Published in final edited form as:

Health Place. 2016 May ; 39: 153–159. doi:10.1016/j.healthplace.2016.04.001.

Rural Tobacco Use across the United States: How Rural and Urban Areas Differ, Broken Down by Census Regions and Divisions

Megan E. Roberts¹, Nathan J. Doogan¹, Allison N. Kurti², Ryan Redner^{2,3}, Diann E. Gaalema², Cassandra A. Stanton⁵, Thomas J. White², and Stephen T. Higgins²

¹College of Public Health, The Ohio State University, Columbus, OH, USA

²Vermont Center on Tobacco Regulatory Science, University of Vermont, Burlington, VT, USA

³Rehabilitation Institute, Southern Illinois University, Carbondale, IL, USA

⁴Westat, Center for Evaluation and Coordination of Training and Research (CECTR) in Tobacco Regulatory Science, Rockville, MD, USA

⁵Department of Oncology, Georgetown University Medical Center/Cancer Prevention and Control Program, Lombardi Comprehensive Cancer Center, Washington D.C., USA

Abstract

This project compared urban/rural differences in tobacco use, and examined how such differences vary across regions/divisions of the U.S. Using pooled 2012–2013 data from the National Survey on Drug Use and Health (NSDUH), we obtained weighted prevalence estimates for the use of cigarettes, menthol cigarettes, chewing tobacco, snuff, cigars, and pipes. NSDUH also provides information on participants' residence: rural vs. urban, and Census region and division. Overall, use of cigarettes, chew, and snuff were higher in rural, compared to urban areas. Across all tobacco products, urban/rural differences were particularly pronounced in certain divisions (e.g., the South Atlantic). Effects did not appear to be fully explained by differences in poverty. Going beyond previous research, these findings show that urban/rural differences vary across different types of tobacco products, as well as by division of the country. Results underscore the need for regulatory efforts that will reduce health disparities.

Keywords

Tobacco use; rural health; disparities

Rural America is frequently described in terms of its health disparities—and for obvious reasons. Compared to non-rural (urban and suburban) areas in the U.S., rural areas have

Corresponding author: Megan E. Roberts, College of Public Health, The Ohio State University, 1841 Neil Ave, Columbus, OH, USA. 614-247-6082.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

higher rates of mortality across all stages of the lifespan: from greater infant mortality through higher mortality rates among senior citizens.¹ Individuals living in rural areas also suffer higher mortality rates from ischemic heart disease, obstructive pulmonary disease, and cancer.^{1,2} For example, one study analyzing U.S. mortality data found that individuals living in rural areas had 18–20% higher lung cancer mortality than those living in urban areas.²

Tobacco-Related Health Disparities

Contributing to these morbidity and mortality disparities, rural areas of the U.S. have among the highest cigarette smoking rates in the country. More specifically, individuals classified as living in rural areas have higher rates of current cigarette use and exposure to secondhand smoke^{1,3} and frequently have poorer cessation-related outcomes than those living in non-rural areas.^{4,5} Use of smokeless tobacco is also higher in rural areas than non-rural areas.³

Several factors likely play a role in these elevated rates of tobacco use in rural areas. Compared to non-rural individuals, rural individuals are more likely to have lower income, lower educational attainment, and more limited access to medical resources;^{1,6,7} these factors are associated with an increased likelihood of smoking initiation and difficulty quitting.^{8,9} Rural populations have also been historically underserved by tobacco control programs and policies (e.g., smoke-free laws that restrict smoking in particular areas^{4,10}). For these reasons, the National Institutes of Health's (NIH) definition of "vulnerable populations" for tobacco research includes groups defined by geographic location.¹¹

Beyond these distal, macro-level factors, it is also important to recognize that health behaviors are embedded in social networks of families, friends, and communities.¹² For rural areas, social networks are often characterized by geographic isolation and more exchanges within one's kin group,^{13,14} resulting in some social norms that are distinct from those of non-rural areas.⁴ These resultant social norms often include stronger acceptance and support for tobacco use.^{13,15,16} Targeted tobacco marketing, which frequently promotes images of masculinity, toughness, and the outdoors, can further reinforce rural pro-tobacco norms.¹⁵

Differences across the Nation

Although a strong body of evidence identifies numerous rural vs. non-rural differences in tobacco use, little research has focused on how these differences vary across the country. Yet rural areas in different parts of the U.S. differ substantially on demographic, cultural, geographic, and economic factors—all of which can have significant implications for health, policy, and research.^{17,18} Moreover, policy enforcement, distribution and targeted marketing of tobacco products differs geographically and may contribute to differences in tobacco use rates. The available research indicates that health disparities between rural and non-rural populations are particularly pronounced in certain parts of the country, such as the South and the Midwest.^{1,19} However, the few studies to compare rural cigarette use across the U.S. have focused on broad groupings (e.g., the four Census regions of West, Midwest, South, and Northeast¹), which may be obscuring more marked division-level differences. Greater

clarity will also be gained by comparing rural use of other tobacco products, such as chew and snuff, across the U.S.

Understanding variations in rural vs. non-rural tobacco use has potentially important and timely policy implications. The Family Smoking Prevention and Tobacco Control Act gives the Food and Drug Administration (FDA) broad authority to regulate the manufacturing, distribution, and marketing of tobacco products. In order for the FDA's regulatory decisions to be evidence based, it is critical that they have a fine-grained understanding of the prevalence and impact of tobacco use in vulnerable populations—including individuals residing in rural areas. While this nuanced understanding may not translate into federal policies that focus on specific populations or divisions in the country, it can help guide policy development away from unanticipated consequences that exacerbate existing disparities.

Purpose of the Current Study

The overarching aim of the present study was to examine rural vs. non-rural differences in use of cigarettes and other tobacco products, and to investigate how those differences vary across regions and divisions of the country. Given the likely role of socioeconomic status in rural tobacco-use disparities, we also conducted supplementary analyses to explore how these differences vary by poverty level. We did not control for poverty (i.e., treat it as a confound) because we expected to find evidence of additive and interactive effects. We used data from the U.S. National Survey on Drug Use and Health (NSDUH), a nationally representative sample with data on multiple tobacco products: cigarettes, menthol cigarettes, chewing tobacco, snuff, cigars, and pipes. The survey also includes information on the rural vs. urban residence of participants, and the *region* and *division* of the country in which they reside (see Methods section).

METHODS

Sample

Data came from the 2012 and 2013 U.S. NSDUH, an annual survey that uses multistage area probability sampling to obtain a large-scale, nationally representative sample of non-institutionalized individuals aged twelve and older. A total of 136,147 individuals participated (68,309 in 2012 and 67,838 in 2013). Respondents completed computer- and audio-assisted structured interviews and were compensated \$30 for completing the interview. A detailed description of survey procedures has been provided by SAMHSA.²⁰

Measures

Regions and Division—The U.S. Census defines four statistical *regions*: West, Midwest, South, and Northeast (U.S. Census Bureau, 2015). Nested within these regions are the nine statistical *divisions*: The West contains the Pacific and Mountain divisions; The Midwest contains the West North Central and East North Central divisions; The South contains the West South Central, East South Central, and South Atlantic divisions; and the Northeast contains the Middle Atlantic and New England divisions (see Figure 1 for a map of these regions and divisions).

Urban/Rural—Our measure of rural vs. urban (i.e., non-rural) drew on the U.S. 2000 Census block-level designation of rural or urban. The Census classifies as “urban” all census blocks located within urbanized areas and urban clusters (generally, these are core census block groups or blocks that have a population density of at least 1,000 people per square mile, and surrounding census blocks that have an overall density of at least 500 people per square mile). In the NSDUH, one or more adjacent Census blocks are combined to form a sampling segment. If one or more of the blocks within a segment is urban, the segment is defined as urban. If all of the segment blocks are rural, the segment is defined as rural. Throughout this paper, we will refer to these as “urban areas” and “rural areas.”

Poverty—Poverty was assessed in terms of family income relative to the poverty threshold. The U.S. Census Bureau establishes the poverty threshold for each combination of family size and number of children in the household. The NSDUH codes poverty values as missing if participants are aged 18–22 and currently living in a college dormitory. Participants living below the poverty threshold were coded as *living in poverty* (poverty), those living at or above the poverty threshold were coded as *not living in poverty* (non-poverty).

Tobacco Use—For tobacco use, participants were asked “During the past 30 days, that is since [date provided], on how many days did you smoke part or all of a cigarette...use snuff...use chewing tobacco...smoke part or all of a cigar.” For these four items, responses were dichotomized to assess any use in the past 30 days. The cigarette item was additionally coded to assess daily use (use every day in the past 30 days). For pipe use, participants were asked: “During the past 30 days, that is since [date provided], have you smoked tobacco in a pipe, even once?” Finally, use of menthol-flavored cigarettes was assessed with the item “Were the cigarettes you smoked during the past 30 days menthol?” Questions on whether a product was used 100 times during their lifetime were not available for all products, and were therefore left out of the analyses to maintain consistency.

Analysis

Data were analyzed using the Restricted-use Data Analysis System (R-DAS).²¹ Created by the Substance Abuse and Mental Health Data Archive,²⁰ R-DAS is an online analysis system that allows researchers to access NSDUH variables not otherwise available in the public-use files. Recently, R-DAS has come to be utilized among health researchers.^{22,23} R-DAS presents much of its data in pooled and aggregated form (and restricts the obtainment of results with low cell sizes), in order to reduce the potential for disclosing confidential information. Available data are also weighted to reflect participant selection probabilities, and account for extreme weights, non-response, and poststratification.²⁴ The present analyses used R-DAS to obtain weighted prevalence rates for tobacco use for the pooled 2012–2013 NSDUH survey data.

Our first analyses compared weighted national prevalence rates of tobacco use between rural and urban areas. We did this by obtaining prevalence estimates (and their standard errors) from R-DAS, and using the R statistical package to conduct independent samples z-tests comparing urban/rural estimates. Next, for each tobacco product, we tested for urban/rural differences within each of the four regions. Finally, at the finest level of analyses, we tested

for urban/rural differences within each of the nine divisions (see Figure 1). Supplementary analyses examined these divisional differences across poverty level. Due to the multiple comparisons being made, we set a conservative threshold for statistical significance at $p < .01$.

RESULTS

National Patterns

For the overall U.S. population over the age of twelve, 17.4% were estimated to be living in a rural area. Thirteen percent lived in poverty and 51.5% were female. Table 1 provides product-specific weighted prevalence estimates disaggregated by urban/rural. Cigarette use (both daily and non-daily), chew, and snuff were significantly more prevalent in rural areas than in urban areas (all $ps < .001$). Urban/rural differences at the national level for the other three products—menthol cigarettes, cigars, and pipes—were not statistically significant.

Regional and Divisional Differences

Table 2 provides prevalence estimates for all products across regions and divisions. Findings are also illustrated in Figure 2, in which divisions of the country are shaded according to the rural:urban ratio for each tobacco product (darker shading indicates proportionately greater use in rural areas). The following paragraphs elaborate on the primary significant findings.

Cigarettes (Daily Use)—In the West and Midwest regions and divisions, urban/rural differences in daily cigarette use were not significant. In the Northeast, rural areas had a higher prevalence of daily cigarette use than urban areas ($p = .003$). Both divisions within the Northeast region—Middle Atlantic and New England—followed this pattern, but only the New England urban/rural difference was significant ($p = .007$). In the South, rural areas had a higher prevalence of daily cigarette use than urban areas ($p < .001$). While all three divisions within the South followed the regional pattern, only the South Atlantic division showed a significant urban/rural difference ($p < .001$). In fact, the greatest absolute difference between rural and urban daily cigarette use was found in the South Atlantic division (16.8% vs. 11.9%, respectively).

Cigarettes (Any Past-30-Day Use)—Among the four regions, only the South showed a significant urban/rural difference in non-daily cigarette use: Rural areas had a higher prevalence of non-daily cigarette use than urban areas ($p < .001$). While all three divisions within the South followed the regional pattern, urban/rural differences were not significant.

Menthol Cigarettes (Any Past-30-Day Use)—Both the West and Midwest regions had significantly lower prevalence of menthol cigarette use in rural, compared to urban areas ($ps < .001$). The two divisions within the West region—Pacific and Mountain—followed the regional pattern and showed a significant urban/rural difference ($p < .001$). The two divisions within the Midwest region followed the regional pattern, but only the East North Central division showed a significant urban/rural difference ($p < .001$). Neither the Northeast nor the South regions showed significant urban/rural differences.

Cigars (Any Past-30-Day Use)—Only the Midwest region showed a significant urban/rural difference in the prevalence of cigar use, whereby rural use was lower than urban use ($p < .001$). While both divisions within the Midwest showed the same urban/rural difference patterns, only the West North Central division urban/rural difference was significant ($p < .001$). Of note, the South Atlantic division within the South also showed that rural cigar use was significantly lower than urban cigar use ($p = .009$).

Pipes (Any Past-30-Day Use)—As with pipe use at the national level, there was no evidence of urban/rural differences within any region or division of the country.

Chew (Any Past-30-Day Use)—All four regions of the U.S. showed a higher prevalence of rural, compared to urban, chew use (all $ps < .001$). Nearly all divisions also showed significant urban/rural differences in chew use, as clearly illustrated in Figure 2.

Snuff (Any Past-30-Day Use)—As with chew, all four regions of the U.S. showed a higher prevalence of rural, compared to urban, snuff use (all $ps < .001$). Again, nearly all divisions also showed significant urban/rural differences in snuff use.

Accounting for Poverty

Additional analyses examined regional and divisional prevalence rates when further broken-down by poverty (see supplemental Table S1 and S2). Results indicated that many urban/rural differences remained among both the non-poverty and poverty groups. In other cases, urban/rural differences emerged where they had not existed in aggregate: The prevalence rate for non-daily cigarette use in the Midwest was 51.5% among the rural poor (compared to 38.1% among the urban poor in that region). Of note, the largest divisional estimates for daily and non-daily cigarette use reported in this paper (41.3% and 55%, respectively) were among the rural poor in the East North Central division of the Midwest (these estimates were more than twice those of the urban poor in that division). Thus, poverty did not seem to fully account for urban/rural differences in the use of many tobacco products—in fact, poverty and rural residence seemed to interact in some instances.

DISCUSSION

This study investigated urban/rural differences in tobacco use, and tested how such differences vary by regions and divisions of the country. To our knowledge, this is the first study to examine national urban/rural differences in tobacco use at this level of detail. Findings indicated that, overall, use of cigarettes, chew, and snuff was higher in rural (compared to urban) areas. These results are consistent with previous research showing greater prevalence in rural areas for tobacco use and tobacco-related diseases.^{1–3} For example, The Rural-Urban Chartbook¹ reported national urban/rural disparities in cigarette use, with the largest disparities appearing in the South region.

Our findings go beyond previous research by showing how these regional urban/rural differences vary across different types of tobacco products, as well as by division of the country. In terms of products, for example, we found few urban/rural differences for cigar and pipe use. In contrast, smokeless tobacco (chew and snuff) had much higher prevalence

in rural (compared to urban) areas for most of the South and Northeast, and all of the Midwest; indeed, rates were frequently twice as high in rural, compared to urban, areas. For menthol cigarettes, the pattern often went in the other direction, with higher prevalence in urban (compared to rural) areas throughout the West and some of the Midwest. In terms of Census divisions, we found that the urban/rural differences were particularly pronounced in certain divisions, such as the South Atlantic. They were less pronounced or reversed in other divisions, such as the Mountain division. All regions and divisions showed a significant urban/rural difference for at least one tobacco product, which underscores the important role of urban/rural status when examining tobacco use.

Further analyses that looked at urban/rural prevalence rates across poverty levels suggest that these rural disparities are not fully driven by differences in income. That is, among those living both above and below the poverty threshold, people living in rural areas generally had higher rates of cigarette, chew, and snuff use than those living in urban areas. In several instances, poverty seemed to exacerbate the urban/rural differences; this finding is consistent with other tobacco research showing that risk factors can have additive and interactive effects.²⁵

Public Health Implications

The present findings characterize how rural-based disparities in tobacco use vary throughout the U.S. Such findings oppose the common misconception that all rural areas are homogeneous. Results also provide more nuance to national reports,²⁶ which have shown cigarette smoking prevalence to be higher in the South and Midwest, but have not examined urban/rural differences. Our results point to parts of the country that are particularly in need of tobacco prevention and cessation efforts that target vulnerable populations, such as the rural, impoverished parts of the Midwest. Accordingly, research and practice conducted in areas with marked urban/rural differences would do well to address the social and economic aspects of rural culture.

These results contribute to tobacco regulatory science by providing information on variations in the use of various tobacco products, including cigars, smokeless tobacco, and pipes. Moreover, the present findings demonstrate why it is important for federal policy-makers to look beyond national rates: Although national prevalence rates may be low or moderate, these overall rates are obscuring concerning high prevalence rates in certain high-risk areas. Regulatory efforts should seek policies that will reduce, rather than exacerbate health disparities; for example, restricting marketing at the external point of sale and banning tobacco advertising around schools and playgrounds have been suggested as equitable approaches^{27,28}—although whether they will be effective in rural areas is unclear.

Limitations

This study relied on U.S. Census regions and divisions to divide up the country. This system is based on political boundaries and is useful from a policy approach; however, it also artificially cuts across other types of boundaries and obscures the high tobacco-use rates that are known to exist in certain places (e.g., the Appalachians, Native American reservations, and the Southern Delta). This study also relied on the U.S. Census definition of “rural” and

analyses using alternative definitions may produce somewhat different results. More detailed urban/rural taxonomies were not possible with the R-DAS data, and future studies may find more nuanced results by looking at smaller geographic units. For example, the greatest health differences are often seen between rural and suburban areas.^{1,29} Likewise, the rural-versus-urban dichotomy applied in this study belies more gradual, continuous distinctions in population density and distance from urban centers.

Conclusions and Directions for the Future

This study is one of the few to compare variations within and among the numerous rural populations across the U.S. Findings indicated greater use of cigarettes, chew, and snuff in rural, compared to urban areas. These differences do not appear to be driven by differences in income, and are particularly pronounced in the South Atlantic. The present findings do not, however, speak to the factors that are causing these patterns. Thus, more research is needed to understand the reasons behind rural variations in smoking, in order to better understand and address tobacco-related health disparities. Prospective research on this topic would help to understand the ways in which identified factors such as income, education, and social networks contribute to rural tobacco-related health disparities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This work was supported by the National Cancer Institute under grant P50CA180908, the National Institute on Drug Abuse under grant P50DA036114, and the Center for Evaluation and Coordination of Training and Research (CECTR) in Tobacco Regulatory Science (1U54CA189222-01; NIDA/FDA).

References

1. Meit M, Knudson A, Gilbert T, Yu ATC, Tanenbaum E, Ormson E, ... Popat MS. The 2014 Update of the Rural-Urban Chartbook. Rural Health Reform Policy Res Cent. 2014
2. Singh GK, Williams SD, Siahpush M, Mulhollen A. Socioeconomic, Rural-Urban, and Racial Inequalities in US Cancer Mortality: Part I—All Cancers and Lung Cancer and Part II—Colorectal, Prostate, Breast, and Cervical Cancers. J Cancer Epidemiol. 2012; 2011:e107497.doi: 10.1155/2011/107497
3. Vander Weg MW, Cunningham CL, Howren MB, Cai X. Tobacco use and exposure in rural areas: Findings from the Behavioral Risk Factor Surveillance System. Addict Behav. 2011; 36(3):231–236. DOI: 10.1016/j.addbeh.2010.11.005 [PubMed: 21146318]
4. Northridge ME, Vallone D, Xiao H, et al. The Importance of Location for Tobacco Cessation: Rural–Urban Disparities in Quit Success in Underserved West Virginia Counties. J Rural Health. 2008; 24(2):106–115. DOI: 10.1111/j.1748-0361.2008.00146.x [PubMed: 18397443]
5. Hodge FS, Fredericks L, Kipnis P. Patient and smoking patterns in northern California American Indian Clinics. Urban and rural contrasts. Cancer. 1996; 78(7 Suppl):1623–1628. [PubMed: 8839583]
6. Byun S, Meece JL, Irvin MJ. Rural-Nonrural Disparities in Postsecondary Educational Attainment Revisited. Am Educ Res J. 2012; 49(3):412–437. DOI: 10.3102/0002831211416344
7. Wewers ME, Katz M, Paskett ED, Fickle D. Risky Behaviors Among Ohio Appalachian Adults. Prev Chronic Dis. 2006; 3(4) <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1779290/>.

8. Kiefe CI, Williams OD, Greenlund KJ, Ulene V, Gardin JM, Raczynski JM. Health care access and seven-year change in cigarette smoking. The CARDIA Study. *Am J Prev Med.* 1998; 15(2):146–154. [PubMed: 9713671]
9. US Department of Health and Human Services. Preventing tobacco use among youth and young adults: a report of the Surgeon General. Atlanta GA: US Dep Health Hum Serv Cent Dis Control Prev Natl Cent Chronic Dis Prev Health Promot Off Smok Health; 2012. p. 3
10. McMillen R, Breen J, Cosby AG. Rural-Urban Differences in the Social Climate Surrounding Environmental Tobacco Smoke: A Report From the 2002 Social Climate Survey of Tobacco Control. *J Rural Health.* 2004; 20(1):7–16. DOI: 10.1111/j.1748-0361.2004.tb00002.x [PubMed: 14964923]
11. NIH. Tobacco Regulatory Science: Research Priorities. 2015. <https://prevention.nih.gov/tobacco-regulatory-science-program/research-priorities>
12. McLeroy KR, Bibeau D, Steckler A, Glanz K. An Ecological Perspective on Health Promotion Programs. *Health Educ Behav.* 1988; 15(4):351–377. DOI: 10.1177/109019818801500401
13. Rhew IC, David Hawkins J, Oesterle S. Drug use and risk among youth in different rural contexts. *Health Place.* 2011; 17(3):775–783. DOI: 10.1016/j.healthplace.2011.02.003 [PubMed: 21414831]
14. Hofferth SL, Iceland J. Social Capital in Rural and Urban Communities I. *Rural Sociol.* 1998; 63(4):574–598. DOI: 10.1111/j.1549-0831.1998.tb00693.x
15. Nemeth JM, Liu ST, Klein EG, Ferketich AK, Kwan M-P, Wewers ME. Factors Influencing Smokeless Tobacco Use in Rural Ohio Appalachia. *J Community Health.* 2012; 37(6):1208–1217. DOI: 10.1007/s10900-012-9556-x [PubMed: 22427033]
16. Hartley D. Rural Health Disparities, Population Health, and Rural Culture. *Am J Public Health.* 2004; 94(10):1675–1678. [PubMed: 15451729]
17. Gamm L, Hutchison L. Public Health Rural Health Priorities in America: Where You Stand Depends on Where You Sit. *J Rural Health.* 2003; 19(3):209–213. DOI: 10.1111/j.1748-0361.2003.tb00563.x [PubMed: 12839126]
18. Hart LG, Larson EH, Lishner DM. Rural Definitions for Health Policy and Research. *Am J Public Health.* 2005; 95(7):1149–1155. DOI: 10.2105/AJPH.2004.042432 [PubMed: 15983270]
19. Burton LM, Lichter DT, Baker RS, Eason JM. Inequality, Family Processes, and Health in the “New” Rural America. *Am Behav Sci.* May.2013 0002764213487348. doi: 10.1177/0002764213487348
20. Substance Abuse and Mental Health Services Administration (SAMHSA). National Survey on Drug Use and Health. 2011. <http://www.samhsa.gov/data/NSDUH.aspx>
21. Restricted-Use Data Analysis System (R-DAS). 2012. <http://www.icpsr.umich.edu/icpsrweb/content/SAMHDA/rdas.html>
22. Parker MA, Anthony JC. Should anyone be riding to glory on the now-descending limb of the crack-cocaine epidemic curve in the United States? *Drug Alcohol Depend.* 2014; 138:225–228. DOI: 10.1016/j.drugalcdep.2014.02.005 [PubMed: 24629632]
23. Seedall RB, Anthony JC. Risk Estimates for Starting Tobacco, Alcohol, and Other Drug Use in The United States: Male-Female Differences and the Possibility that “Limiting Time With Friends” is Protective. *Drug Alcohol Depend.* 2013; 133(2):751–753. DOI: 10.1016/j.drugalcdep.2013.06.035 [PubMed: 24018318]
24. Center for Behavioral Health Statistics and Quality. Subst Abuse Ment Health Serv Adm. Rockville, MD: 2015. 2013 National Survey on Drug Use and Health: Methodological Resource Book (Section 11, Person-Level Sampling Weight Calibration).
25. Higgins ST, Kurti AN, Redner R, White TJ, Keith DR, Gaalema DE, Sprague BL, Stanton CS, Roberts ME, Doogan NJ, Priest JS. Co-occurring risk factors for current cigarette smoking in a U.S. nationally representative sample. *Prev Med.* in press.
26. Jamal, Ahmed; Agaku, Israel T.; O’Connor, Erin; King, Brian A.; Kenemer, John B.; Neff, Linda. Current Cigarette Smoking Among Adults — United States, 2005–2013. *Morb Mortal Wkly Rep MMWR.* 2014; 63(47):1108–1112. [PubMed: 25426653]
27. Lee JGL, Henriksen L, Rose SW, Moreland-Russell S, Ribisl KM. A Systematic Review of Neighborhood Disparities in Point-of-Sale Tobacco Marketing. *Am J Public Health.* 2015; 105(9):e8–e18. DOI: 10.2105/AJPH.2015.302777 [PubMed: 26180986]

28. Luke DA, Ribisl KM, Smith C, Sorg AA. Family Smoking Prevention And Tobacco Control Act: banning outdoor tobacco advertising near schools and playgrounds. *Am J Prev Med.* 2011; 40(3): 295–302. DOI: 10.1016/j.amepre.2010.11.018 [PubMed: 21335260]
29. Eberhardt MS, Pamuk ER. The Importance of Place of Residence: Examining Health in Rural and Nonrural Areas. *Am J Public Health.* 2004; 94(10):1682–1686. DOI: 10.2105/AJPH.94.10.1682 [PubMed: 15451731]

Figure 1.
U.S. Census regions and divisions. Shading in this figure is merely for artistic purposes.

Figure 2. Illustrative map of rural:urban ratios in tobacco use. As enumerated in the legend, darker shades indicates greater rural use, compared to urban use. The gray background color corresponds to a 1:1 rural-to-urban ratio.

Rural and urban prevalence rate (for individuals aged twelve and older) for tobacco-product use in the U.S., as % (S.E.). Urban/rural differences were calculated using independent samples *z*-tests.

Table 1

	Daily Use Cigarettes		Any Past-30-Day Use			
	Cigarettes	Cigars	Menthol Cigarettes	Pipes	Chew	Snuff
Rural	16.3 (0.49)	24.1 (0.58)	4.6 (0.21)	7.6 (0.32)	1.0 (0.12)	2.2 (0.16)
Urban	12.3 (0.20)	21.0 (0.25)	5.0 (0.11)	8.4 (0.16)	0.9 (0.05)	2.3 (0.08)
Difference test <i>p</i> -value	< 0.001	< 0.001	0.183	0.076	0.442	< 0.001

Note: For each cell of output, R-DAS provided weighted Ns, which differed slightly across products. For cigarettes, the weighted N was 46,017,000 for rural areas and 214,704,000 for urban areas.

Table 2

Rural and urban prevalence rates (for individuals aged twelve and older) for tobacco-product use, as %(S.E.), across U.S. Census regions and divisions. The larger value of each urban/rural pair is bolded.

	Daily Use Cigarette		Any Past-30-Day Use			
	Cigarette	Menthol Cigarette	Cigar	Pipe	Chew	Snuff
West						
<i>Rural</i>	11.4 (1.29)	17.6 (1.46)	3.2 (0.44)	4.0 (0.65)	1.0 (0.24)	2.4 (0.39) *
<i>Urban</i>	9.9 (0.43)	18.3 (0.55)	5.4 (0.28) *	4.1 (0.22)	0.9 (0.09)	1.0 (0.11)
Pacific						
<i>Rural</i>	12.3 (2.10)	17.4 (2.26)	2.5 (0.67)	3.8 (0.92)	0.6 (0.16)	4.8 (1.13) *
<i>Urban</i>	8.6 (0.50)	16.9 (0.66)	5.2 (0.35) *	4.0 (0.28)	0.9 (0.12)	0.7 (0.11)
Mountain						
<i>Rural</i>	10.5 (1.42)	17.7 (1.84)	3.8 (0.63)	4.2 (0.93)	1.3 (0.42)	3.1 (0.63)
<i>Urban</i>	13.1 (0.82)	21.7 (0.96)	5.9 (0.42) *	4.6 (0.35)	0.8 (0.13)	1.7 (0.25)
Midwest						
<i>Rural</i>	17.4 (0.82)	24.7 (0.95)	7.2 (0.52)	3.9 (0.35)	1.0 (0.20)	2.8 (0.28) *
<i>Urban</i>	15.8 (0.45)	24.4 (0.50)	10.1 (0.33) *	5.7 (0.25) *	1.1 (0.12)	1.2 (0.10)
West North Central						
<i>Rural</i>	16.3 (1.37)	24.7 (1.63)	6.4 (0.72)	3.1 (0.48)	0.7 (0.22)	3.4 (0.52) *
<i>Urban</i>	15.5 (0.92)	23.3 (0.98)	7.9 (0.55)	6.3 (0.60) *	1.0 (0.16)	1.6 (0.22)
East North Central						
<i>Rural</i>	18.0 (0.98)	24.7 (1.12)	7.8 (0.70)	4.4 (0.47)	1.1 (0.28)	2.4 (0.33) *
<i>Urban</i>	16.0 (0.50)	24.9 (0.58)	10.9 (0.41) *	5.5 (0.25)	1.2 (0.16)	1.0 (0.11)
Northeast						
						2.4 (0.18)

	Daily Use Cigarette		Any Past-30-Day Use			
	Cigarette	Menthol Cigarette	Cigar	Pipe	Chew	Snuff
<i>Rural</i>	15.0 (1.02) *	21.3 (1.22)	7.2 (0.62)	5.6 (0.72)	0.5 (0.13)	1.8 (0.28) *
<i>Urban</i>	11.7 (0.42)	20.0 (0.54)	9.0 (0.38)	4.8 (0.25)	0.7 (0.09)	0.6 (0.07)
Middle Atlantic						
<i>Rural</i>	14.7 (1.35)	21.2 (1.62)	8.1 (0.87)	5.8 (0.87)	0.5 (0.17)	2.3 (0.42) *
<i>Urban</i>	11.8 (0.49)	20.4 (0.64)	9.8 (0.46)	4.6 (0.30)	0.7 (0.12)	0.7 (0.09)
New England						
<i>Rural</i>	15.7 (1.45) *	21.4 (1.72)	5.4 (0.69)	5.2 (1.27)	0.7 (0.20)	0.9 (0.20) *
<i>Urban</i>	11.3 (0.80)	19.1 (0.96)	6.6 (0.65)	5.5 (0.43)	0.8 (0.14)	0.2 (0.05)
South						
<i>Rural</i>	17.1 (0.80) *	25.8 (0.96) *	8.9 (0.57)	4.8 (0.31)	1.1 (0.19)	1.9 (0.25) *
<i>Urban</i>	12.4 (0.35)	21.6 (0.44)	9.2 (0.30)	5.3 (0.21)	0.9 (0.09)	0.8 (0.09)
South Atlantic						
<i>Rural</i>	16.8 (1.30) *	24.7 (1.59)	10.7 (0.94)	4.2 (0.44)	1.0 (0.32)	1.5 (0.35) *
<i>Urban</i>	11.9 (0.50)	20.8 (0.65)	9.6 (0.45)	5.6 (0.30) *	0.9 (0.12)	0.5 (0.09)
East South Central						
<i>Rural</i>	20.2 (1.23)	29.6 (1.39)	8.4 (0.80)	5.0 (0.61)	1.1 (0.30)	2.8 (0.67)
<i>Urban</i>	17.1 (1.06)	26.0 (1.24)	10.2 (0.72)	5.3 (0.50)	0.8 (0.19)	1.3 (0.37)
West South Central						
<i>Rural</i>	14.9 (1.28)	24.5 (1.48)	5.8 (0.87)	5.8 (0.66)	1.2 (0.32)	1.9 (0.33) *
<i>Urban</i>	11.3 (0.58)	21.0 (0.70)	8.1 (0.42)	4.9 (0.32)	1.0 (0.15)	0.9 (0.19)

* indicates z-test statistical significance at $p < .01$.

Note: For each cell of output, R-DAS provided weighted Ns, which differed slightly across products. For cigarettes, the weighted Ns in Rural/Urban areas were as follows: 4,961,000/55,857,000 (West); 13,120,000/42,812,000 (Midwest); 5,347,000/41,890,000 (Northeast); and 22,589,000/74,144,000 (South).

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript