**Correlations Between a Proxy of Child Supplemental Security Income (SSI) Participation Rate with State-Level Attributes and Policies**

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**ABSTRACT**

*Objectives*: To compute correlations between estimated child participation rate in the Supplementary State Income (SSI) program with potentially relevant state characteristics and public policies

*Methods*:

*Results*: We found significant positive correlation (p < 0.05) between state-level child SSI participation rates and states with higher percentages of population in urbanized areas, higher percentages of financially eligible children with health insurance, and that award Medicaid automatically if SSI is awarded.

*Conclusions*:

**INTRODUCTION**

In 2020, 63.8% of the 27.4 million uninsured in US who were eligible for Medicaid, the Children’s Health Insurance Program, or Affordable Care Act subsidies did not sign up, with lack of awareness of programs, uncertainty about eligibility, and administrative hurdles cited as reasons for not enrolling.11 Similar concerns exists for the SSI program.12 Since most SSI recipients are categorically eligible for Medicaid, the two programs are inevitably intertwined.13 The 16 and 17 states that opted to use more restrictive eligibility criteria for Medicaid than their SSI program and had not expanded Medicaid eligibility by 2019, respectively, may see this effect reflected in their child SSI participation rates.14,15 Beyond these potential policy impacts, evidence of general geographic variation in SSI participation has been shown to exist.8,10,16–18

A secondary aim is to describe the distribution of uncertainty of our child SSI participation rate estimates to provide context for future research studies that may use our estimates.

**METHOD**

*State Attributes and Policy Information*

To explore the correlations between the estimated child SSI participation rates and various state-level attributes and policies of interest, we utilized a variety of public resources. To examine how estimates were associated with the percentage of urbanized areas in a state (areas with greater than 50,000 people), we extracted from the 2010 US Census Bureau’s urban-rural classification data (2020 data has not been released yet).28 We gathered information about Medicaid expansion states and the percentage of low-income children with health insurance from the Kaiser Family Foundation (KFF).15,29 For all years, Alaska, Rhode Island, and Vermont are excluded from the insurance correlation analysis due to missing data. For information about whether a state offered SSP for children with disabilities and automatically awarded Medicaid if SSI was awarded, we used the Policy Surveillance Program and SSA’s SSI annual report appendices, respectively.4,14

*Statistical Analysis*

In the secondary analysis in which we incorporate uncertainty in the public data estimates, we fit normal distributions to the mean and 5% and 95% quantiles provided in the ACS tables and beta distributions to the mean and 2.5% and 97.5% quantiles provided in the NSCH tables. After the distribution fitting, we sample 1,000 points from these distributions and carry out the aforementioned methodology to compute 1,000 child SSI participation rates for each state and year. No distribution fitting is applied to the SSA data because there is no uncertainty in these numbers. We used Pearson’s correlation coefficient to compute the association between numeric variables (child SSI participation rate, population percentage in urbanized areas, percent of financially eligible children with health insurance, etc.) and two sample t-tests for the association between a numeric variable and binary variable (whether a state grants automatic Medicaid when SSI is awarded, whether a state expanded Medicaid, etc.). We defined statistical significance as p < 0.05 for all testing. We used R version 4.2.2 (R Foundation for Statistical Computing) for all data collection and statistical analysis.

**RESULTS**

For all years, the base state-level child SSI participation rate estimates were significantly positively correlated with the percentages of state population located in urbanized areas and the percentages of financially eligible children with health insurance for all years (except 2018; p = 0.15), respectfully. Examples of these relationships are shown for 2019 in Figure 2. Notably, the percentages of the state population located in urbanized areas and the percentages of financially eligible children with health insurance for all years are not significantly correlated with each other. Also, we found the base state-level estimates were not significantly associated with indicators of whether the states expanded Medicaid nor offered additional supplementary payments, but they were associated with automatically awarding Medicaid when SSI was awarded for all individual years (Supplementary Figure S2).

After randomly drawing 1,000 times from appropriately fitted distributions to the uncertain estimates of the number financially eligible children with and without disability from the ACS data and the percentages of financially eligible children needing more special health care needs from the NSCH data, we generated 90% confidence intervals for each state (Figure 3). Through this process, states with relatively larger margins of error in their public data estimates, like Rhode Island (1st largest error bar margin: 62.5%) and North Dakota (12th: 42.8%), or states with relatively larger numbers of financially eligible children, like New York (3rd: 58.0%) and California (4th: 56.9%), for which smaller changes to their estimates can have higher impacts on outputs tended to have the widest ranges of participation estimates. Overall, the smallest range of participation rates belonged to Wyoming, with a 19.2% difference between its 95th and 5th quantiles. The distribution of rates from this process are shown for a selection of states in Supplementary Figure S3 for which the uncertainty in true estimates can be explicitly observed.

We also used this bootstrapping process to repeat the base case state attribute/policy analysis. We found that in 99.1%, 96.8%, and 99.6% of our 4,000 random draws (1,000 samples for each of the four years), the positive correlations existed between child SSI participation rates and the percentages of the state population located in urbanized areas, the percentages of financially eligible children with health insurance, and whether Medicaid was automatically awarded if SSI was awarded, respectively (Table 2). Although our base correlation estimates between participation rates and indicators of whether a state expanded Medicaid were not shown to be significant, we found them to be positively correlated in 75.6% instances of the bootstrapped data.

**DISCUSSION**

Then, we assessed the association between this metric and a handful of relevant state-level attributes and policies to gain high-level insight about states with below-average participation rates. The child SSI participation rate metric can also be used to assess the success of other relevant policies and outreach programs.

. However, we do observe similar findings to theirs that metropolitan areas (as compared to rural areas) and the West region of the US are associated with higher-than-expected levels of SSI participation among all children (Figures 1-2A).30

Our findings that significant state-level correlation exist between the estimated child SSI participation rates and urbanized areas, the insurance status of financially eligible children, and whether Medicaid awards were directly tied to SSI awards provide high-level guidance for program administrators as to where to potentially target outreach efforts (Figure 2, Table 2, Supplementary Figure S2). Areas that are less populated, less likely to have children with health insurance, and require extra criteria for Medicaid to awarded beyond SSI payment receipt are more likely to have a lower-than-average number of program-eligible families even applying for SSI. These observations could be evidence of an aggregated word-of-mouth effect in which program awareness is highest in states with more concentrated populations and that the higher transaction cost of applying for Medicaid separately from SSI can be damaging for program participation. Although we did not find statistically significant associations between state-level policies like Medicaid expansion and offering SSP for children, our bootstrap analysis at least hints that Medicaid expansion may have impacted the number of SSI-eligible families that participated (Table 2).

*Limitations*

The incorporation of the uncertainty in public data estimates into our analysis clearly reflects the general difficulty in quantifying this participation metric before, but also prevents us from making many strong statements without further investigation (Figure 3). In the bootstrap analysis, we randomly weighted the two disability prevalences used prior to the participation rate computation to further incorporate uncertainty about which prevalence is closer to ground truth. Propagating the uncertainty of our disability prevalent estimates in this way yields the possibility for very high child SSI participation rates, specifically in the states for which our base results indicate had above-average participation (Supplementary Figure S3). If specific beliefs by a researcher are held about which disability prevalence definition aligns more appropriately with the SSI disability criteria, this could be incorporated in a modified methodology and more precise estimates would be generated. In the end, this process is necessary because it would be inappropriate for outreach efforts in Wyoming to assume that they can operate just like those in Mississippi, a state with a similar percentage of people in urbanized areas but with a much different child SSI participation rate (Figure 3). The incorporation of uncertainty also prevents us from making more than a couple of statistical claims. For example, we cannot claim with 90% confidence that the top state in SSI participation, Arkansas, performs above the US average of 38.6% (Figure 3). More precise information about child disability prevalence or more complete information about which of the two survey aligns more properly with the SSI disability criteria would eventually allow for bolder statistical statements.

**CONCLUSION**

We have developed distributional rate estimates for each state and found significant positive correlations with the percentage of population in urbanized areas and the health insurance coverage of low-income children.

**REFERENCES**

**TABLES**

Table. Percentage of bootstrapped data sets for which the state-level attribute/policy of interest were positively correlated to estimated child Supplemented Security Income (SSI) participation rate.

|  |  |
| --- | --- |
| **State Attribute/Policy** | **Percent Positively Correlated with Child SSI Participation Rate** |
| Percentage of state population in urbanized areas | 99.1% |
| Percentage of financially eligible children with health insurance | 96.8% |
| Medicaid automatically award if SSI awarded | 99.6% |
| Medicaid expansion | 75.6% |
| State offers child-specific supplemental security payments | 22.3% |

**FIGURES**

Figure. Relationship between the estimated child Supplemented Security Income (SSI) participation rates in 2019 and the percentage of state population in urbanized areas (A) and the percentage of financially eligible children with health insurance (B).

Chart, scatter chart

Description automatically generated

Figure. Mean and 90% confidence intervals of child Supplemented Security Income (SSI) participation rates using bootstraps from the distribution-fitting process of the public data.

Chart

Description automatically generated

**SUPPLEMENTARY MATERIALS**

Supplementary Figure. Relationship between estimated child Supplemented Security Income (SSI) rates and state-level policies (whether Medicaid was automatically rewarded if SSI was awarded, Medicaid was expanded, children are eligible to receive State Supplementary Payments [SSP]) by year. According to two-sample t-tests, all year-policy relationships are statistically significant for the first row and insignificant for the second and third rows.

Diagram, schematic

Description automatically generated

Supplementary Figure. Distribution of child Supplemented Security Income (SSI) participation rates using bootstraps generated from the distribution-fitting process of the public data tables colored by whether the state had greater than or equal to 60% of its population in urbanized areas for selected states.

Chart, surface chart

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