The 2023 OMAS Small Area Estimation Methodology Report

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Introduction

The 2023 Ohio Medicaid Assessment Survey (OMAS) is a repeated cross-sectional random probability survey of non-institutionalized Ohio adults 19 years of age and older and proxy interviews of children 18 years of age and younger. It provides health status and health system-related information about residential Ohioans at the state, regional, and county levels, with a concentration on Ohio's Medicaid, Medicaid-eligible, and non-Medicaid populations. The 2023 OMAS used a combination of an address-based sampling (ABS) frame and a list frame of Medicaid enrollees and collected surveys by phone, web, and paper. The survey was fielded from September 2023 to January 2024 and had an overall sample size of 39,626 adult interviews and 5,505 child interviews (via proxy adults). The eligibility-adjusted response rate of the 2023 OMAS was 24.0%. For more information on the survey design and methods, see the 2023 OMAS Survey webpage.

Direct estimates from the 2023 OMAS, calculated as survey-weighted averages, can be used to learn about the adult and child populations in the state of Ohio overall and in subpopulations of interest. Both adult and child estimates at the county-level are of particular interest, but in some cases these estimates are suppressed due to small samples sizes or low precision. For direct estimates from the OMAS to be published, they must meet all the following requirements:

- The numerator of a univariate estimate contains responses from 10 or more respondents.
- The denominator of a univariate estimate contains responses from 30 or more respondents.
- The coefficient of variation (CV) of survey-weighted estimates is 30% or lower.

Small area estimation (SAE) is an alternative approach that can be used in situations where suppression would generate missing estimates for many counties to obtain desired county-level estimates. SAE uses a model-based approach to obtain estimates by borrowing strength from auxiliary data and proximate geographic areas. In

this report, we present the SAE methods used to obtain county-level estimates from the 2023 OMAS.

Outcomes of Interest

The Government Resource Center (GRC) utilized SAE to obtain county-level estimates of a variety of important outcomes on sociodemographic characteristics, health status, healthcare utilization and access, and health insurance coverage. All outcomes were derived from the 2023 OMAS.

Outcomes for Adults Ages 19 to 64

We estimated several county-level proportions for adult Ohioans ages 19 to 64. This included the proportion of adults who experienced each of the following indicators of economic distress:

- difficulty paying for food for family or household in the past 12 months
- difficulty paying rent or mortgage in the past 12 months
- EBT or food stamp use in the past 30 days
- food ran out before getting money to buy more in the past 12 months
- forced to move due to being unable to pay rent or mortgage in the past 12 months
- household income of 138% of the Federal Poverty Line (FPL) or less
- household income of 206% FPL or less
- household income of 300% FPL or less
- not working (not having a job last week)
- problems paying or were unable to pay for medical bills in the past 12 months
- worried about food running out before getting money to buy more in the past 12 months

County-level insurance estimates from the 2023 OMAS were of interest as well and hence we estimated the proportion of adults with:

- dental insurance

- employer-sponsored health insurance
- health insurance through Medicaid
- health insurance through Medicare but not Medicaid
- health insurance through the Ohio Health Care Exchange
- no health insurance
- vision insurance

We also estimated the proportion ever diagnosed with the following chronic conditions:

- asthma
- cancer
- COPD
- diabetes (not including a borderline diagnosis)
- heart attack, coronary heart disease, or congestive heart failure
- hypertension
- high cholesterol
- stroke

To consider the general health status of adult Ohioans ages 19 to 64, we estimated the proportion with:

- fair or poor self-rated dental health
- fair or poor self-rated mental health
- fair or poor self-rated health
- a mental health impairment (a mental health condition or emotional problem prevented work or usual activities for 14 or more days in the last month)

We additionally considered disability status by estimating the proportion of Ohio adults ages 19 to 64 with:

- a developmental disability

- a disability (a serious difficulty with hearing, vision, ambulation, cognition, self-care, or independent living) (US Census Bureau, How Disability Data are Collected from The American Community Survey, 2021)

The availability of healthcare was considered by estimating the proportion of Ohio adults ages 19 to 64 with:

- a usual source of medical care
- no routine doctor's visit in the past 12 months
- a pain reliever prescribed in the past 12 months
- three or more emergency room visits in the past 12 months
- unable to fill a prescription at least one time in the past 12 months
- unmet need for dental care in the past 12 months
- unmet need for vision care in the past 12 months
- unmet need for mental health care in the past 12 months
- unmet need for alcohol or drug treatment in the past 12 months

We also estimated each of the following substance use indicators:

- binge drank alcohol in the past 30 days (having 5 more drinks on an occasion if male and 4 or more if female)
- smokes cigarettes every day or some days
- e-cigarette or vape use every day or some days
- marijuana, cannabis, or THC use in the past 30 days

Finally, among adult Ohio Medicaid members ages 19 to 64 who are working (defined as having a job last week), we considered the proportion who are the:

- parent of any child in their household

Outcomes for Children Ages 18 or Less

At the county-level, we also estimated proportions among Ohio children ages 18 or less. First, we estimated the proportion who ever experienced the following Adverse Childhood Experiences (ACEs):

- a parent or guardian getting divorced or separated
- a parent or guardian dying
- a parent or guardian serving time in jail
- seeing or hearing parents or adults slap, hit, kick, or punch one another in the home
- being a victim of violence or witnessing violence in their neighborhood
- living with anyone who was mentally ill, suicidal, or severely depressed
- living with anyone who had a problem with alcohol or drugs
- being treated or judged unfairly because of their race or ethnic group

We also estimated the proportion of children with:

- a household income of 138% of the Federal Poverty Line (FPL) or less
- fair or poor self-rated health
- no health insurance

Direct Estimation

For each outcome of interest, we first calculated direct estimates for each Ohio county, indexed $\mathrm{i} = 1, 2, \ldots, 88$, using the survey weighted proportion:

$$\hat{p}_{iD} = \frac{\sum_{j=1}^{n_i} w_{ij} y_{ij}}{\sum_{j=1}^{n_i} w_{ij}}$$

where n_i is the county sample size and w_{ij} and y_{ij} are the survey weight and binary response for respondent j in county i, respectively. Standard errors of each direct estimate, s_{iD}, were estimated in R, accounting for the OMAS's complex survey design. Confidence intervals were constructed using an incomplete beta function where the

effective sample size was calculated using the estimated standard error, s_{iD} (Korn & Graubard, 1998).

Imputation for Outcomes with Missing Respondent Outcomes

When outcomes of interest had missing values due to non-response, we imputed the missing responses using unweighted hot deck (UHD) with single imputation. Hot deck imputation replaces a respondent's missing response with an observed response from a similar respondent. A similar respondent is found by dividing respondents and nonrespondents into donor classes determined by variables observed for all units. A nonrespondent's outcome is then imputed by randomly selecting a donor respondent from within the same donor class. UHD imputation utilizes design and survey response variables for stratification. It has been shown that UHD imputation produces robust estimates under different missingness patterns (Andridge & Little, 2009).

For the 2023 OMAS SAE, hot deck donor classes for adult outcomes were created using county type (Rural Appalachian, Metropolitan, Rural Non-Appalachian, Suburban), insurance type (Employer-sponsored, Medicaid, Medicare only, Other Insured, or Uninsured), sex (Male or Female), survey mode (phone, web, or paper), and age category (19-24, 25-34, 35-44, 45-54, 55-64, 65-74, or 75+ years old). Note that no child outcomes of interest contained unknown responses.

To ensure sufficient variation in the donor groups, the minimum donor groups size was set to 15 members. All members of donor groups with fewer than 15 members were pooled and the process for creating donor groups was repeated for these adults with one or fewer stratifying variables. This process was repeated until only one stratifying variable remained or until all respondents were in groups of an appropriate size. If a donor group with fewer than 15 members remained, its members were assigned to a new donor group by ordering all survey respondents based on the full set of stratifying variables and assigning the donor group of the nearest respondent before the member in the order list that was in a donor group of at least 15 members. Once the donor groups were created, missing values were set to a randomly drawn complete response from the same donor group. Note that a completed response value could be selected any number of times.

Small Area Estimation

To obtain SAEs, we utilized an area-level Fay-Herriot model for each outcome of interest (Fay III & Herriot, 1979). These models relate the direct estimates for each outcome to county-level covariates. By using area-level models to obtain county-level SAEs, we are assuming that relationship between county-level covariates and the outcome of interest is consistent throughout Ohio's counties. Additionally, we are assuming that we can explain much of the observed variability in the direct estimates with available county-level covariates. The Fay-Herriot model assumes that the variance in the county-level estimates comes from two sources: sampling error, e_i, and model error, v_i, for each Ohio county $i = 1,2,\ldots,88$. We describe these two variance sources with the sampling model,

$$\log\left(\frac{p_i}{1-p_i}\right) = \log\left(\frac{\pi_i}{1-\pi_i}\right) + e_i$$

and the linking model,

$$\log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 X_{1i} + \cdots + \beta_K X_{Ki} + v_i$$

for Ohio county $i = 1,2,\ldots,88$ where X_{ki}, $k = 1,\ldots,K$,are county-level covariates and β_0, $\beta_1,\ldots,\beta_K$ are independently and identically distributed according to a standard normal distribution. We assume that, for all $i = 1,2,\ldots,88$, e_i follows a normal distribution with mean 0 and variance

$$\psi_i = \frac{s_i^2}{\left(p_i\,(1-p_i)\right)^2}$$

and v_i follows a normal distribution with mean 0 and variance σ_v^2 that follows a uniform distribution from zero to 100.

If the direct estimate for any county is zero, so $p_i = 0$ for at least one $i = 1,2,\ldots,88$, we used the arcsin transformation, $y_i = arcsin\sqrt{\widehat{p_{iD}}}$, in both the sampling model and the linking model. When an arcsin transformation is used, the sampling variance of the $\widehat{p_{iD}}$ becomes

$$\psi_i = \frac{\text{deff}_i}{4n_i}$$

where deff_i is the design effect at the county-level comparing the variance of the direct estimate of the proportion to the variance from a study of the same size using simple random sampling with replacement. For this setting, the design effect is calculated as

$$\text{deff}_i = \frac{s_i^2}{\hat{p}_{iD}\left(1 - \hat{p}_{iD}\right)}$$

We implemented these hierarchical Bayesian models using a Markov chain Monte Carlo (MCMC) method in R.

Model Selection Procedure

To produce SAEs, we first fit linear models for each outcome of interest. To ensure proper posterior distributions, a logit transformation of direct estimates of the proportions was used when no county had a direct estimate of zero. If a direct estimate for at least one county was zero, an arcsin transformation (which takes the arcsin of the square root of the direct estimate) was used instead. The covariates in each model were selected from a set of candidate predictors using stepwise selection by AIC. All covariates were centered prior to analysis.

Candidate County-Level Covariates

To capture measures of provider availability in our candidate predictors, we included provider rates per county in 2022 to 2023 from the HRSA Area Health Resource Files (US Department of Health and Human Services, 2022-2023). Specifically, we considered:

- Physician Rate: M.D.s and D.O.s per 10,000 county residents
- Dentist Rate: dentists per 10,000 county residents

To capture complex differences in determinants of opportunity and health across Ohio's counties, we considered domain indices from Ohio Opportunity Index (OOI) (v3) (Ohio Opportunity Index Consortium, 2021) at the county-level. The four domain indices we included as candidate predictors are:

- Housing OOI: Considers features such as median home value and moving rates
- Education OOI: Considers features such as high school graduation rates and school performance index
- Health OOI: Considers features such as distance to the nearest healthy food location and age adjusted mortality
- Transportation OOI: Considers features such as time spent commuting to work and access to public transportation

Ohio counties vary along multiple dimensions, including but not limited to their populations' demographic, education, and housing characteristics. To capture this variation, we considered as candidate predictors the following 2016-2020 American Community Survey (US Census Bureau, American Community Survey Data Tables, 2016-2020) five-year proportion estimates:

- 18 or Older: the population 18 or older
- 65 or Older Households: households with one or more person who is 65 or older
- American Indian or Alaskan Native: residents who identify as American Indian or Alaskan Native
- Divorced, Separated, or Widowed: residents over the age of 15 who have been divorced, separated, or widowed
- Foster Children: resident children less than 18 who are living in a household as a foster child
- High School Degree or Less: residents 25 years and older with education less than a high school degree
- Hispanic or Latino: residents who identify as Hispanic or Latino
- Male: residents who are male
- Non-Citizens: residents who are not U.S. citizens
- Owner Occupied Housing: housing units in the county that are owner occupied

To capture economic variation across counties, we considered the following candidate predictors from the 2021 U.S. Census Bureau's Small Area Income and Poverty

Estimates (US Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program, 2021)):

- SNAP Benefit Rate
- Poverty Rate
- Median Household Income

From the 2022 County Health Rankings (University of Wisconsin Population Health Institute, 2025), we obtained as candidate predictors county-level estimates of:

- Poor Mental Health Days: the average number of mentally unhealthy days per month among resident adults
- Excessive Drinking: the proportion of resident adults reporting excessive drinking
- Drug Overdose Deaths: the number of drug overdose deaths per 100,000 residents
- Children in Single Parent Households: the proportion of resident children who live in single-parent households
- Obesity: the proportion of resident adults with a body mass index greater than 30

Finally, we also considered the following additional candidate predictors:

- Per Capita Personal Income: 2022 total personal income divided by the county's total midyear population (US Bureau of Economic Analysis, 2022)
- Unemployment Rate: the 2022 county unemployment rate (US Bureau of Labor Statistics, 2022)
- Metropolitan County: an indicator that a county's 2023 Rural-Urban Continuum Code designated it as metropolitan (US Department of Agriculture Economic Research Service, 2023)
- Medicaid Enrolled Proportion: the average proportion of county residents who were Medicaid enrolled in a single month in 2023 (Ohio Department of Medicaid, 2023)

2023 OMAS SAE Models

The following tables contain information on what candidate predictors were selected for each outcome's model.

Table 1: Covariates in each adult economic distress SAE model

Adult Economic Distress Outcome	Model Covariates
Difficulty paying for food for family or household in the past 12 months	Poverty Rate American Indian or Alaskan Native Non-Citizens 65 or Older Households Hispanic or Latino Male Divorced, Separated, or Widowed Poor Mental Health Days Children in Single Parent Household Drug Overdose Deaths Housing OOI Health OOI Transportation OOI Medicaid Enrolled Proportion
Difficulty paying rent or mortgage in past 12 months	American Indian or Alaskan Native Owner Occupied Housing High School Degree or Less 65 or Older Households Hispanic or Latino Divorced, Separated, or Widowed Children in Single Parent Household Drug Overdose Deaths Housing OOI Transportation OOI Physician Rate Dentist Rate Medicaid Enrolled Proportion
EBT or food stamp use in the past 30 days	Per Capita Personal Income SNAP Benefit Rate Poverty Rate American Indian or Alaskan Native High School Degree or Less Hispanic or Latino Divorced, Separated, or Widowed Obesity Housing OOI Transportation OOI Physician Rate

Adult Economic Distress Outcome	Model Covariates
Food ran out before getting money to buy more in the past 12 months	SNAP Benefit Rate Non-Citizens Owner Occupied Housing High School Degree or Less Unemployment Rate Male Divorced, Separated, or Widowed Drug Overdose Deaths Housing OOI Education OOI
Forced to move due to being unable to pay rent or mortgage in the past 12 months	Non-Citizens Median Household Income 65 or Older Households Unemployment Rate Divorced, Separated, or Widowed Poor Mental Health Days Obesity Drug Overdose Deaths Metropolitan County Physician Rate
Household income of 138% of the Federal Poverty Line (FPL) or less	Poverty Rate American Indian or Alaskan Native Non-Citizens Owner Occupied Housing High School Degree or Less 65 or Older Households Divorced, Separated, or Widowed Poor Mental Health Days Drug Overdose Deaths Metropolitan County Physician Rate
Household income of 206% FPL or less	Poverty Rate American Indian or Alaskan Native Non-Citizens Owner Occupied Housing Divorced, Separated, or Widowed Poor Mental Health Days Children in Single Parent Household Housing OOI Health OOI Metropolitan County
Household income of 300% FPL or less	Poverty Rate American Indian or Alaskan Native High School Degree or Less 65 or Older Households

Adult Economic Distress Outcome	Model Covariates
	Unemployment Rate Divorced, Separated, or Widowed Children in Single Parent Household Excessive Drinking Transportation OOI Physician Rate
Not working (not having a job last week)	SNAP Benefit Rate 18 or Older 65 or Older Households Male Divorced, Separated, or Widowed Children in Single Parent Household Education OOI
Problems paying or were unable to pay for medical bills in the past 12 months	SNAP Benefit Rate American Indian or Alaskan Native Owner Occupied Housing 65 or Older Households Unemployment Rate Divorced, Separated, or Widowed Foster Children Transportation OOI Dentist Rate
Worried about food running out before getting money to buy more in the past 12 months	American Indian or Alaskan Native Owner Occupied Housing High School Degree or Less 65 or Older Households Divorced, Separated, or Widowed Children in Single Parent Household Drug Overdose Deaths Housing OOI Transportation OOI Physician Rate

Table 2: Covariates in each adult insurance SAE model

Adult Insurance Outcome	Model Covariates
Dental insurance	Poverty Rate High School Degree or Less Unemployment Rate Children in Single Parent Household Obesity Health OOI Transportation OOI
Employer-sponsored health insurance	SNAP Benefit Rate

Adult Insurance Outcome	Model Covariates
	Poverty Rate American Indian or Alaskan Native High School Degree or Less Divorced, Separated, or Widowed Poor Mental Health Days Excessive Drinking Metropolitan County Physician Rate
Health insurance through Medicaid	Per Capita Personal Income SNAP Benefit Rate 18 or Older American Indian or Alaskan Native Divorced, Separated, or Widowed Obesity Metropolitan County Physician Rate Non-Citizens
Health insurance through Medicare but not Medicaid	Per Capita Personal Income Poverty Rate American Indian or Alaskan Native Non-Citizens Male Foster Children Children in Single Parent Household Drug Overdose Deaths Transportation OOI Metropolitan County Medicaid Enrolled Proportion 65 or Older Households
Health insurance through the Ohio Health Care Exchange	SNAP Benefit Rate 18 or Older American Indian or Alaskan Native Non-Citizens Owner Occupied Housing Male Foster Children Children in Single Parent Household Health OOI Transportation OOI Physician Rate Medicaid Enrolled Proportion
No health insurance	Per Capita Personal Income SNAP Benefit Rate 18 or Older Owner Occupied Housing

Adult Insurance Outcome	Model Covariates
	High School Degree or Less Divorced, Separated, or Widowed Children in Single Parent Household Health OOI Transportation OOI Medicaid Enrolled Proportion
Vision insurance	Non-Citizens High School Degree or Less 65 or Older Households Unemployment Rate Drug Overdose Deaths Education OOI Health OOI Transportation OOI

Table 3: Covariates in each adult chronic conditions SAE model

Adult Chronic Conditions Outcome	Model Covariates
Asthma	Per Capita Personal Income Poverty Rate 18 or Older American Indian or Alaskan Native Median Household Income High School Degree or Less Unemployment Rate Male Foster Children Poor Mental Health Days Children in Single Parent Household Obesity Drug Overdose Deaths Metropolitan County Dentist Rate Medicaid Enrolled Proportion
Cancer	Per Capita Personal Income Drug Overdose Deaths Physician Rate Medicaid Enrolled Proportion
COPD	Per Capita Personal Income SNAP Benefit Rate American Indian or Alaskan Native Median Household Income Owner Occupied Housing Divorced, Separated, or Widowed Housing OOI

Adult Chronic Conditions Outcome	Model Covariates
	Health OOI
Diabetes (not including a borderline diagnosis)	Per Capita Personal Income SNAP Benefit Rate Poverty Rate Non-Citizens High School Degree or Less Hispanic or Latino Male Housing OOI Physician Rate Dentist Rate Medicaid Enrolled Proportion
Heart attack, coronary heart disease, or congestive heart failure	Poverty Rate 18 or Older Median Household Income Owner Occupied Housing 65 or Older Households Housing OOI Metropolitan County Medicaid Enrolled Proportion
Hypertension	18 or Older Median Household Income High School Degree or Less 65 or Older Households Male Housing OOI Education OOI Medicaid Enrolled Proportion
High cholesterol	Per Capita Personal Income SNAP Benefit Rate 18 or Older 65 or Older Households Poor Mental Health Days Drug Overdose Deaths Metropolitan County Physician Rate Dentist Rate
Stroke	18 or Older Median Household Income Owner Occupied Housing Unemployment Rate Male Obesity Excessive Drinking Housing OOI

Adult Chronic Conditions Outcome	Model Covariates
	Health OOI Metropolitan County Dentist Rate

Table 4: Covariates in each adult general health status SAE model

Health Status Outcome	Model Covariates
Fair or poor self-rated dental health	Per Capita Personal Income Poverty Rate 65 or Older Households Hispanic or Latino Male Divorced, Separated, or Widowed Children in Single Parent Household Drug Overdose Deaths Housing OOI Transportation OOI
Fair or poor self-rated mental health	Poverty Rate Median Household Income 65 or Older Households Male Divorced, Separated, or Widowed Children in Single Parent Household Transportation OOI
Fair or poor self-rated health	SNAP Benefit Rate Divorced, Separated, or Widowed Drug Overdose Deaths
Mental Health Impairment	SNAP Benefit Rate Poverty Rate 18 or Older 65 or Older Households Hispanic or Latino Divorced, Separated, or Widowed Poor Mental Health Days Children in Single Parent Household Obesity Housing OOI Transportation OOI Metropolitan County

Table 5: Covariates in each adult disability status SAE model

Disability Status Outcome	Model Covariates
Developmental disability	Poverty Rate

Disability Status Outcome	Model Covariates
	American Indian or Alaskan Native Owner Occupied Housing High School Degree or Less 65 or Older Households Hispanic or Latino Unemployment Rate Male Divorced, Separated, or Widowed Poor Mental Health Days Obesity Housing OOI Education OOI Medicaid Enrolled Proportion
Disability	Per Capita Personal Income Poverty Rate Owner Occupied Housing 65 or Older Households Unemployment Rate Male Divorced, Separated, or Widowed Drug Overdose Deaths Housing OOI Dentist Rate

Table 6: Covariates in each adult health care availability SAE model

Health Care Availability Outcome	Model Covariates
Usual source of medical care	Per Capita Personal Income SNAP Benefit Rate Poverty Rate Median Household Income High School Degree or Less 65 or Older Households Unemployment Rate Divorced, Separated, or Widowed Obesity Drug Overdose Deaths Education OOI Transportation OOI Physician Rate
No routine doctor's visit in the past 12 months	SNAP Benefit Rate Median Household Income High School Degree or Less Hispanic or Latino Education OOI

Health Care Availability Outcome	Model Covariates
	Dentist Rate Medicaid Enrolled Proportion
Prescribed a pain reliever in the past 12 months	Median Household Income 65 or Older Households Hispanic or Latino Unemployment Rate Children in Single Parent Household Excessive Drinking Transportation OOI Dentist Rate
Three or more emergency room visits in the past 12 months	18 or Older Owner Occupied Housing High School Degree or Less Divorced, Separated, or Widowed Foster Children Housing OOI Medicaid Enrolled Proportion
Unable to fill a prescription at least one time in the past 12 months	SNAP Benefit Rate Poverty Rate 65 or Older Households Male Divorced, Separated, or Widowed Obesity Housing OOI
Unmet need for dental care in the past 12 months	18 or Older Owner Occupied Housing 65 or Older Households Hispanic or Latino Divorced, Separated, or Widowed Health OOI Metropolitan County Physician Rate Dentist Rate
Unmet need for vision care in the past 12 months	Per Capita Personal Income Poverty Rate Owner Occupied Housing 65 or Older Households Divorced, Separated, or Widowed Foster Children Dentist Rate
Unmet need for mental health care in the past 12 months	American Indian or Alaskan Native Owner Occupied Housing Divorced, Separated, or Widowed Medicaid Enrolled Proportion Hispanic or Latino

Health Care Availability Outcome	Model Covariates
Unmet need for alcohol or drug treatment in the past 12 months	Per Capita Personal Income SNAP Benefit Rate Poverty Rate 18 or Older Non-Citizens Median Household Income Owner Occupied Housing High School Degree or Less 65 or Older Households Male Foster Children Poor Mental Health Days Children in Single Parent Household Obesity Drug Overdose Deaths Health OOI Metropolitan County Physician Rate

Table 7: Covariates in each adult substance use SAE model

Substance Use Outcome	Model Covariates
Binge drank alcohol in the past 30 days	Per Capita Personal Income SNAP Benefit Rate Median Household Income High School Degree or Less 65 or Older Households Unemployment Rate Foster Children Children in Single Parent Household Excessive Drinking Transportation OOI Metropolitan County Physician Rate Poverty Rate
Smokes cigarettes every day or some days	SNAP Benefit Rate Poverty Rate American Indian or Alaskan Native High School Degree or Less Hispanic or Latino Unemployment Rate Children in Single Parent Household Excessive Drinking Drug Overdose Deaths Education OOI

Substance Use Outcome	Model Covariates
	Health OOI Metropolitan County Physician Rate
E-cigarette or vape use every day or some days	Per Capita Personal Income Poverty Rate 18 or Older Non-Citizens 65 or Older Households Hispanic or Latino Male Divorced, Separated, or Widowed Foster Children Poor Mental Health Days Obesity Excessive Drinking Housing OOI Metropolitan County Physician Rate
Marijuana, cannabis, or THC use in the past 30 days	Poverty Rate 18 or Older American Indian or Alaskan Native 65 or Older Households Divorced, Separated, or Widowed Poor Mental Health Days Health OOI Dentist Rate

Table 8: Covariates in each SAE model for Medicaid Members ages 19 to 64

Medicaid Members (19 to 64) Outcome	Model Covariates
Parent of any child	18 or Older Poor Mental Health Days Excessive Drinking Transportation OOI

Table 9: Covariates in each child Adverse Childhood Experience (ACE) SAE model

Child ACE Outcome	Model Covariates
Parent/guardian divorced or separated	Per Capita Personal Income Poverty Rate Non-Citizens Owner Occupied Housing Hispanic or Latino Unemployment Rate

Child ACE Outcome	Model Covariates
	Male Divorced, Separated, or Widowed Poor Mental Health Days Housing OOI Metropolitan County
Parent/guardian dying	Per Capita Personal Income Non-Citizens Hispanic or Latino Male Divorced, Separated, or Widowed Children in Single Parent Household Housing OOI Education OOI
Parent/guardian serving time in jail	Per Capita Personal Income SNAP Benefit Rate 18 or Older Median Household Income Hispanic or Latino Divorced, Separated, or Widowed Foster Children Poor Mental Health Days Housing OOI Education OOI Dentist Rate
Seeing or hearing parents or adults slap, hit, kick, or punch one another in the home	American Indian or Alaskan Native Owner Occupied Housing High School Degree or Less Male Foster Children Poor Mental Health Days Obesity Housing OOI Physician Rate Dentist Rate Medicaid Enrolled Proportion
Being a victim of violence or witnessing violence in their neighborhood	Poverty Rate Divorced, Separated, or Widowed Obesity Education OOI Transportation OOI Dentist Rate
Living with anyone who was mentally ill, suicidal, or severely depressed	Per Capita Personal Income Owner Occupied Housing Foster Children Excessive Drinking

Child ACE Outcome	Model Covariates
	Housing OOI Medicaid Enrolled Proportion
Living with anyone who had a problem with alcohol or drugs	Non-Citizens Owner Occupied Housing Poor Mental Health Days Excessive Drinking Housing OOI Health OOI Foster Children
Treated or judged unfairly because of their race or ethnic group	Poverty Rate Hispanic or Latino Children in Single Parent Household Metropolitan County

Table 10: Covariates in each child economic and health SAE model

Child Outcome	Model Covariates
138% FPL or less	Per Capita Personal Income Poverty Rate 18 or Older American Indian or Alaskan Native Median Household Income Hispanic or Latino Divorced, Separated, or Widowed Children in Single Parent Household Health OOI Transportation OOI Metropolitan County Dentist Rate
Fair or poor health	18 or Older Non-Citizens Owner Occupied Housing Divorced, Separated, or Widowed Children in Single Parent Household Obesity Drug Overdose Deaths Metropolitan County
No health insurance	Per Capita Personal Income SNAP Benefit Rate Non-Citizens Owner Occupied Housing Male Poor Mental Health Days Housing OOI Health OOI

Child Outcome	Model Covariates
	Metropolitan County Dentist Rate

Results

The final small area estimates for each outcome can be found on the Ohio Medicaid Assessment Survey Dashboard: https://grcapps.osu.edu/app/omas

To view estimates for each outcome in the dashboard, navigate to the SAE tab and select the desired age group, year, and outcome and click on the “Show Estimates” button. A map of the county-level estimates will be shown to the right, as well as a table of estimates below the map. Note that each point estimate is shown along with a 95% credible interval indicating the uncertainty of the estimate, and estimates with large credible intervals should be interpreted with caution.

Performance Checks

To assess how well the modeled SAEs compared with traditional direct estimates, we used a series of diagnostic visualizations. First, we plotted the SAEs against the direct estimates to assess the level of agreement between the two sets of estimates. Next, to assess the variability in uncertainty measures between the SAE and direct estimates, we plotted the ratios of the standard error of each SAE to the standard error of the corresponding direct estimate against the standard error of the direct estimate. Second, we assessed any potential inflation or suppression of SAEs relative to the direct estimates based on precision by plotting the ratio of each SAE to its corresponding direct estimate against the standard error of the direct estimate. Finally, to assess how the SAEs vary as a function of sample size, we considered plots of the ratio of each SAE to its corresponding direct estimate against the sample size.

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