



Methodology for Estimating National- and State-Level Cessation Prescriptions in Medicaid

Technical Appendix

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October 2025

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Tobacco use remains a major driver of preventable illness and Medicaid spending, and this dashboard provides a transparent, policy-relevant framework to track how much evidence-based cessation pharmacotherapy reaches adult Medicaid enrollees with daily tobacco or nicotine use across states. This technical appendix is a methodological supplement to the dashboard, describing data sources, medication identification and classification schemes, data imputation, and estimation methods.

Data Sources and Scope

For this analysis, we used Medicaid State Drug Utilization Data (SDUD) maintained by the Centers for Medicare & Medicaid Services (CMS). The SDUD include quarterly state-level data on outpatient prescription and over-the-counter medications reimbursed by Medicaid, covering all 50 states and Washington, DC. We calculated prescription counts by aggregating initial fills and refills (“fills”) per medication, quarter, and state from 2019 to 2024.¹ Later quarters will be processed using the same methodology. We used the Transformed Medicaid Statistical Information System (T-MSIS) to estimate the share of bupropion fills for cessation by national drug code (NDC) group and the average annual prescriptions per treated person. To estimate the share of adults who use tobacco or nicotine daily among adult Medicaid enrollees at the state level, we incorporated data from the National Survey on Drug Use and Health (NSDUH) and the CMS Performance Indicator Medicaid administrative enrollment data.

Identifying and Classifying Cessation Medications in Medicaid SDUD and Medicaid Claims

We examined the use of medications approved by the US Food and Drug Administration (FDA) for tobacco and nicotine cessation covered by Medicaid. These include both non-nicotine medications—

varenicline and bupropion—and five categories of prescription and over-the-counter nicotine replacement therapy (NRT): gum, patches, lozenges, nasal sprays, and inhalers.

We identified cessation prescriptions by matching NDCs in the State Drug Utilization Data to a list of cessation NDCs constructed from prior literature and the current and archived versions of the FDA’s NDC Directory (HBOM 2022).² For NRT, we used the SDUD and FDA product descriptions to categorize records into the five types of NRT medications by NDC. When product descriptions differed between the SDUD and FDA sources, we relied on information on dosage and route of administration from the FDA to classify the NRT product type. We manually reviewed NDCs with unclear product descriptions and searched SDUD records that did not match our NDC list to identify additional NRT records.³

We used 2022 T-MSIS data from 12 states for two purposes: to develop attribution rates for identifying bupropion prescriptions used for cessation and to estimate the average number of cessation-related prescriptions per treated Medicaid enrollee. These estimates are necessary for interpreting SDUD prescribing data, which do not contain diagnosis codes or person-level detail. Because bupropion is more commonly prescribed for depression than for cessation treatment, prior research has noted the challenge of distinguishing cessation use in claims data, which can bias treatment estimates (DiGiulio et al. 2020; Hajizadeh et al. 2023). To address this, we examined diagnoses associated with the 150 mg 12-hour sustained-release formulation of bupropion—the only FDA-approved formulation for smoking cessation—and diagnoses associated with prescriptions for other bupropion formulations. Among all prescriptions for the 150 mg 12-hour sustained-release formulation, 17.7 percent were associated with a nicotine dependence diagnosis. For other bupropion formulations, 9.4 percent were associated with a nicotine dependence diagnosis. We used these attribution rates to adjust bupropion prescribing counts in SDUD.

We also used the 2022 T-MSIS claims from 12 states to calculate the average number of cessation prescriptions per treated enrollee, based on person-level data linking prescriptions to nicotine dependence diagnoses. This average of 3.0 annually was applied to SDUD prescription counts to estimate the number of individuals treated and compute treatment rates.

Addressing SDUD Suppression

In the SDUD, prescription fill counts are suppressed for confidentiality when fewer than 11 prescriptions are reported for a given NDC, state, quarter, and utilization type combination (where

utilization type is fee-for-service or managed care). At the NDC, state, quarter, and utilization type level, we used a two-step rule for imputation: (1) if all four quarters were suppressed in a year, we set fills to zero for that NDC/state/year/utilization type; and (2) if at least one quarter was reported, we set each suppressed quarter to five fills. We then applied a single year-specific scaling factor to the imputed “fives” within each state so that the sum of state totals closely matched the national imputed total; observed cells and fully suppressed year-level zeros were left unchanged. We capped any adjusted imputed quarter at 10 fills to remain consistent with suppression rules. All computations used fractional counts; published totals are rounded. Suppression was common and increased over time, reinforcing the need for imputation to recover prescribing patterns.

Estimating Adults with Daily Tobacco or Nicotine Use Enrolled in Medicaid at the State Level

We constructed a multistep estimator for each state-year to estimate the number of adults enrolled in Medicaid with daily tobacco/nicotine use at the state level. First, we took the state-specific share of adults (ages ≥ 18) reporting any past-month tobacco product use from the 2021–2022 NSDUH state files.⁴ To incorporate nicotine vaping, we multiplied those tobacco-only shares by a national adjustment equal to the ratio of any tobacco-or-nicotine use to tobacco use in the population (24.2 percent divided by 19.7 percent ≈ 1.23).⁵ Because tobacco/nicotine use is higher among Medicaid enrollees than in the total adult population, we then applied a Medicaid-upweight using a national ratio of Medicaid to total-population “any use” (41.3 percent divided by 29.0 percent ≈ 1.42).⁶ To adjust the baseline state NSDUH rates for time trends, we applied National Health Interview Survey (NHIS)-based annual multipliers that reflect the observed national change in adult tobacco/nicotine use from 2019–23, and, because of short-term volatility in recent NHIS point estimates, held the 2024 national rate equal to that of 2023 for all states (CDC 2024; Cornelius et al. 2023). We then converted “any use” to daily use with a national daily-share factor derived from the NHIS for cigarette use (daily smokers $\div$ all current smokers ≈ 0.59),⁷ consistent with evidence that daily consumption best captures nicotine dependence and the group most likely to receive pharmacotherapy (Han et al. 2023).⁸ Finally, we multiplied the state daily-use share by adult enrollment based on the CMS Performance Indicator Medicaid Enrollment Data⁹ to obtain the state denominator of adult Medicaid enrollees with daily tobacco or nicotine use used in the treatment-rate calculation.

Notes

- ¹ Following previous research, we did not standardize fills by package size or dosage duration, although we may estimate standardization in future research.
- ² “National Drug Code Directory (Archive),” US Food and Drug Administration, February 6, 2019, <https://web.archive.org/web/20190206201657/https://www.fda.gov/Drugs/InformationOnDrugs/ucm142438.htm>; “2024 NC Medicaid Covered Nicotine Replacement Therapies,” North Carolina Department of Health and Human Services, February 28, 2024; “National Drug Code Directory,” US Food and Drug Administration, last updated November 14, 2024, <https://www.fda.gov/drugs/drug-approvals-and-databases/national-drug-code-directory>; “NPI Number Lookup and Validation,” HIPAASpace, accessed April 15, 2025, <https://www.hipaaspace.com>; Oklahoma Health Care Authority, “Letter to Health Care Providers on Covered OTC Smoking Cessation,” November 29, 2021; and BMC2, “Smoking Cessation Codes,” accessed September 18, 2025.
- The FDA officially ended the practice of reusing NDCs effective November 29, 2016. While Medicaid rules implemented a policy rejecting the use of reused codes in 2024, see Alissa Mooney DeBoy, “Medicaid Drug Rebate Program Notice For Participating Drug Manufacturers,” CMS, accessed September 18, 2025. We assume no codes were reused in these data.
- ³ We include the NDCs from the unmatched SDUD records in our constructed NDC list to facilitate use in future research.
- ⁴ “2021-2022 NSDUH: Model-Based Estimated Prevalence for States,” SAMHSA, February 15, 2024, <https://www.samhsa.gov/data/report/2021-2022-nsduh-state-prevalence-estimates>.
- ⁵ “Table 2.1A Tobacco Product Use, Nicotine Vaping, and Alcohol Use in Lifetime, Past Year, and Past Month: Among People Aged 12 or Older; by Age Group, Numbers in Thousands, 2021 and 2022,” and “Table 2.1B,” Substance Abuse and Mental Health Services Administration, accessed September 18, 2025.
- ⁶ “Table 2.30B: Tobacco Product Use or Nicotine Vaping in the Past Year: Among People Aged 12 or Older, by Age Group and Geographic and Socioeconomic Characteristics, Percentages, 2021 and 2022,” Substance Abuse and Mental Health Services Administration, last updated July 17, 2023.
- ⁷ “Table 2.1A,” and “Table 2.1B,” Substance Abuse and Mental Health Services Administration.
- ⁸ These findings are corroborated by the authors’ calculations based on the 2022 Tobacco Use Supplement to the Current Population Survey.
- ⁹ “CMS Performance Indicator Medicaid Enrollment Data,” CMS, updated August 29, 2025, <https://data.medicaid.gov/dataset/6165f45b-ca93-5bb5-9d06-db29c692a360>.

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Acknowledgments

This research was funded by the Global Action to End Smoking, formerly known as Foundation for a Smoke-Free World. We are grateful to them and to all our funders, who make it possible for Urban to advance its mission.

The views expressed are those of the authors and should not be attributed to the Urban Institute, its trustees, or its funders. Funders do not determine research findings or the insights and recommendations of Urban experts. Further information on the Urban Institute’s funding principles is available at [urban.org/fundingprinciples](https://www.urban.org/fundingprinciples).

For more information on this project, see:

Lisa Clemans-Cope, Victoria Lynch, and Maya Payton, “Are Medicaid Enrollees Accessing Tobacco and Nicotine Dependence Treatment in Your State?,” Urban Institute, October 13, 2025, <https://www.urban.org/data-tools/are-medicaid-enrollees-accessing-tobacco-and-nicotine-dependence-treatment-your-state>.

Lisa Clemans-Cope, Maya Payton, and Victoria Lynch, *Estimating Tobacco and Nicotine Use across Sociodemographic Groups in the US in 2022*, Urban Institute, August 20, 2025, <https://www.urban.org/research/publication/estimating-tobacco-and-nicotine-use-across-sociodemographic-groups-us-2022>.



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