line 61, "Health care: individual responsibility," form 1094, "Transmittal of Health Insurance Offer and Coverage," and/or form 1095, "Health Insurance Offer and Coverage." Fourth, we expect to study the available ACA health insurance marketplace enrollment data from the Department of Health and Human Services (HHS) to discern whether they could be useful in SAHIE production.

We may also research refinements to the Medicaid+CHIP prediction methods described herein. One approach could be to develop and use model(s) of program take-up rate, grounded in other recent work (Watson, 2014; Kenney, et al., 2012; De La Mata, 2012; Finkelstein, et al., 2015). For example, the Medicaid+CHIP take-up rate could be a function of many factors, including: income eligibility criteria, metro/micro status, various employment variables, ACA-related outreach, population growth, poverty rates, prior degree of public aid participation.

Regarding SAHIE model research, one of our initiatives is to evaluate our approach to measurement error and to gauge the benefits from Bayesian versus frequentist estimation. Another initiative is to go beyond SAHIE's current state-level effects and explore modeling state predictor-interaction terms; this might provide another means for updated Medicaid data to matter and might also allow for estimation of state-level policy effects. Some of our other research involves building-block approaches to estimation, such as at the tract level and even at the person/housing-unit level, for which we would then aggregate the modeling results up to the standard SAHIE county and demographic cells.

Finally, we would also like to develop methods to formally test for statistically significant differences in point estimates across different versions of SAHIE, such as from using different Medicaid+CHIP source data/methods, as we have discussed herein. We would also like to develop more advanced methods to study the differences in SAHIE standard errors and in model residuals (i.e., the differences between the ACS and SAHIE estimates). These statistical tests may ultimately build upon other research we have been conducting to statistically compare sequential years of SAHIE. Overall, these efforts would allow us to make more definitive statements about any statistical benefits of potential changes in SAHIE production methods and/or source data.

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