

Alcohol Use Disorder and Marijuana Use Disorder Among Adolescents and Young Adults Aged 12 to 24 in the Rural and Urban U.S., 2021

KEY FINDINGS

Alcohol Use Disorder

- In 2021, the prevalence of past-year alcohol use disorder (AUD) among adolescents and young adults aged 12 to 24 years old was 9.2% in urban and 8.5% in rural counties. AUD is a clinical diagnosis characterized by impaired control over alcohol use.
- Differences in the rates of past-year AUD between rural and urban counties and across U.S. Census Divisions were not statistically significant.
- The prevalence of past-year AUD was lowest in the rural West South Central Census Division (6.0%), while adolescents and young adults in urban counties of the West North Central (13.5%) and rural counties of the New England (13.1%) Census Divisions had the highest rates.

Marijuana Use Disorder

- In 2021, the prevalence of past-year marijuana use disorder (MUD) among adolescents and young adults age 12 to 24 years was 10.0% in both urban and rural counties. Marijuana use disorder is a diagnosable condition characterized by impaired control over cannabis use.
- The prevalence of past-year MUD varied significantly across U.S. Census Divisions overall and within both urban and rural counties by Census Divisions.
- Nationally, adolescents and young adults in completely rural counties had the lowest rate (4.2%) of past-year MUD, significantly lower than all other geographies.
- Rural adolescents and young adults in the Mountain Census Division had significantly lower rates of past-year MUD (10.7%) compared to adolescents and young adults in urban (14.9%) counties ($p < .05$).
- The prevalence of past-year MUD in rural Pacific Census Division counties was more than double the national rate (25.3%), and significantly higher than in urban (9.6%) counties of this Census Division ($p < .001$).

BACKGROUND

This study describes the prevalence of alcohol use disorder (AUD) and marijuana use disorder (MUD) in the past year among adolescents and young adults aged 12 to 24 years in rural and urban counties and across U.S. Census Divisions in 2021. AUD and MUD are clinical diagnoses characterized by impaired control of alcohol and cannabis use respectively. The complete definition is included in the Technical Appendix. Specifically, we provide information about the geographic differences in the extent of substance use disorders among adolescents and young adults for these commonly used substances.

METHODS

We used data from the 2021 National Survey on Drug Use and Health (NSDUH), administered annually by the Substance Abuse and Mental Health Services Administration (SAMHSA). The NSDUH measures used, their definitions, and detailed methodology are available in the Appendix. We grouped respondents into geographic categories based on the 2013 U.S. Department of Agriculture Economic Research Service Rural-Urban Continuum Code (RUCC) county typology. We classified counties with RUCC 1-3: large metro (RUCC 1-2) and small metro (RUCC 3) as urban. Rural counties were those with RUCC codes 4 and higher (urbanized rural, RUCC 4-5; less urbanized rural, RUCC 6-7; and completely rural, RUCC 8-9). We calculated weighted frequencies for urban (metro), and rural (nonmetro) counties overall and the five geographic categories defined by RUCCs, and for Census Divisions. We conducted chi-squared tests comparing distributions across these groups.

RESULTS

Alcohol Use Disorder

In 2021, the national prevalence of past-year AUD among adolescents and young adults aged 12 to 24 years was 9.1% overall (9.2% urban, 8.5% rural). Prevalence estimates varied across Census Divisions and rurality, although no differences were statistically significant (Table 1). Adolescents and young adults in counties within the West North Central Census Division had the highest overall prevalence at 12.4%, while the South Atlantic Census Division showed the lowest prevalence (8.2% overall). The West North Central Census Division demonstrated the largest urban-rural difference, with urban areas (13.5%) experiencing higher AUD rates than rural communities (9.8%); however, this difference was not statistically significant.

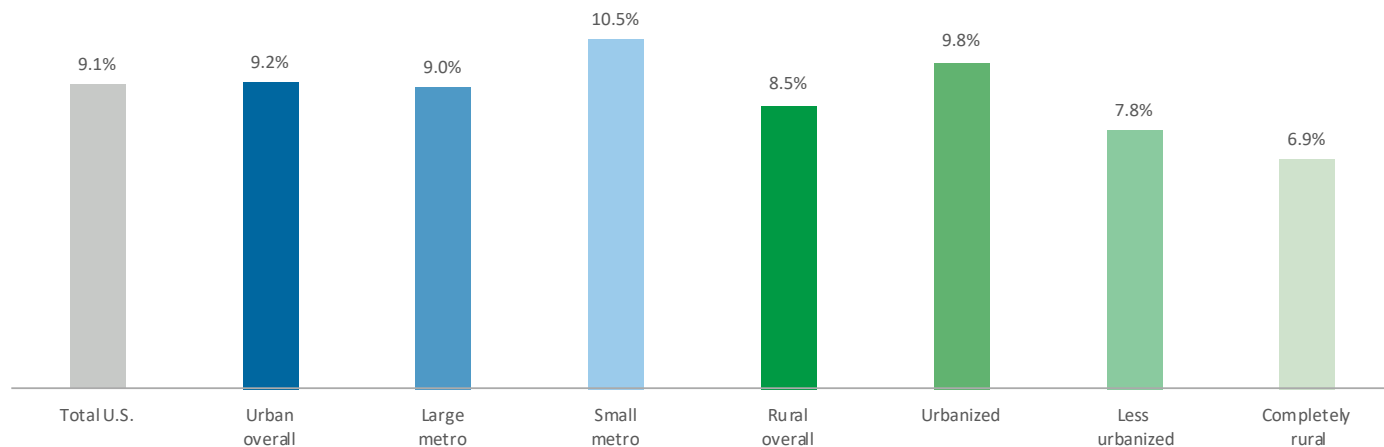
Table 1. Percentage of Adolescents and Young Adults Aged 12 to 24 With Alcohol Use Disorder (AUD) in the Past Year in Urban and Rural Counties, by Census Division, United States, 2021

	Overall (%)	Urban (%)	Rural (%)
National	9.1	9.2	8.5
New England	10.2	9.8	13.1
Middle Atlantic	8.4	8.3	9.5
East North Central	8.5	8.5	8.7
West North Central	12.4	13.5	9.8
East South Central	8.4	8.9	7.5
South Atlantic	8.2	8.3	7.5
West South Central	8.9	9.3	6.0
Mountain	10.0	10.0	10.3
Pacific	9.6	9.6	9.5

Data source: National Survey on Drug Use and Health (NSDUH), 2021. Rural-Urban Continuum Codes (RUCCs, 2013) used to determine geographic categories are described in Appendix Table A2, and Census Divisions and corresponding states are described in Appendix Table A3.

Across geographic categories, the prevalence of past-year AUD ranged from 6.9% (completely rural counties) to 10.5% (small metro counties) (Figure 1). No significant differences were observed in past-year AUD among 12-to-24-year-olds across categories of rurality.

Figure 1. Percentage of Adolescents and Young Adults Aged 12 to 24 With Past-Year Alcohol Use Disorder (AUD) in Urban and Rural Counties, United States, 2021



Data source: National Survey on Drug Use and Health (NSDUH), 2021. Rural-Urban Continuum Codes (RUCCs, 2013) used to determine geographic categories are described in Appendix Table A2.

Marijuana Use Disorder

The prevalence of past-year MUD among adolescents and young adults aged 12 to 24 years was 10.0% nationally as well as for rural and urban counties. Significant variation was observed in past-year MUD prevalence across Census Divisions nationally ($p < .01$), ranging from 8.2% in the West South Central Census Division to 14.1% in counties within the Mountain Census Division. Within both urban and rural counties, the prevalence of MUD varied significantly (Table 2). Rural counties in the Pacific Census Division had a prevalence of MUD of 25.3%, significantly higher than rural counties in all other Census Divisions except New England ($p < 0.05$ for all pairwise comparisons among rural counties).

Table 2. Percentage of Adolescents and Young Adults Aged 12 to 24 With Marijuana Use Disorder (MUD) in the Past Year in Urban and Rural Counties, by Census Division, United States, 2021

	Overall ^a (%)	Urban ^a (%)	Rural ^a (%)
National	10.0	10.0	10.0
New England	11.5	11.3	13.7
Middle Atlantic	9.6	9.7	7.4
East North Central	11.0	11.5	8.5
West North Central	10.6	12.0	7.3
East South Central	9.8	10.0	9.5
South Atlantic	8.5	8.2	10.1
West South Central	8.2	7.9	10.3
Mountain ^b	14.1	14.9	10.7
Pacific ^b	10.2	9.6	25.3

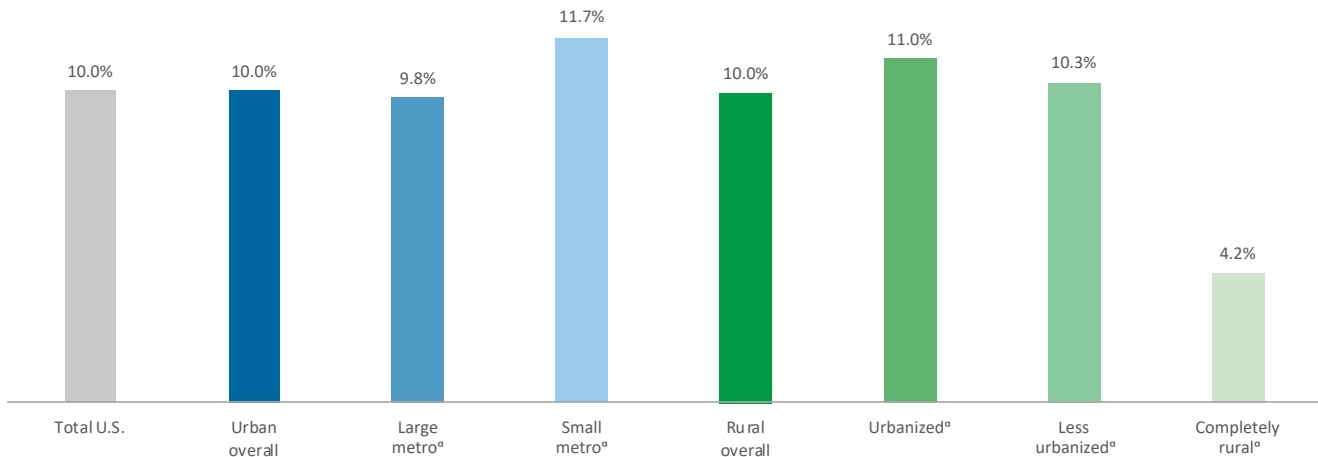
Data source: National Survey on Drug Use and Health (NSDUH), 2021. Rural-Urban Continuum Codes (RUCCs, 2013) used to determine geographic categories are described in Appendix Table A2, and Census Divisions and corresponding states are described in Appendix Table A3.

a. Significant difference across Census Divisions (chi-squared test $p < .05$).

b. Significant difference between urban and rural counties within the indicated Census Divisions (chi-squared test $p < .05$).

Across geographic categories, the prevalence of past-year MUD among 12-to-24-year-olds ranged from 4.2% (completely rural counties) to 11.7% (small metro counties) (Figure 2). Chi-squared tests indicate a significant difference in MUD across geographic categories ($p < .05$). The prevalence of MUD in completely rural counties was significantly lower than all other geographic categories ($p < .001$).

Figure 2. Percentage of Adolescents and Young Adults Aged 12 to 24 With Marijuana Use Disorder (MUD) in the Past Year in Urban and Rural Counties, United States, 2021



Data source: National Survey on Drug Use and Health (NSDUH), 2021. Rural-Urban Continuum Codes (RUCCs, 2013) used to determine geographic categories are described in Appendix Table A2.

a. Significant difference across the five rural-urban categories (chi-squared test $p < .05$).

LIMITATIONS

The NSDUH data policy, which suppresses information when individual unweighted cell counts fall below 11, disproportionately affects rural places and creates limitations for understanding drug and alcohol use patterns in rural places. Data was suppressed in some rural places at the Census Division level, hampering efforts to provide detailed data to inform policymakers seeking to target specific states or regions of the country. To overcome these analytical constraints, larger survey sample sizes and oversampling of rural populations are required.

DISCUSSION

This study informs our understanding of how the prevalence of past-year AUD and MUD in adolescents and young adults varies across the U.S. The highest rates of past-year AUD were identified in the urban West North Central (13.5%) and rural New England (13.1%) Census Divisions, whereas the highest burden of MUD stands out in the rural Pacific Census Division (25.3%) at more than double the national and urban rates. It is important to note that this study examined NSDUH data from 2021, by which time most states in the Pacific Census Division had legalized recreational marijuana for those age 21 and older. In contrast, proportionally fewer states in other Census Divisions had legalized and begun recreational marijuana sales by 2021. Some research suggests that recreational marijuana legalization may be associated with increased marijuana use and significantly elevated risk for MUD, especially for young people;^{1,2} however, other research finds no such association.³⁻⁶ Future longitudinal research may shed light on the temporal relationship between policy changes and substance use disorders across geographic regions, with particular attention to rural-urban differences.

CONCLUSION AND POLICY CONSIDERATIONS

The prevalence of AUD and MUD among adolescents and young adults aged 12 to 24 is similar nationally, yet varies widely across geographic regions of the U.S., with more substantial variation for MUD than AUD. Understanding the differences in prevalence across geographies is critical to creating and implementing targeted interventions and policies to provide support and services where they are most needed.

REFERENCES

1. Cerdá M, Mauro C, Hamilton A, et al. Association between recreational marijuana legalization in the United States and changes in marijuana use and cannabis use disorder from 2008 to 2016. *JAMA Psychiatry*. 2020;77(2):165-171. doi:10.1001/jamapsychiatry.2019.3254
2. Cerdá M, Wall M, Feng T, et al. Association of state recreational marijuana laws with adolescent marijuana use. *JAMA Pediatr*. 2017;171(2):142-149. doi:10.1001/jamapediatrics.2016.3624
3. Pawar AKS, Firmin ES, Wilens TE, Hammond CJ. Systematic review and meta-analysis: medical and recreational cannabis legalization and cannabis use among youth in the United States. *J Am Acad Child Adolesc Psychiatry*. 2024;63(11):1084-1113. doi:10.1016/j.jaac.2024.02.016
4. Coley RL, Kruzik C, Ghiani M, Carey N, Hawkins SS, Baum CF. Recreational marijuana legalization and adolescent use of marijuana, tobacco, and alcohol. *J Adolesc Health*. 2021;69(1):41-49. doi:10.1016/j.jadohealth.2020.10.019
5. Anderson DM, Rees DI, Sabia JJ, Safford S. Association of marijuana legalization with marijuana use among US high school students, 1993-2019. *JAMA Netw Open*. 2021 Sep 1 2021;4(9):e2124638. doi:10.1001/jamanetworkopen.2021.24638
6. Anderson DM, Fe HT, Liang Y, Sabia JJ. Recreational marijuana laws and teen marijuana use, 1993-2021. *JAMA Psychiatry*. 2024;81(8):840–842. doi:10.1001/jamapsychiatry.2024.0698
7. Substance Abuse and Mental Health Services Administration. *2021 National Survey on Drug Use and Health (NSDUH): Methodological Summary and Definitions*. 2021. <https://www.samhsa.gov/data/sites/default/files/reports/rpt39442/2021NSDUHMethodSummDefs100422.pdf>
8. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. 2013. doi:10.1176/appi.books.9780890425596.
9. Economic Research Service, U.S. Dept of Agriculture. Rural-Urban Continuum Codes. 2013. Accessed November 5, 2023. <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx>

AUTHORS

Gina A. Keppel, MPH, WWAMI Rural Health Research Center, University of Washington
Lisa A. Garberson, PhD, WWAMI Rural Health Research Center, University of Washington
C. Holly A. Andrilla, MS, WWAMI Rural Health Research Center, University of Washington
Janessa M. Graves, PhD, MPH, WWAMI Rural Health Research Center, University of Washington

FUNDING

This study was supported by the Federal Office of Rural Health Policy (FORHP), Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services (HHS) under cooperative agreement #U1CRH03712. The information, conclusions and opinions expressed in this paper are those of the authors and no endorsement by FORHP, HRSA, or HHS is intended or should be inferred.

ACKNOWLEDGMENTS

The authors gratefully acknowledge Beverly Marshall for assistance with manuscript production.

SUGGESTED CITATION

Keppel GA, Garberson LA, Andrilla CHA, Graves JM. *Prevalence of Alcohol Use Disorder and Marijuana Use Disorder Among Adolescents and Young Adults Aged 12 to 24 in the Rural and Urban U.S., 2021*. Data Brief. WWAMI Rural Health Research Center, University of Washington; April 2026.

University of Washington • School of Medicine
Box 354982 • Seattle WA 98195-4982
phone: (206) 685-0402 • fax: (206) 616-4768
<https://familymedicine.uw.edu/rhrc/>

TECHNICAL APPENDIX

Detailed Methodology

We used 2021 data from the National Survey on Drug Use and Health (NSDUH), which is administered annually by the Substance Abuse and Mental Health Services Administration (SAMHSA). The 2021 NSDUH surveyed 13,270 adolescents aged 12 to 17 years and 56,580 adults aged 18 and over, to generate national prevalence estimates of noninstitutionalized U.S. civilians.⁷

Details about the NSDUH survey questions, measures used, and their definitions are outlined in Table A1.

Table A1. 2021 National Survey on Drug Use and Health (NSDUH)⁷ Measures

Measure	Description
Alcohol Use Disorder (AUD)	Alcohol use disorder (AUD) was defined as meeting criteria in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5). ⁸ Respondents who used alcohol on 6 or more days in the past 12 months were classified as having an AUD if they met two or more of the following criteria: (1) used alcohol in larger amounts or for a longer time period than intended; (2) had a persistent desire or made unsuccessful attempts to cut down on alcohol use; (3) spent a great deal of time in activities to obtain, use, or recover from alcohol use; (4) felt a craving or strong desire to use alcohol; (5) engaged in recurrent alcohol use resulting in failure to fulfill major role obligations at work, school, or home; (6) continued to use alcohol despite social or interpersonal problems caused by the effects of alcohol; (7) gave up or reduced important social, occupational, or recreational activities because of alcohol use; (8) continued to use alcohol in physically hazardous situations; (9) continued to use alcohol despite physical or psychological problems caused by alcohol use; (10) increased the amount of alcohol needed to achieve same effect or noticed that the same amount of alcohol use had less effect than before; and (11) either of the following: (11a) experienced a required number of withdrawal symptoms after cutting back or stopping alcohol use or (11b) used alcohol or a related substance to get over or avoid alcohol withdrawal symptoms.
Marijuana Use Disorder (MUD)	Marijuana use disorder was defined as meeting criteria in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5). ⁸ Respondents who used marijuana on 6 or more days in the past 12 months were classified as having a marijuana use disorder in that period if they met two or more of the following criteria: (1) used marijuana in larger amounts or for a longer time period than intended; (2) had a persistent desire or made unsuccessful attempts to cut down on marijuana use; (3) spent a great deal of time in activities to obtain, use, or recover from marijuana use; (4) felt a craving or strong desire to use marijuana; (5) engaged in recurrent marijuana use resulting in failure to fulfill major role obligations at work, school, or home; (6) continued to use marijuana despite social or interpersonal problems caused by the effects of marijuana; (7) gave up or reduced important social, occupational, or recreational activities because of marijuana use; (8) continued to use marijuana in physically hazardous situations; (9) continued to use marijuana despite physical or psychological problems caused by marijuana use; (10) increased the amount of marijuana needed to achieve same effect or noticed that the same amount of marijuana use had less effect than before; and (11) either of the following: (11a) experienced a required number of withdrawal symptoms after cutting back or stopping marijuana use or (11b) used marijuana or a related substance to get over or avoid marijuana withdrawal symptoms.

We categorized respondents into one of five (two urban and three rural) geographic categories based on the 2013 Rural-Urban Continuum Code (RUCC) county typology.⁹ The RUCCs distinguish metropolitan counties by the population size of their metro area and nonmetropolitan counties by the degree of urbanization and adjacency to a metro area (Table A2). We classified urban counties as those with RUCC 1-3: large metro (RUCC 1-2) and small metro (RUCC 3). Rural counties were those with RUCC codes 4 and higher (urbanized rural, RUCC 4-5; less urbanized rural, RUCC 6-7; and completely rural, RUCC 8-9). The study population included the U.S. civilian, noninstitutionalized population aged 12 to 24 years old in 2021.

Table A2. Rural-Urban Classification and Sub-Grouping Based on 2013 Rural-Urban Continuum Code (RUCC) County Typology

Rural vs. Urban	Geographic Category	RUCC	Description
Urban	Large metro	1	Counties in metro areas of 1 million population or more
		2	Counties in metro areas of 250,000 to less than 1 million population
	Small metro	3	Counties in metro areas of fewer than 250,000 population
Rural	Urbanized rural	4	Population of 20,000 or more, adjacent to a metro area
		5	Population of 20,000 or more, not adjacent to a metro area
	Less urbanized rural	6	Population of 2,500 to 19,999, adjacent to a metro area
		7	Population of 2,500 to 19,999, not adjacent to a metro area
	Completely rural	8	Less than 2,500 population, adjacent to a metro area
		9	Less than 2,500 urban population, not adjacent to a metro area

We calculated weighted frequencies for urban (metro), and rural (nonmetro) counties overall, as well as for the five geographic categories described above, and for Census Divisions (Table A3). All analyses followed SAMHSA’s policy for data suppression, wherein underlying (unweighted) sample size for any table cell must be greater than 10; table cells that did not meet this requirement were suppressed and are indicated as such in this report.

Table A3. U.S. Census Divisions and Corresponding States

Census Division	State
New England	CT, ME, MA, NH, RI, VT
Middle Atlantic	NJ, NY, PA
East North Central	IL, IN, MI, OH, WI
West North Central	IA, KS, MN, MO, NE, ND, SD
East South Central	AL, KY, MS, TN
South Atlantic	DE, DC, FL, GA, MD, NC, SC, VA, WV
West South Central	AR, LA, OK, TX
Mountain	AZ, CO, ID, MT, NV, NM, UT, WY
Pacific	AK, CA, HI, OR, WA