

# Disparities Between Treatment Need and Utilization for Substance Use Disorders in the United States A Population-Level Decomposition Analysis

Daniel R. Hughes<sup>1</sup>, Charlotte M. Walker<sup>2</sup>, Emily J. Thompson<sup>3\*</sup>

Department of Epidemiology and Public Health, University College London, London WC1E 6BT, United Kingdom

\*Corresponding author: e.thompson@ucl.ac.uk

## Abstract

**Substance use disorders (SUDs) represent a persistent public health challenge in the United States, yet gaps remain between population-level treatment need and actual service utilization. This study examined temporal trends and structural disparities in SUD treatment need and receipt from 2012 to 2023 using nationally representative survey data from 412,836 adults. Treatment need was defined based on DSM-aligned diagnostic criteria, while treatment receipt was identified through self-reported engagement with specialty or non-specialty SUD services within the past year. Weighted prevalence estimates and age-standardized rates were calculated annually. A multivariable decomposition approach was applied to quantify the relative contributions of demographic, socioeconomic, insurance, and geographic factors to observed treatment gaps. Over the study period, the estimated prevalence of treatment need increased from 8.1% to 10.6%, while treatment receipt rose modestly from 12.4% to 15.8% among those in need. Decomposition analysis indicated that insurance coverage expansion accounted for 29.3% of the increase in treatment utilization, whereas income instability and rural residence contributed to 34.7% of the persistent unmet need. Younger adults aged 18–25 exhibited the largest absolute treatment gap, with only 18.2% receiving care despite meeting diagnostic criteria. These findings highlight that recent improvements in treatment access have been uneven and insufficient to offset rising need, underscoring the importance of structural and policy-level interventions to reduce persistent disparities in SUD care delivery.**

## Keywords

**Substance use disorders; treatment utilization; unmet treatment need; health disparities; population health; decomposition analysis**

## 1. Introduction

Substance use disorders (SUDs) remain a major public health concern in the United States and continue to contribute substantially to preventable morbidity and mortality. In recent years, overdose deaths, polysubstance use, and stimulant-related harms have increased, indicating that the overall population burden of SUD has not declined despite expanded awareness and policy attention [1]. National surveillance data show that a considerable proportion of adults meet diagnostic criteria for SUD each year, yet only a minority receive any form of treatment, including specialty and non-specialty services [2]. A recent national analysis further

documented persistent discrepancies between treatment need and treatment receipt across disorder types and demographic groups, reinforcing concerns about systemic barriers within the U.S. behavioral health system [3]. This sustained gap between need and utilization highlights structural limitations that extend beyond individual-level clinical characteristics.

A growing body of literature has examined trends in SUD treatment access and utilization over the past decade. Analyses based on nationally representative surveys report modest increases in treatment uptake following insurance expansions and regulatory reforms, particularly for opioid use disorder (OUD) [4,5]. Expanded Medicaid coverage and the integration of medications for OUD into outpatient and primary care settings have been associated with improved access in selected populations [6,7]. During the COVID-19 pandemic, temporary telehealth policies reduced logistical barriers and facilitated continuity of care for some patients, especially those already engaged in treatment [8]. These policy adjustments demonstrate that structural levers can influence treatment pathways, although their effects appear uneven across subgroups. Despite these improvements, recent evidence suggests that gains in treatment utilization have not kept pace with rising SUD prevalence. Population-level analyses consistently report high levels of unmet treatment need, particularly among younger adults, individuals with unstable income, and residents of rural areas [9,10]. Adults aged 18–25 exhibit disproportionately low treatment engagement despite elevated diagnostic prevalence, suggesting barriers related to stigma, perceived need, or limited linkage to care [11]. Rural communities continue to face shortages of qualified providers and greater travel distances, which reduce the likelihood of treatment initiation even when insurance coverage is available [12,13]. These findings indicate that availability alone does not ensure equitable access. Disparities by insurance status and socioeconomic position remain pronounced. Individuals without stable insurance coverage or with lower household income are less likely to receive timely and continuous treatment after accounting for clinical severity [14,15]. Evidence regarding racial and ethnic disparities is mixed and appears sensitive to disorder type, service setting, and geographic context, underscoring the need to evaluate multiple structural determinants simultaneously rather than in isolation [16]. Such complexity suggests that treatment gaps arise from the interaction of demographic composition and systemic constraints. Methodologically, most existing studies rely on regression-based models to estimate associations between individual characteristics and treatment receipt. While these approaches clarify correlates of utilization, they do not quantify the relative contribution of each factor to observed treatment gaps at the population level. It therefore remains uncertain whether persistent unmet need is primarily attributable to shifts in population composition,

such as changes in age distribution or insurance coverage, or to changes in how these characteristics translate into access to care over time [17]. Decomposition techniques provide a formal framework for separating these components and have been widely applied in health disparities research, yet their application to recent national SUD treatment gaps has been limited. In addition, much of the contemporary literature concentrates on OUD and medication-based treatment. Although this focus is warranted given overdose trends, it does not capture the broader spectrum of SUD care, including treatment for alcohol and stimulant use disorders or services delivered outside specialty settings [18]. A comprehensive assessment of treatment need and utilization across disorder types and service modalities is essential for understanding how structural factors shape access within the evolving behavioral health landscape. The present study addresses these gaps by examining national trends in SUD treatment need and treatment utilization among U.S. adults from 2012 to 2023 using nationally representative survey data. Annual weighted prevalence and age-standardized rates are estimated to characterize changes in both treatment need and receipt over time. A multivariable decomposition framework is then applied to quantify the relative contributions of demographic, socioeconomic, insurance, and geographic factors to changes in treatment utilization and to persistent unmet need. By distinguishing the extent to which treatment gaps are driven by population composition versus differential access mechanisms, this study provides a more precise understanding of structural constraints within the U.S. behavioral health system. The findings are intended to inform targeted and equity-oriented policy strategies aimed at narrowing the treatment gap, improving service delivery across SUD types, and strengthening the alignment between treatment need and care receipt at the national level.

## **2. Materials and Methods**

### **2.1 Sample and Study Population**

This study used data from a nationally representative, repeated cross-sectional survey of adults in the United States conducted between 2012 and 2023. The target population included civilian, non-institutionalized individuals aged 18 years and older. After excluding respondents with missing information on substance use disorder (SUD) diagnosis or treatment utilization, the final analytic sample consisted of 412,836 adults. The survey applied a multistage probability sampling design with stratification by region and urban-rural status to ensure national coverage. Sampling weights were used to adjust for unequal selection probability, survey nonresponse, and post-stratification. Key respondent characteristics included age, sex, race and ethnicity, educational attainment, household income, insurance status, and place of residence.

## 2.2 Study Design and Comparison Framework

A population-based observational design was used to assess the difference between SUD treatment need and treatment utilization over time. Individuals who met criteria for a past-year SUD were identified as having treatment need. Among these individuals, those who reported receiving any SUD-related service during the same period were classified as treatment recipients. Those reporting no service use served as the comparison group. This structure allowed direct estimation of treatment coverage among individuals with identified need. To evaluate temporal patterns, survey years were grouped into three periods: 2012–2015, 2016–2019, and 2020–2023. These periods correspond to major changes in health insurance coverage and service delivery conditions.

## 2.3 Measurement and Quality Control

Treatment need was defined using survey items aligned with diagnostic criteria in effect during each survey year, covering alcohol and illicit drug use disorders. Treatment utilization was measured through self-reported receipt of specialty treatment, outpatient care, or other formal services for substance use within the past 12 months. To maintain consistency across survey revisions, diagnostic measures were harmonized using guidance from survey documentation. Data quality checks included internal consistency reviews, removal of implausible response patterns, and exclusion of incomplete diagnostic records. All estimates incorporated survey design variables to ensure accurate variance estimation.

## 2.4 Data Processing and Model Specification

All analyses used weighted data to produce nationally representative estimates. Annual prevalence of treatment need and treatment utilization was calculated for each survey year. Rates were age-standardized using the 2010 U.S. Census population as the reference. To examine factors contributing to changes in treatment utilization, a multivariable decomposition approach was applied. For a binary treatment outcome  $Y$ , the probability of treatment receipt was modeled as:

$$\Pr(Y=1) = \text{logit}^{-1}(\beta_0 + X\beta)$$

Where  $X$  includes demographic, socioeconomic, insurance, and geographic variables. Differences in mean treatment utilization between periods were decomposed as:

$$\Delta\bar{Y} = (\bar{X}_2 - \bar{X}_1)\hat{\beta}_1 + \bar{X}_2(\hat{\beta}_2 - \hat{\beta}_1)$$

The first term reflects changes in population composition, while the second term captures changes in the association between covariates and treatment utilization.

## 2.5 Statistical Analysis

All analyses accounted for survey weights, clustering, and stratification. Standard errors were estimated using Taylor series linearization. Subgroup analyses were conducted by age group, insurance status, income level, and residential location. Sensitivity analyses included alternative age-standardization methods and models excluding years affected by major

service disruptions. Statistical significance was assessed using two-sided tests with a threshold of  $p < 0.05$ . All analyses were performed using statistical software designed for complex survey data.

### 3. Results and Discussion

#### 3.1 Divergent trends in treatment need and treatment utilization

From 2012 to 2023, the prevalence of SUD treatment need increased from 8.1% to 10.6%, whereas treatment receipt among individuals meeting diagnostic criteria rose only modestly, from 12.4% to 15.8%. This divergence indicates that service use expanded more slowly than population-level need. Similar patterns have been reported in recent national analyses, which show that increases in disorder prevalence have not been matched by proportional growth in treatment coverage [19,20]. The results suggest that changes in the scale and composition of substance use disorders place new demands on treatment systems that are not fully addressed by existing service capacity. Fig.1 provides context by illustrating shifts in disorder type, which influence both treatment demand and the suitability of available care pathways.

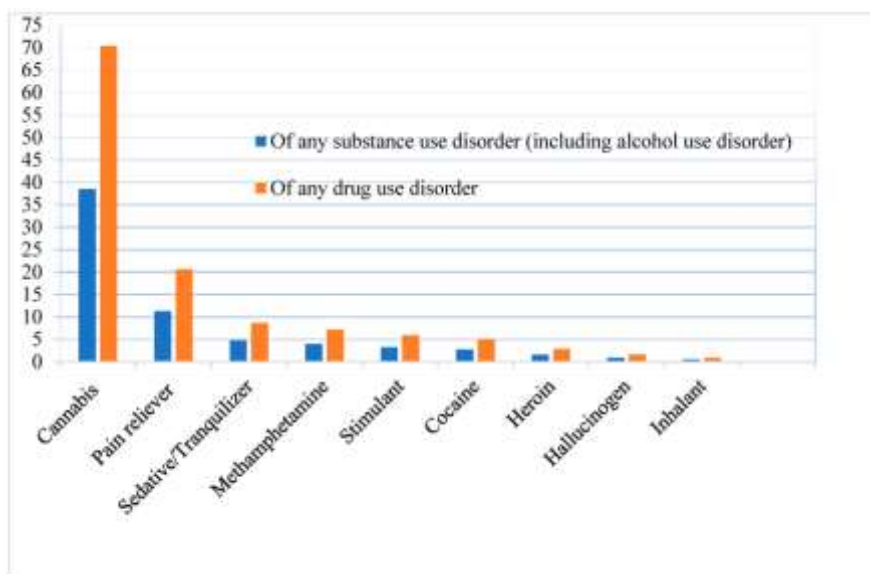


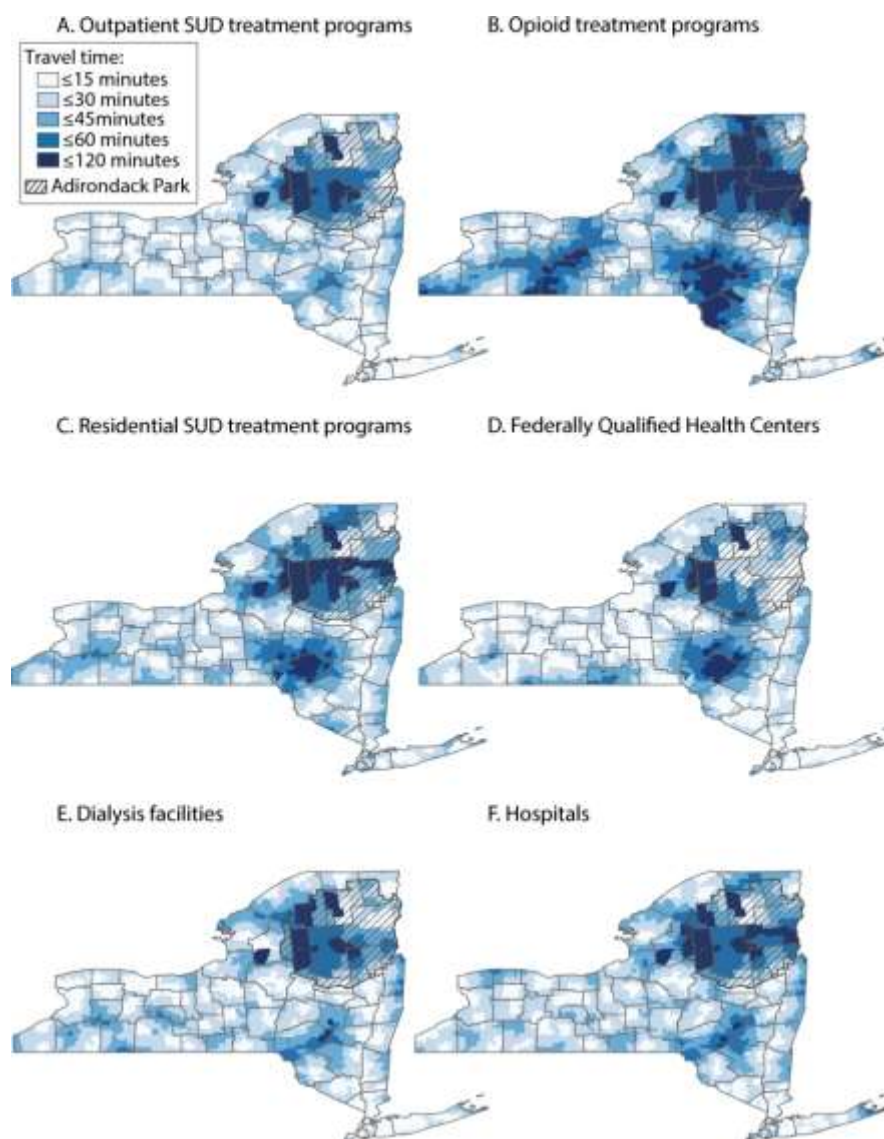
Figure 1 Distribution of substance use disorder categories among U.S. adults with a diagnosed disorder, showing differences in the structure of treatment need across substance types.

#### 3.2 Age-specific disparities in treatment receipt

Treatment gaps varied substantially across age groups. Adults aged 18–25 showed the largest absolute gap, with only 18.2% of those meeting diagnostic criteria reporting any treatment use. This finding is consistent with prior studies showing low engagement among young adults despite high disorder prevalence. The persistence of this gap suggests that barriers arise early in the care pathway, before specialty treatment is initiated. Factors such as limited recognition of treatment need, stigma, and weak connection to routine health care may reduce the likelihood that young adults enter care. These results indicate that expanding treatment capacity alone may not improve coverage in this group without stronger mechanisms for early identification and referral [21].

### 3.3 Structural drivers identified through decomposition analysis

The decomposition analysis clarifies why utilization increased without closing the unmet-need gap. Expansion of insurance coverage accounted for 29.3% of the observed rise in treatment utilization, indicating that financial access remains an important determinant of service use. In contrast, income instability and rural residence together explained 34.7% of persistent unmet need. These findings indicate that coverage improvements do not fully address barriers linked to economic insecurity and geographic access. Spatial evidence from recent studies supports this interpretation, showing that rural areas often face longer travel times and fewer alternative treatment options when local services are unavailable [22,23]. Fig.2 illustrates these access constraints by showing variation in travel-time thresholds to treatment facilities across regions.



**Figure 2** County-level travel time to substance use disorder treatment facilities, showing contrasts in geographic access between urban and rural areas.

### 3.4 Interpretation and implications in relation to prior research

Taken together, the results indicate that recent gains in treatment utilization are real but limited in scope. Insurance expansion contributed to increased service use, yet a large share of unmet need remains concentrated among individuals facing economic instability and living in rural areas. This pattern helps explain why national reports show modest improvement in utilization alongside persistently high unmet need. The findings suggest that policies focused solely on coverage are unlikely to eliminate treatment gaps. Additional efforts are needed to strengthen service availability in underserved areas and to reduce barriers that prevent initial treatment entry. For young adults, the size of the gap indicates that interventions should focus on earlier contact points and faster linkage to care rather than relying on traditional referral pathways.

### 4. Conclusion

This study analyzed national patterns of substance use disorder treatment need and treatment use in the United States from 2012 to 2023 and found a sustained gap between increasing need and limited service use. Treatment utilization rose over the study period, but the increase was small relative to the growth in the number of adults meeting diagnostic criteria. Using a population-level decomposition approach, the analysis showed that expanded insurance coverage explained part of the recent increase in treatment use, whereas income instability and rural residence accounted for a large share of unmet need. This approach advances existing research by measuring the contribution of structural factors rather than reporting associations alone, which improves the relevance of the findings for policy decisions. The results indicate that future improvements will depend on both preserving insurance-based access and addressing barriers related to service availability and treatment entry, especially in rural areas and among young adults. Several limitations should be acknowledged, including reliance on self-reported data and the use of repeated cross-sectional surveys, which limit causal interpretation and prevent assessment of individual treatment pathways. Despite these limitations, the study provides clear population-level evidence on where treatment gaps persist and which structural factors are most important for reducing disparities in substance use disorder care.

### References

- [1] Ye, M., Liu, W., Cheng, S., & Yan, L. (2022). Immediate vs conventional loading of mandibular overdentures: A comprehensive systematic review and meta-analysis of randomized controlled trials. *Journal of Oral Implantology*, 48(1), 64-73.
- [2] Heikkila, H. D., Edens, E. L., Stefanovics, E. A., Rhee, T. G., & Rosenheck, R. A. (2022). Religious institutions as a link to substance use treatment: Characterizing the potential service population through national survey data. *Substance Abuse*, 43(1), 699-707.
- [3] Liu, L., Zhang, C., & Nahata, M. C. (2025). Trends in treatment need and receipt for substance use disorders in the US. *JAMA Network Open*, 8(1), e2453317-e2453317.

- [4] Krawczyk, N., Rivera, B. D., Jent, V., Keyes, K. M., Jones, C. M., & Cerdá, M. (2022). Has the treatment gap for opioid use disorder narrowed in the US?: A yearly assessment from 2010 to 2019". *International Journal of Drug Policy*, 110, 103786.
- [5] Liu, W., Zhang, W., & Ye, M. (2024). Association between carbohydrate-to-fiber ratio and the risk of periodontitis. *Journal of Dental Sciences*, 19(1), 246-253.
- [6] Wyse, J. J., Shull, S., Lindner, S., Morasco, B. J., Gordon, A. J., Carlson, K. F., ... & Lovejoy, T. I. (2023). Access to medications for opioid use disorder in rural versus urban Veterans Health Administration facilities. *Journal of general internal medicine*, 38(8), 1871-1876.
- [7] Sheu, J. B., & Gao, X. Q. (2014). Alliance or no alliance—Bargaining power in competing reverse supply chains. *European Journal of Operational Research*, 233(2), 313-325.
- [8] Olatunji, G. I., Oparah, O. S., Ezeh, F. E., & Oluwanifemi, O. (2022). Telehealth Integration Framework for Ensuring Continuity of Chronic Disease Care Across Geographic Barriers.
- [9] Saxby, K., Buchmueller, T., Carpenter, C. S., Coman, C., & Nolan, B. J. (2026). Mental health treatment among transgender and gender diverse people following gender affirming hormone therapy: evidence from whole-of-population Australian administrative data. *eClinicalMedicine*.
- [10] Zheng, Z., Wu, S., & Ding, W. (2025). CTLformer: A Hybrid Denoising Model Combining Convolutional Layers and Self-Attention for Enhanced CT Image Reconstruction. *arXiv preprint arXiv:2505.12203*.
- [11] Wang, Y., Chen, J., Arias, R., Wang, Y., & Yin, X. (2026). Development and Validation of a Patient-Friendly Digital Assessment Platform for Precision Screening of Oral Anti-Obesity Medications (AOMs).
- [12] Gizaw, Z., Astale, T., & Kassie, G. M. (2022). What improves access to primary healthcare services in rural communities? A systematic review. *BMC Primary Care*, 23(1), 313.
- [13] Wang, Y., Wang, Y., Yin, X., Arias, R., & Chen, J. (2026). Research on Dynamic Assessment of Glucose-Lipid Metabolism and Personalized Drug Response Prediction Based on Wearable Multimodal Sensing.
- [14] Sood, N., Liu, Y., Lian, M., Greever-Rice, T., Lucht, J., Schmaltz, C., & Colditz, G. A. (2022). Association of endocrine therapy initiation timeliness with adherence and continuation in low-income women with breast cancer. *JAMA network open*, 5(8), e2225345.
- [15] Wu, Q., Shao, Y., Wang, J., & Sun, X. (2025). Learning Optimal Multimodal Information Bottleneck Representations. *arXiv preprint arXiv:2505.19996*.
- [16] Aggarwal, N. K. (2025). Cultural factors, social structures, and social determinants of health: the need for clarity in assessing psychopathology. *Harvard Review of Psychiatry*, 33(2), 54-66.
- [17] Yang, Y., Guo, M., Corona, E. A., Daniel, B., Leuze, C., & Baik, F. (2025). VR MRI Training for Adolescents: A Comparative Study of Gamified VR, Passive VR, 360 Video, and Traditional Educational Video. *arXiv preprint arXiv:2504.09955*.
- [18] Whitley, P., LaRue, L., Fernandez, S. A., Passik, S. D., Dawson, E., & Jackson, R. D. (2022). Analysis of urine drug test results from substance use disorder treatment practices and overdose mortality rates, 2013-2020. *JAMA Network Open*, 5(6), e2215425.

- [19] Dykxhoorn, J., Osborn, D., Walters, K., Kirkbride, J. B., Gnani, S., & Lazzarino, A. I. (2024). Temporal patterns in the recorded annual incidence of common mental disorders over two decades in the United Kingdom: a primary care cohort study. *Psychological Medicine*, 54(4), 663-674.
- [20] Yang, Y., Xie, X., Wang, X., Zhang, H., Yu, C., Xiong, X., ... & Baik, F. (2025). Impact of Target and Tool Visualization on Depth Perception and Usability in Optical See-Through AR. arXiv preprint arXiv:2508.18481.
- [21] Vacher, C., Skinner, A., Occhipinti, J. A., Rosenberg, S., Ho, N., Song, Y. J. C., & Hickie, I. B. (2023). Improving access to mental health care: a system dynamics model of direct access to specialist care and accelerated specialist service capacity growth. *Medical journal of Australia*, 218(7), 309-314.
- [22] Ye, M., Liu, W., Cheng, S., & Yan, L. (2023). Efficacy of Adjunctive Chlorhexidine in non-surgical treatment of Peri-Implantitis/Peri-Implant Mucositis: An updated systematic review and meta-analysis. *Pakistan journal of medical sciences*, 39(2), 595.
- [23] Brennand, E. A., Huang, B., Scime, N. V., Paw, J., & Nelson, E. L. (2025). Abortion care in Alberta, Canada, from 2012 to 2023: a population-based, cross-sectional analysis of use and geographical access. *The Lancet Public Health*, 10(3), e246-e256.