HHS Public Access

Author manuscript

Psychooncology. Author manuscript; available in PMC 2021 September 25.

Published in final edited form as:

Psychooncology. 2021 May ; 30(5): 708–715. doi:10.1002/pon.5616.

Problem Alcohol Use among Rural Head and Neck Cancer Patients at Diagnosis: Associations with Health-related Quality of Life

M. Bryant Howren, PhD, MPH[1,2,3,4], **Alan J. Christensen, PhD**[1,5], **Jenna L. Adamowicz, MA**[1,6], **Aaron Seaman, PhD**[1,4,7], **Shylo Wardyn, MS**[1,4], **Nitin A. Pagedar, MD, MPH**[8]

[1]VA Office of Rural Health (ORH), Veterans Rural Health Resource Center—Iowa City, Iowa City VA Health Care System; Iowa City, IA

[2]Department of Behavioral Sciences & Social Medicine, College of Medicine, Florida State University; Tallahassee, FL

[3]Florida Blue Center for Rural Health Research & Policy, College of Medicine, Florida State University; Tallahassee, FL

[4]Center for Access Delivery Research & Evaluation (CADRE), VA Iowa City Healthcare System; Iowa City, IA

[5]Department of Psychology, East Carolina University; Greenville, NC

[6]Department of Psychological & Brain Sciences, The University of Iowa; Iowa City, IA

[7]Department of Internal Medicine, The University of Iowa; Iowa City, IA

[8]Department of Otolaryngology—Head and Neck Surgery, Carver College of Medicine, The University of Iowa; Iowa City, IA

Abstract

Objective: Problem alcohol use in persons with head and neck cancer (HNC) is associated with poor outcomes, including survival. Some evidence suggests that individuals living in rural areas may be at greater risk of problem alcohol use. The present exploratory cross-sectional study sought to examine problem alcohol use at diagnosis in a sample of HNC patients by rural vs urban status.

Methods: Self-reported problem alcohol use as measured by the Short Michigan Alcoholism Screening Test (SMAST) was examined in rural and urban HNC patients at diagnosis (N=454). Multivariable linear regression analysis was conducted to examine correlates of problem alcohol use. Subgroup analyses examined HNC-specific health-related quality of life (HRQOL) by problem drinking status at diagnosis and 3- and 12-months postdiagnosis in rural patients.

Address correspondence and reprint requests to: M. Bryant Howren, PhD, MPH, Florida State University College of Medicine, 1115 W. Call Street, Tallahassee, FL 32306, Office: 850-644-3454. matthew.howren@med.fsu.edu.

Conflict of Interest Statement

The authors declare no conflicts of interest.

Results: Multivariable linear regression analysis controlling for age, cancer site, cancer stage, depressive symptoms at diagnosis, and tobacco use at diagnosis indicated that rural residence was significantly associated with SMAST scores at diagnosis such that rural patients were more likely to report higher scores (ß=.095, sr^2=.010, p=.04). Covariate-adjusted subgroup analyses suggest that rural patients with self-reported problem alcohol use may exhibit deficits in HNC-specific HRQOL at diagnosis and 3- and 12-months postdiagnosis.

Conclusions: HNC patients should be screened for problem alcohol use at diagnosis and counseled regarding the deleterious effects of continued drinking during treatment and beyond. Because access to treatment and referral options may be lacking in rural areas, additional ways of connecting rural patients to specialty care should be explored.

Keywords

alcohol consumption; head and neck cancer; health-related quality of life; psycho-oncology; rural health

Introduction

Problem alcohol use is a known risk factor for the development of head and neck cancer (HNC) and continued use after diagnosis is associated with cancer recurrence, significant comorbidities including poor long-term survival, and poor psychosocial outcomes including depression and reduced HNC-specific health-related quality of life (HRQOL) [1–5]. Estimates suggest that upwards of thirty percent of HNC patients demonstrate problem alcohol use with many continuing to exhibit this behavior into the survivorship period [6–9].

Individuals residing in rural areas may be at increased risk of problem alcohol use. National data suggest that rural residents, although more likely to abstain from alcohol, have similar if not higher rates of alcohol use disorder when compared to those living in urban areas [10–12]. More broadly, there is both a greater incidence of HNC in rural areas and evidence indicating that HNC patients may experience worse outcomes than their urban counterparts [13,14]. For example, a recent Surveillance, Epidemiology, and End Results (SEER) database study by Pagedar and colleagues reported that the incidence of oropharynx cancer was increasing faster in rural areas, while the rates of larynx and oral cavity cancers were decreasing more rapidly in urban areas [13]. In a recent study of psychosocial outcomes in rural HNC patients, it was reported that rural patients experienced greater levels of depressive symptomatology and poorer HNC-specific HRQOL when compared to urban HNC patients [14]. These studies align with a larger body of evidence suggesting that outcomes, including survival, are worse among rural cancer patients of all types including breast, gynecologic, prostate, colorectal, lung, melanoma, hematologic and head and neck cancers [15–20] and may be exacerbated by problem alcohol use.

Some work in chronic disease populations has suggested that the presence of factors that negatively impact quality of life and disease management may explain why patients in rural settings face a so-called “rural disadvantage” [21–23]. These factors may include greater travel burden, lack of health insurance, and provider shortages, all of which may impact accessibility of cancer care and continued cancer surveillance [24,25]. Other factors that

may also explain this disadvantage are reduced access to technology, reduced social support, and/or limited access to other psychosocial resources.

Taken together, further study of problem alcohol use in HNC patients, particularly those residing in rural areas, is needed as no study to date has specifically focused on this behavior in rural (vs urban) HNC patients. The present exploratory cross-sectional study sought to (1) examine self-reported problem alcohol use at diagnosis in rural vs. urban HNC patients and (2) examine rural patients' HNC-specific health-related quality of life (HRQOL) outcomes at diagnosis and 3- and 12-months postdiagnosis as a function of self-reported problem alcohol use. The two postdiagnosis time points were chosen a priori given the expectation that many HNC patients report their lowest HRQOL around 3 months postdiagnosis due to shorter-term treatment related sequelae whereas by 12 months their HRQOL has begun to stabilize, with many essential functions such as eating, swallowing, breathing, and speech progressively improving to approximate baseline levels [26], but could be complicated by poor health behaviors such as problem alcohol use [27]. Better understanding of problem alcohol use in rural HNC patients, including its association with HNC-specific HRQOL during the survivorship period, may help inform efforts to identify and treat such patients for problem use which is known to impact recurrence and longer-term survival.

Materials & Methods

Participants & Procedure

Participants were 18 years old and older with upper aerodigestive tract carcinomas from the Department of Otolaryngology's head and neck oncology clinic at The University of Iowa Hospitals and Clinics (UIHC). These patients are enrolled in the Outcomes Assessment Project (OAP), an ongoing longitudinal study of oncologic treatment outcomes in HNC. The OAP parent study successfully accrued approximately 76% of all eligible patients with HNC seen at UIHC from November 1998 through October 2013, the period including the sample of patients described below. Information regarding patients' site and stage of cancer, comorbidities, treatment, survival outcome, demographics (age, race, sex), and other clinical and psychosocial characteristics were collected as part of the OAP via self-report or abstracted from the patient's medical record, as appropriate. At the time of diagnosis, patients were offered participation in a longitudinal study of cancer-related outcomes and consented in writing if interested in participating in the study. The present study includes HNC patients recruited within the parent study window with a history of drinking behavior (current or previous) who completed measures assessing problem alcohol use and HNC-specific HRQOL at diagnosis and 3- and 12-month follow-up appointments. All procedures were approved by The University of Iowa's IRB (#199412746).

Measurement of Key Variables

Problem Alcohol Use.—The Short Michigan Alcoholism Screening Test is a self-report screening tool designed to detect problem drinking and alcohol use disorder [28]. The SMAST has been used in numerous patient populations, including previous studies of HNC patients [2,29]. Items include, "*Do you feel that you are a normal drinker*?" and "*Are you able to stop drinking when you want to?*" Adequate reliability and validity have been

reported [30]. Items are presented in yes/no format, with scores ranging from 0–13. A score of 2 suggests possible alcohol abuse and a score of 3 or higher suggests probable alcohol abuse [28,30]. For the purposes of these analyses, scores were treated continuously in multivariable linear regression and, although both cut-off scores are reported, the more conservative cutoff of 3+ was used classify patients with self-reported problem alcohol use in subgroup analyses (see below). The SMAST was collected at study enrollment, which coincides with the time of diagnosis, for those patients indicating current or previous use of alcohol. Cronbach's alpha in this sample was .78, which is consistent with previous reports of this measure [30].

Health-related Quality of Life.—Health-related quality of life was measured using the Head and Neck Cancer Inventory (HNCI) [31], a validated 30-item instrument which captures HNC-specific outcomes including speech, eating, aesthetics, and social disruption. Scores transformed into a scale ranging from 0 to 100 may be classified into low (0–30), intermediate (31–69), and high (70–100) functioning, with higher scores indicating better HRQOL [32]. Patients with scores in the high category have relatively normal functioning, and those in the intermediate and low ranges have abnormal or severely compromised functioning, respectively. The HNCI has been used in many HNC studies [33,34] and has good reliability and validity [31]. Cronbach's alpha in this sample was .91.

Depressive Symptoms.—Depressive symptoms, which were controlled for in these analyses, were assessed using the Beck Depression Inventory, a widely used and well-validated measure of depressive symptomatology [35]. The BDI consists of 21 items scored 0–3, each assessing a unique category of depressive symptoms. Cutoff scores have been established which suggest minimal (0–9), mild (10–18), moderate (19–29), and severe (30–63) depression [35]. The BDI has been used in both nonclinical and clinical samples, including those with HNC [36]. Cronbach's alpha in this sample was .87.

Rurality.—Rurality was determined using the US Department of Agriculture's Rural Urban Commuting Area (RUCA) codes. RUCA utilizes a 10-point classification system and includes primary commuting flow and secondary commuting flow scores, based on the 2010 census data. RUCA codes were then dichotomized to either a rural or urban location, based on the recommendations of the University of Washington's Rural Health Research Center two category classification system, categorization C [37]. Specifically, urban codes were 1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1; rural codes were 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1, 9.2, 10.0, 10.2, 10.3, 10.4, 10.5, and 10.6.

Statistical Analyses

Multivariable linear regression analysis was used to examine rurality as a correlate of SMAST scores at diagnosis, controlling for age, cancer site (oral cavity, oropharynx, hypopharynx, larynx, else/unknown), cancer stage, depressive symptoms at diagnosis, and tobacco use at diagnosis. Subgroup analyses examined HNC-specific HRQOL by SMAST category (3+ vs <3) in rural HNC patients at diagnosis and 3- and 12-months postdiagnosis. Analyses were conducted using SPSS, version 26. Results were considered statistically significant if $p<.05$.

Results

Table 1 summarizes the demographic and clinical characteristics of the study sample based on rural/urban residence at diagnosis. Of the study sample, 192 (42.3%) were classified as living in a rural area and 262 (57.7%) were classified as urban. The mean age of rural patients was 60.9 (SD = 12.3) and the mean age of urban patients was 60.2 (SD = 12.4). Both the majority of rural and urban patients were diagnosed with advanced disease stage (ie, 3 or 4; 55.2% rural, 55.0% urban), the most common site for both groups was oral cavity (37.5% rural, 44.6% urban), and the most common treatment modality for both groups was combination therapy (43.7% rural, 45.0% urban). Mean total BDI scores were comparable with rural patients having a mean of 8.5 (SD = 7.6) and urban patients having a mean of 8.3 (SD = 6.6); both means fell within the range suggesting minimal depressive symptomatology overall. Notably, rural and urban patients scored similarly within the mild (28.6% vs 29.0%), moderate (4.7% vs 3.8%), and severe (2.1% vs 1.5%) ranges (p=.93). At diagnosis, both rural and urban patients reported similar levels of drinking behavior (rural, current = 55.2% vs urban, current = 61.0%, p=.21) but rural patients scored significantly higher than urban patients on the SMAST (2.07 vs 1.51, p=.03; range = 0–13 in both groups). Rural patients were also more likely than their urban counterparts to score 2 or 3+ (p=.01) which are scores suggestive of problem alcohol use.

Multivariable linear regression analysis examining rurality as a correlate of SMAST scores at diagnosis adjusted for age, cancer site, cancer stage, depressive symptoms at diagnosis and tobacco use at diagnosis are presented in Table 2. In addition to age (ß = −.107, sr^2 = .010, p=.02), depressive symptoms at diagnosis (ß = .175, sr^2 = .029, p<.001), and tobacco use at diagnosis (ß = .244, sr^2 = .057, p<.001), rural residence was significantly associated with higher SMAST scores at diagnosis (ß = .095, sr^2 = .010, p=.04).

Table 3 shows covariate-adjusted (estimated marginal) mean scores on each of the four HNCI domains by self-reported problem drinking status in rural patients at diagnosis and 3- and 12-month postdiagnosis follow-up time points. Covariates were age, depressive symptoms at diagnosis, and tobacco use at diagnosis. Overall, HNCI domain scores were generally lower for those scoring 3+ as compared to those scoring less than 3 on the SMAST after controlling for covariates. At diagnosis, mean HNCI scores were 81.9 (SE =3.4) vs 89.0 (SE =1.9) for aesthetics, 66.0 (SE =4.2) vs 73.0 (SE =2.3) for eating, 69.9 (SE =3.7) vs 75.7 (SE =2.1) for speech, and 75.6 (SE =3.4) vs 80.1 (SE =1.9) for social disruption. At 3-month follow-up, mean HNCI scores were 67.7 (SE =5.5) vs 72.1 (SE =3.2) for aesthetics, 41.8 (SE =5.5) vs 46.5 (SE =3.2) for eating, 63.7 (SE =5.3) vs 64.8 (SE =2.9) for speech, and 64.9 (SE =4.9) vs 71.3 (SE =2.8) for social disruption. Finally, at 12-month follow-up, mean HNCI scores were 73.5 (SE =5.5) vs 79.5 (SE =2.8) for aesthetics, 57.5 (SE =5.7) vs 58.9 (SE =2.8) for eating, 63.7 (SE =5.0) vs 73.7 (SE =2.3) for speech, and 74.9 (SE =3.9) vs 84.2 (SE =1.9) for social disruption.

Discussion

The results of this exploratory cross-sectional study suggest that potentially problem alcohol use may be somewhat more pronounced in rural HNC patients compared to their urban

counterparts and that problem use at diagnosis is associated with somewhat poorer HNC-specific HRQOL at diagnosis, 3- and 12-months postdiagnosis. In addition to typical correlates of alcohol use such as depressive symptoms and tobacco use, rural residence was significantly associated with higher SMAST scores at HNC diagnosis. Given that problem alcohol use may complicate treatment and has been associated with poor HRQOL, depressive symptoms, cancer recurrence, and reduced survival in this population [1–5], additional studies of this behavior in rural HNC patients are warranted.

Previous studies have demonstrated a somewhat mixed picture with regard to rural-urban differences in alcohol use [10,11,15]. For example, in a national study of rural-urban differences in health behaviors among US cancer survivors, Weaver and colleagues reported that alcohol consumption in rural survivors was lower than in urban survivors; however, rates of heavy drinking were similar in rural and urban survivors [15]. In a study of geographic variation in alcohol use using National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) data, Borders and Booth [10] found that nationally, rural respondents in the general population were also more likely to abstain from alcohol, but among drinkers, rural persons had greater odds of problem use (ie, risky drinking and alcohol use disorder) when compared to suburban drinkers; rates of problem use between rural and urban residents were similar. As has been noted, rural residence likely interacts with a host of demographic, social, and cultural factors to explain this variation [38]. In this study of those with a history of alcohol use, overall rates of current drinking behavior were similar between rural and urban patients and both groups exhibited a considerable degree of potentially problem use, but rural patients exhibited somewhat greater rates of potentially problem use.

Although the consideration of whether there are true differences between rural and urban residents in terms of problem use is important, it is also equally—if not more—important to consider the implications of problem use in rural HNC patients irrespective of this comparison. Fundamentally, access to cancer care is different in rural areas, thus even if rural and urban patients exhibit similar rates of a behavior, the functional impact may be different for those residing in rural areas [25]. For example, rural areas are known to have provider shortages of all types—including primary care, oncology, social work, and mental/behavioral health—which may result in reduced contact with the healthcare system for rural patients, making identification and treatment of problem use much more difficult [25]. A recent position paper by the American Society of Clinical Oncology specifically advocates for increased research into the identification of cancer patients who are using alcohol or may be at risk for relapse [39]. McCarter and colleagues [6] also note that there has been considerably less research done regarding alcohol use as compared to other behavioral risk factors such as tobacco use in HNC patients, underscoring a need for increased attention. Given that some types of HNC are increasing faster in rural areas [13], a focus on rural patients seems especially warranted.

Additional studies of the incorporation of alcohol treatment interventions into rural cancer care are also needed. Previous work indicates that time since treatment is significantly associated with alcohol use in HNC patients during the survivorship period [8]. This suggests that monitoring and intervention for problem alcohol use should continue at regular

intervals throughout treatment into the survivorship period and may require a different approach than is typically used in urban centers where access issues may be somewhat less complex. One study which interviewed rural and urban VA primary care providers on the topic of alcohol use disorder (AUD) treatment found that rural providers reported substantial barriers to specialty care referrals for AUD [40]. Studies have also evaluated the feasibility of concomitantly addressing risky alcohol use and mood management in the context of smoking cessation, including in HNC patients, and have shown promise [9,41]. In this study, tobacco use and depressive symptomatology both were significantly associated with problem alcohol use, suggesting that several patients in this study may have been candidates for such multimodal intervention, but requires additional research. Moreover, although only a small number of rural and urban patients reported moderate to severe depressive symptomatology, a considerable number reported mild symptoms, which are not trivial and have been associated with deficits in HNC-specific HRQOL [33] and may also be associated with drinking behavior. Increased efforts to integrate mental and behavioral health into rural primary care settings, as well as primary-specialty care coordination for HNC should be further explored.

Limitations

Despite a large sample, high accrual rate of eligible patients, and sample similarity to national epidemiologic data, there are several limitations which deserve mention. First, the study sample was approximately 97% White and included patients from one Midwestern healthcare system, making generalizability an issue. Second, although the larger parent study was prospective in its design, this cross-sectional substudy only looked at diagnosis and two a priori chosen time points during the survivorship period. Third, we do not have information on patient HPV status; additional research is needed to examine how HPV-associated disease varies by rural-urban classification in this context. Fourth, we do not have information regarding other variables which may impact HRQOL including fear of cancer recurrence. Fifth, although the SMAST has been used in dozens of studies and has demonstrated adequate to good reliability and validity in several, there are other measures which may better capture problem drinking behavior in this population. This exploratory substudy was limited to the measure employed in the parent study, but future investigations should consider other (and perhaps multiple) measures of this behavior in HNC patients. Finally, this study relied on a self-report measure of problem alcohol use, which is a behavior that may have been underreported to some degree. We had no information about corresponding diagnoses of alcohol use disorder or other indication of problematic use from a provider to validate these reports, nor did we have information regarding previous treatment for alcohol use in this sample.

Clinical Implications

Given the considerable rates of potentially problematic drinking in this sample—which aligns with other published studies in the HNC population—the results of this study suggest that all HNC patients should be screened for problem alcohol use at diagnosis and counseled regarding the deleterious effects of continued drinking during treatment and beyond. There are several brief screening tools which can be readily incorporated into the clinic environment to ascertain the need for more in-depth evaluation and possibly referral.

For patients residing in rural areas, consideration should be given if specialty treatment referral is in order as, depending on the individual patient's circumstances, few options may be available in the patient's immediate residing area. Opportunities to connect to services via telehealth should be explored as should the possibility of accessing/integrating behavioral treatment for alcohol use into other access points such as primary care. The recent increase in telehealth availability and reimbursement for many services due to the COVID-19 pandemic may allow for connection to services that were not possible a short time ago. Because HNC patients may also experience impactful depressive symptomatology as was reflected in this study, the availability of multimodal interventions for complex behavioral health cases could also be relevant dependent on the individual patient's needs. Lastly, these options could also provide an opportunity to improve care coordination for cancer survivors, ensuring multiple important needs are met over the survivorship trajectory.

Conclusion

In conclusion, the present exploratory study suggests that problem alcohol use is an issue for rural HNC patients at diagnosis and may be associated with deficits in HNC-specific HRQOL up to several months postdiagnosis. Whether this behavior is greater than or only equal to urban patients is not the most important issue; rather, a focus on understanding access issues which may delay timely identification and treatment referral may be most prudent. Indeed, the host of factors encompassing the "rural disadvantage" may exacerbate clinical and psychosocial issues highlighted in other studies, underscoring the need for additional work in this area.

Disclaimer:

This work was primarily supported by an award from the VA Office of Rural Health, Veterans Rural Health Resource Center—Iowa City (VRHRC-IC), Iowa City VA Health Care System, Iowa City, IA (Award #14381, PI Howren). This work was also supported by the National Center for Advancing Translational Sciences (Award #UL1TR002537) and the National Cancer Institute and University of Iowa Holden Comprehensive Cancer Center (Award #P30 CA086862). The views expressed in this article are those of the authors and do not necessarily represent the position or policy of the Department of Veterans Affairs or United States Government.

Data Availability Statement

The data that support the findings of this article are available from the corresponding author upon request.

References

1. Marziliano A, Teckie S, Diefenbach MA. Alcohol-related head and neck cancer: Summary of the literature. Head Neck2020;42:732–738. [PubMed: 31777131]
2. Potash AE, Karnell LH, Christensen AJ, et al.Continued alcohol use in patients with head and neck cancer. Head Neck2010;32:905–912. [PubMed: 19918984]
3. Viswanathan H, Wilson JA. Alcohol—the neglected risk factor in head and neck cancer. Clin Otolaryngol Allied Sci2004;29:295–300. [PubMed: 15270811]
4. Llewellyn CD, McGurk M, Weinman J. Are psycho-social and behavioural factors related to health related-quality of life in patients with head and neck cancer? A systematic review. Oral Oncology. 2005;41:440–454. [PubMed: 15878748]

5. Funk GF, Karnell LH, Christensen AJ. Long-term health-related quality of life in survivors of head and neck cancer. Archives of Otolaryngology–Head & Neck Surgery. 2012;138:123–133. [PubMed: 22248560]
6. McCarter K, Baker AL, Britton B, et al.Smoking, drinking, and depression: Comorbidity in head and neck cancer patients undergoing radiotherapy. Cancer Medicine2018;7:2382–2390. [PubMed: 29671955]
7. Lambert MT, Terrell JE, Copeland LA, et al.Cigarettes, alcohol, and depression: Characterizing head and neck cancer survivors in two systems of care. Nicotine Tob Res2005;7:233–241. [PubMed: 16036280]
8. Allison PJ. Factors associated with smoking and alcohol consumption following treatment for head and neck cancer. Oral Oncology2001;37:513–520. [PubMed: 11435178]
9. Duffy SA, Ronis DL, Valenstein M, et al.A tailored smoking, alcohol, and depression intervention for head and neck cancer patients. Cancer Epidemiol Biomarkers Prev2006;15:2203–2208. [PubMed: 17119047]
10. Borders TF, Booth BM. Rural, suburban, and urban variations in alcohol consumption in the United States. Findings from the National Epidemiologic Survey on Alcohol and Related Conditions. J Rural Health2007;23:314–321. [PubMed: 17868238]
11. Dawson DA, Hingson RW, Grant BF. Epidemiology of alcohol use, abuse and dependence. In: Tsuang MT, Tohen M, Jones PB, Eds. Textbook in Psychiatric Epidemiology, Third Edition. Chichester, United Kingdom: John Wiley & Sons, 2011, pp.361–379.
12. Hasin DS, Stinson FS, Ogburn E, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. Arch Gen Psychiatry2007;64:830–842. [PubMed: 17606817]
13. Pagedar NA, Kahl AR, Tasche KK, et al.Incidence trends for upper aerodigestive tract cancers in rural United States counties. Head Neck2019;41:2619–2624. [PubMed: 30843640]
14. Adamowicz JL, Christensen AJ, Howren MB, et al.Patient-reported outcomes in head and neck cancer survivors: Evaluating the rural disadvatange. Manuscript submitted for publication.
15. Weaver KE, Geiger AM, Lu L, Case DL. Rural-urban disparities in health status among US cancer survivors. Cancer2013;119:1050–1057. [PubMed: 23096263]
16. Beck SL, Towsley GL, Caserta MS, et al.Symptom experiences and quality of life of rural and urban older adult cancer survivors. Cancer Nurs2009;32:359–369. [PubMed: 19661799]
17. Burris JL, Andrykowski M. Disparities in mental health between rural and nonrural cancer survivors: a preliminary study. Psychooncology2010;19:637–45. [PubMed: 19582800]
18. Schootman M, Homan S, Weaver KE, et al.The health and welare of rural and urban cancer survivors in Missouri. Prev Chornic Dis2013;10:E152.
19. Afshar N, English DR, Milne RL. Rural-urban residence and cancer survival in high-income countries: A systematic review. Cancer2019;125:2172–2184. [PubMed: 30933318]
20. Blake KD, Moss LJ, Gaysynsky A, et al.Making the case for investment in rural cancer control: an analysis of rural cancer incidence, mortality, and funding trends. Cancer Epidemiol Biomarkers Prev2017;26:992–997. [PubMed: 28600296]
21. Eberhard MS, Pamuk AR. The importance of place of residence: examining health in rural and nonrural areas. Am J Public Health Res2004;94:1682–1686.
22. Hartley DRural health disparities, population health, and rural culture. Am J Public Health2004;94:1675–1678. [PubMed: 15451729]
23. James CV, Moonesinghe R, Shondelle R, et al.Racial/ethnic health disparities among rural adults - United States, 2012–2015. MMWR Surveill Summ2017;66:23, 1–9.
24. Ambroggi M, Biasini C, Del Giovanc C, et al.Distance as a barrier to cancer diagnosis and treatment: review of the literature. Oncologist2015;20:1378–1385. [PubMed: 26512045]
25. Charlton M, Schlicting J, Chioreso C, et al.Challenges of rural cancer care in the United States. Oncology2015;29:633–640. [PubMed: 26384798]
26. Hammerlid E, Silander E, Hörnestam L, Sullivan M. Health-related quality of life three years after diagnosis of head and neck cancer—A longitudinal study. Head Neck. 2001;23:113–125. [PubMed: 11303628]

27. Howren MB, Christensen AJ, Karnell LH, Funk FG. Psychological factors associated with head and neck cancer treatment and survivorship: Evidence and opportunities for behavioral medicine. J Consult Clin Psych2013;81:299–317.
28. Selzer ML, Vinokur A, van Rooijen L. A self-administered Short Michigan Alcoholism Screening Test (SMAST). J Stud Alcohol1975;36:117–126. [PubMed: 238068]
29. Van Liew JR, Brock RL, Christensen AJ, et al.Weight loss after head and neck cancer: A dynamic relationship with depressive symptoms. Head Neck. 2017;39:370–379. [PubMed: 27704695]
30. Minnich A, Erford BT, Bardhoshi G, et al.Systematic evaluation of psychometric characteristics of the Michigan Alcoholism Screening Test 13-item Short (SMAST) and 10-item Brief (BMAST) versions. J Counseling Develop2019;97:15–24.
31. Funk G, Karnell L, Christensen A, Moran P, Ricks J. Comprehensive head and neck oncology health status assessment. Head Neck2003;25:561–575. [PubMed: 12808660]
32. Funk GF, Karnell LH, Smith RB, Christensen AJ. Clinical significance of health status assessment measures in head and neck cancer. What do quality-of-life scores mean? Archives of Otolaryngology—Head & Neck Surgery. 2004;130:825–829. [PubMed: 15262758]
33. Howren MB, Christensen AJ Karnell LH, Funk GF. Health-related quality of life in head and neck cancer survivors: impact of pretreatment depressive symptoms. Health Psychol2010;29:65–71. [PubMed: 20063937]
34. Howren MB, Christensen AJ, Karnell LH, et al.Influence of pretreatment social support on health-related quality of life in head and neck cancer survivors: Results from a prospective study. Head Neck2013;35:779–787. [PubMed: 22715128]
35. Beck AT, Steer RA, Garbin MG. Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. Clin Psychol Rev. 1988;8:77–100.
36. Katz MR, Kopek N, Waldron J, et al.Screening for depression in head and neck cancer. Psycho-oncology. 2004;13:269–280. [PubMed: 15054731]
37. WWAMI RUCA Rural health research center. Rural-urban community area codes (RUCAs). Available at http://depts.washington.edu/uwruca/.
38. Dixon MA, Chartier KG. Alcohol use patterns among urban and rural residents. Alcohol Res: Curr Rev2016:38:69–77.
39. LoConte NK, Brewster AM, Kaur JS, et al.Alcohol and cancer: A statement of the American Society of Clinical Oncology. J Clin Oncology2018;36:88–93.
40. Young JP, Achtmeyer CE, Bensley KM, et al.Differences in perceptions of and practices regarding treatment of alcohol use disorders among VA primary care providers in urban and rural clinics. J Rural Health2018;34:359–368. [PubMed: 29363176]
41. Vander Weg MW, Cozad AJ, Howren MB, et al.An individually-tailored smoking cessation intervention for rural veterans: A pilot randomized trial. BMC Public Health. 2016;16:811. [PubMed: 27535024]

Table 1.

Demographic and clinical characteristics of rural and urban HNC patients at diagnosis

	Rural N = 192 (42.3%)	Urban N = 262 (57.7%)	*p-value*
Sex			.43
Male	125 (65.1%)	161 (61.5%)	
Female	67 (34.9%)	101 (38.5%)	
Age			.55
Mean (SD)	60.9 (12.3)	60.2 (12.4)	
Race			.17
White	187 (97.4%)	252 (96.1%)	
Black	1 (<1%)	7 (2.7%)	
Other	4 (2.1%)	3 (1.1%)	
Stage			.54
Early (0–2)	74 (38.5%)	97 (37.0%)	
Advanced (3–4)	106 (55.2%)	144 (55.0%)	
Not stageable/unknown	12 (6.2%)	21 (8.0%)	
Site			.09
Oral cavity	72 (37.5%)	117 (44.6%)	
Oropharynx	39 (20.3%)	57 (21.7%)	
Hypopharynx	7 (3.6%)	12 (4.6%)	
Larynx	45 (23.4%)	35 (13.4%)	
Else/unknown	29 (15.1%)	41 (15.6%)	
Treatment			.78
Surgery only	70 (36.5%)	97 (37.0%)	
Chemotherapy only	0 (0%)	1 (<1%)	
Radiotherapy only	23 (12.0%)	22 (8.4%)	
Combination	84 (43.7%)	118 (45.0%)	
Other/unknown	15 (7.8%)	24 (9.2%)	
Smoking status			.43
Current	57 (29.7%)	67 (25.6%)	
Previous	91 (47.4%)	126 (48.1%)	
Never	44 (22.9%)	69 (26.3%)	
Drinking status			.21
Current	106 (55.2%)	160 (61.0%)	
Previous	86 (44.8%)	102 (38.9%)	
SMAST score (Mean/SD/95% CI)	2.07 (2.95); 1.65–2.49	1.51 (2.66); 1.19–1.84	.03
SMAST score			.01
0–1	116 (60.4%)	193 (73.6%)	
2	29 (15.1%)	18 (6.9%)	
3+	47 (24.5%)	51 (19.5%)	
BDI score (Mean/SD/95% CI)	8.5 (7.6); 7.5–9.4	8.3 (6.6); 7.6–9.0	.77
Minimal (0–9)	124 (64.6)	172 (65.6)	.93

	Rural N = 192 (42.3%)	**Urban N = 262 (57.7%)**	***p-value***
Mild (10–18)	55 (28.6)	76 (29.0)	
Moderate (19–29)	9 (4.7)	10 (3.8)	
Severe (30+)	4 (2.1)	4 (1.5)	
HNCI scores (Mean/SD/95% CI)			
Aesthetics	87.5 (21.4); 84.6–90.5	85.7 (24.6); 82.9–88.4	.42
Eating	71.4 (25.8); 68.1–74.7	70.7 (25.0); 67.9–73.5	.77
Speech	74.3 (23.1); 71.2–77.4	77.5 (22.2); 75.0–80.0	.14
Social Disruption	80.5 (21.0); 77.8–83.3	82.0 (19.6); 79.8–84.2	.39

Note: T-tests and chi-square test used as appropriate.

Table 2.

Multivariable regression analysis examining the association of selected characteristics with SMAST score at diagnosis

Variable	Standardized Beta Coefficient	sr^2	p-value
Age	**−.107**	**.010**	**.02**
Depressive symptoms	**.175**	**.029**	**<.001**
Rurality	**.095**	**.010**	**.04**
Site	.015	.001	.31
Stage	.012	.001	.25
Tobacco use	**.244**	**.057**	**<.001**

Note. N = 435. Analysis adjusted for age, cancer site and stage, depressive symptoms at diagnosis, and tobacco use at diagnosis; sr^2 = squared semi-partial correlation; SMAST = Short Michigan Alcoholism Screening Test.

Table 3.

Covariate-adjusted mean HNCI domain scores by problem drinking status in rural patients

Outcome	Problem Use (SMAST 3+) Mean/SE N =47	Non-problem Use (SMAST <3) Mean/SE N =145
Diagnosis		
Aesthetics	81.9 (3.4)	89.0 (1.9)
Eating	66.0 (4.2)	73.0 (2.3)
Speech	69.9 (3.7)	75.7 (2.1)
Social Disruption	75.6 (3.4)	80.1 (1.9)
3-month f/u		
Aesthetics	67.7 (5.5)	72.1 (3.2)
Eating	41.8 (5.5)	46.5 (3.2)
Speech	63.7 (5.3)	64.8 (2.9)
Social Disruption	64.9 (4.9)	71.3 (2.8)
12-month f/u		
Aesthetics	73.5 (5.5)	79.5 (2.8)
Eating	57.5 (5.7)	58.9 (2.8)
Speech	63.7 (5.0)	73.7 (2.3)
Social Disruption	74.9 (3.9)	84.2 (1.9)

Note. N = 192. Analysis adjusted for age, depressive symptoms at diagnosis, and tobacco use at diagnosis; HNCI = Head and Neck Cancer Inventory; SE = standard error; SMAST = Short Michigan Alcoholism Screening Test.