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Racial/Ethnic and Rural Differences in Alcohol Use, Care, and Related Outcomes
among VA Patients Living with HIV

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Abstract

Racial/Ethnic and Rural Differences in Alcohol Use, Care, and Related Outcomes among VA Patients Living with HIV

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Alcohol use is common and particularly risky for people living with HIV (PLWH). Certain subpopulations of PLWH, such as racial/ethnic minorities and rural PLWH, may be at particularly increased risk of adverse alcohol-related outcomes. This dissertation describes differences in alcohol-related mortality risk across racial/ethnic groups (Aim 1), patterns of alcohol use across rurality (Aim 2), and the receipt of alcohol related care across both rurality and race/ethnicity (Aims 3a and 3b).

In Aim 1, we found that PLWH from all racial/ethnic groups have increased mortality risk at higher-risk, relative to lower-risk drinkers. White patients have increased mortality risk relative to black patients at higher-risk levels of drinking, and black patients have increased mortality risk relative to white patients at lower-levels of drinking.

In Aim 2, we found that patterns of alcohol use vary across rurality among PLWH. Urban PLWH appear to be more likely to report any alcohol use, although this association varies across

region and by neighborhood poverty level. Among drinkers, PLWH from small rural communities may be more likely to drink at higher-risk levels.

In Aims 3a and 3b, we identified differences in receipt of alcohol related care across both rurality and race/ethnicity among PLWH. Large rural PLWH are more likely to receive brief interventions overall, in the Midwest, and the South, but may be less likely than urban PLWH in the Northeast. Urban patients are more likely than large or small rural patients to receive specialty addictions treatment. Black PLWH were more likely to receive specialty addictions treatment. There were no differences across rurality or race/ethnicity in receipt of AUD medications.

In this dissertation, we document differences in alcohol use, care, and outcomes among PLWH across rurality and race/ethnicity. Specifically, black PLWH have increased mortality risk at lower levels of drinking but more likely to receipt specialty addictions treatment than Hispanic and white patients. Additionally, rural PLWH may be more likely to drink at higher risk levels of drinking, but are less likely to receive specialty addictions treatment. These differences highlight important areas for future interventions.

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DEDICATION

This dissertation is dedicated to: 1) the memory of my beloved grandfather, Loren B. Bensley, Jr., Professor of Health Education at Central Michigan University (1934 - 2016); and 2) to all veterans who are living with HIV.

Chapter 1. INTRODUCTION

1.1 ALCOHOL USE IS COMMON AND HARMFUL

Alcohol use is common and known to be associated with many adverse health outcomes,¹ particularly among people living with HIV (PLWH).^{2,3} Among drinkers, there is a spectrum of alcohol use based on frequency and quantity of alcohol consumption, which is associated with increased corresponding risk.^{4,5} Specifically, among PLWH, alcohol use is associated with increased risk of HIV transmission, delayed entry to treatment, decreased engagement with HIV care,^{6,7} non-adherence to ART, increased disease progression,⁶ and mortality.^{6,8-14} While no level of alcohol use appears to be “safe” for PLWH, risk of adverse outcomes is generally increased for those with higher severity of alcohol use — unhealthy alcohol use — relative to those who drink at lower-risk levels.^{13,15} Unhealthy alcohol use is also a spectrum. Those with the most severe unhealthy alcohol use meet diagnostic criteria for alcohol use disorders (AUD), due to experience of physiological dependence, uncontrollable use, and functional consequences of drinking.¹⁶ To address the spectrum of unhealthy alcohol use, including alcohol use disorders, there are several evidence-based interventions, although none are universally effective, and most people with unhealthy alcohol use do not receive alcohol-related care.¹⁷

The reasons people drink, experience alcohol-related outcomes, and receive alcohol-related care are complex and not fully understood. Societal, or contextual factors and the lived experience play an important role predicting socially determined individual level risk factors as well as alcohol consumption patterns, health outcomes associated with alcohol use,¹⁸ and receipt of alcohol related care.¹⁹ Therefore, understanding how contextual factors and socially determined individual level risk factors affect drinking patterns is key to understanding which

populations have greatest risk of any and unhealthy alcohol use, under-receipt of alcohol-related care, and adverse alcohol-related outcomes. This variation may be particularly important among PLWH, who experience increased HIV-related stigma and have increased risk of poor health outcomes due to HIV comorbidity.

Throughout the life of the epidemic, HIV has disproportionately burdened vulnerable populations, such as sexual minorities (e.g., men who have sex with men), people living in poverty, and racial/ethnic minorities. Vulnerable populations are subpopulations with increased risk of risks due to shared social characteristics that expose them to specific contextual conditions that increase risk of poor outcomes.^{20,21} As alcohol use patterns, experience of alcohol-related outcomes, and receipt of alcohol related care are affected by contextual factors, it is likely that there are subpopulations of vulnerable PLWH who may be particularly at risk. For example, among VA patients with unhealthy alcohol use, patients with HIV appear to be more likely than those without HIV to be black, divorced/separated or single, and to have higher prevalence of major depression, other mood disorders, anxiety, serious mental illness, and to have stimulant, opioid, or other drug use disorders.²² The effects of these contextual factors are exemplified in Figure 1.1, showing how alcohol consumption is associated with alcohol related outcomes, and may be modified with effective alcohol-related care. These associations are moderated by several individual-level factors, including HIV comorbidity, which themselves can be affected by social context, including HIV-related stigma.

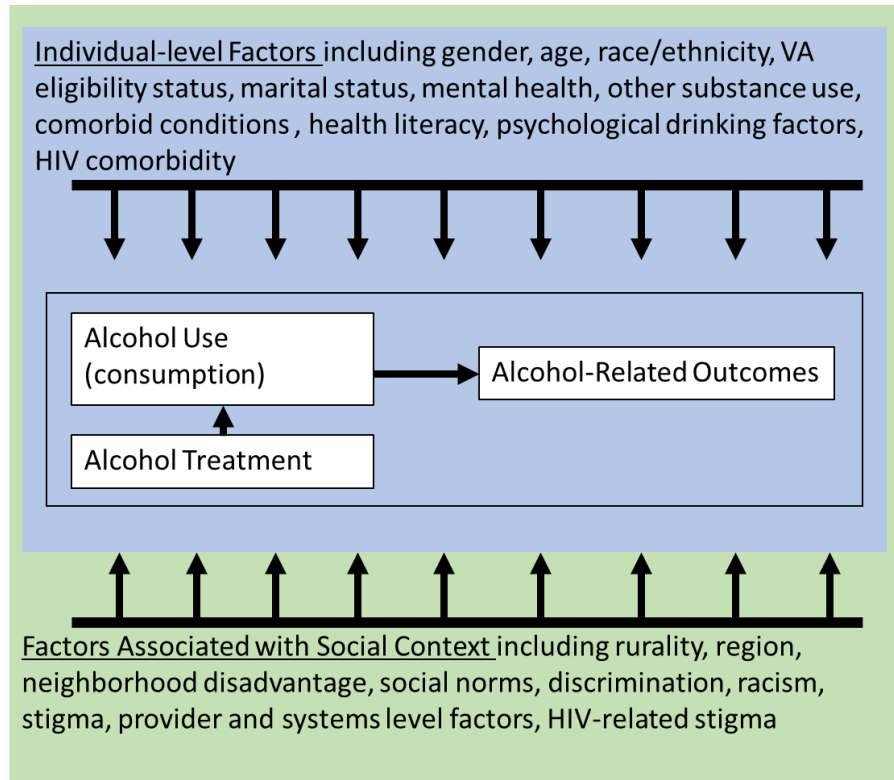


Figure 1.1. Conceptual model showing individual and social/contextual factors affecting alcohol use, care, and outcomes among PLWH

1.2 ALCOHOL USE MAY BE PARTICULARLY HARMFUL AMONG RACIAL/ETHNIC MINORITY PLWH

Across racial/ethnic groups, in studies of non-HIV specific populations, racial/ethnic minorities experience worse consequences of alcohol use than whites.^{23,24} In addition, the association between alcohol use and mortality varies by race/ethnicity, such that black individuals have a higher risk of mortality at lower levels of drinking than white individuals.^{25,26} While it has not been previously studied, there are reasons that these differences in alcohol-related consequences may exist specifically among PLWH. Racial/ethnic minority PLWH experience increased HIV stigma relative to white PLWH.²⁷ Additionally, racial/ethnic minorities experience increased socioeconomic disadvantage and increased persecution²⁴ that may make drinking consequences worse for racial/ethnic minority PLWH relative to white

PLWH.^{28–32} In Chapter 2, we compare racial/ethnic differences in the association between alcohol use and mortality among PLWH.

1.3 RURAL PLWH ARE AN UNDERSTUDIED SUBPOPULATION OF PLWH WHO MAY HAVE UNIQUE ALCOHOL-RELATED RISKS

Historically HIV has primarily affected those in urban communities.³³ However, HIV presents a significant in rural communities as well, particularly in the South.² Previous studies in non-HIV specific populations show that rural individuals are more likely to abstain from alcohol use,^{35–38} but among those who do drink, rural individuals often drink at similar levels³⁷ or even more heavily than urban or suburban counterparts.^{36,38,39} These differences in alcohol use across rurality may be due to a number of factors, including differences in religiosity,⁴⁰ population age,⁴¹ social support,⁴² availability of alcohol,⁴³ and enforcement of alcohol laws.

Drinking patterns and access to alcohol-related care among rural PLWH have not been previously described in a national sample.⁴⁴ Stigma of and discrimination against PLWH are often higher in areas with low HIV prevalence, such as rural communities.⁴⁵ PLWH in rural communities may experience increased HIV stigma relative to urban PLWH.^{45–47} This increased experience of stigma may be associated with increased drinking to cope with negative affect.^{28,29,48} Therefore, in Chapter 3, we described alcohol use patterns – including any alcohol use, levels of drinking, heavy episodic drinking, and alcohol use disorders – across rurality and tested for an association between rurality and patterns of alcohol use. Additionally, while urban and rural differences in alcohol use in non-HIV specific populations have been documented, and some reasons for differences have been suggested above, it is not clear what might drive differences in patterns of alcohol use specifically among PLWH.

Therefore, in Chapter 3, we also tested whether neighborhood poverty, depression status, or region moderated the associations between rurality and alcohol. In testing these interactions, we were able to generate hypotheses about what may be moderating differences across rurality, and better understand some of the complicated ways lived experiences affect drinking behaviors of PLWH.

1.4 VA AS AN IDEAL LABORATORY FOR STUDYING RECEIPT OF ALCOHOL-RELATED CARE AMONG VULNERABLE SUBPOPULATIONS OF PLWH

The U.S. Veterans Health Administration (VA) offers an important opportunity to study alcohol use patterns, outcomes, and related care among PLWH. The VA is the largest single provider of medical care to PLWH in the United States, with over 26,000 PLWH receiving care from the VA in 2013. Use of this large sample of PLWH allows a unique opportunity to study alcohol use, care, and outcomes among particularly vulnerable sub-populations of PLWH, such as those living in rural areas, which has not previously been possible to study nationally in smaller samples due to limited power.

Since 2004, the VA has been offering screening for unhealthy alcohol use with the three-item Alcohol Use Disorders Identification Test Consumption AUDIT-C), which measures frequency of drinking, quantity of consumption on a typical drinking day, and frequency of heavy episodic drinking in the past year. Since 2008, AUDIT-C data have been available nationally, allowing clinical epidemiologic studies of alcohol use among patients receiving care.⁴⁹ All patients are screened annually with the AUDIT-C at the VA, regardless of diagnoses or receipt of alcohol-related care.

The VA is also a leader in implementation of alcohol-related care. Brief interventions are recommended among patients with unhealthy alcohol use, although these are not considered to

be an effective treatment for those with most severe unhealthy alcohol use, or alcohol use disorder.⁵⁰ To encourage implementation of brief interventions among those with unhealthy alcohol use, there is a performance measure.⁴⁹ Brief interventions include EHR documentation of advice to reduce or abstain drinking within 14 days of a positive AUDIT-C screen,⁴⁹ derived from text data generated when care is documented in electronic clinical decision support. However, among VA patients with unhealthy alcohol use, those with HIV receive less brief interventions than those without HIV.²² This is troubling, and given that individual and contextual factors may influence access to treatment, examination of further variation in vulnerable subpopulations of PLWH is warranted.

For those with alcohol use disorders, there are two recommended forms of treatment: specialty addictions treatment and AUD medications. Specialty addictions treatment includes any visits to VA specialty addictions treatment (measured by VA clinic stop and bed section codes for substance use treatment along with an AUD diagnosis). VA specialty addictions treatment includes a variety of treatment options (from detox to psychosocial interventions and twelve step programs) for those with AUD. VA clinical guidelines suggest that these treatments vary based on an individual's current needs and should be agreed on by physicians and patients using shared decision making.⁵⁰

AUD medications are also evidence-based treatment for those with AUD. These include for medications: acamprostate, disulfiram, topiramate, or oral or injectable naltrexone,²² which can be prescribed in any treatment setting. These medications have FDA approval for treatment of AUD or strong meta-analytic support for their use in the treatment of AUD⁵¹ and have demonstrated effectiveness at helping to decrease alcohol use by decreasing cravings, relieving withdrawal symptoms, or increasing experience of adverse acute reactions to alcohol (to

dissuade use).⁵⁰ While one previous study found no differences in receipt of specialty addictions treatment or AUD medications among those with and without HIV, overall receipt of these types of alcohol-related care is low at the VA and receipt of care may vary in vulnerable subpopulations.²²

1.5 RECEIPT OF ALCOHOL-RELATED CARE MAY DIFFER ACROSS SUBPOPULATIONS OF PLWH

Differences in receipt of alcohol-related care are not well known in non-HIV specific nor HIV-specific populations. Generally, decreased accessibility to care is more common among rural relative to urban PLWH.³⁵ There were two early studies examining receipt of alcohol-related care across rurality. The first study was in a non-HIV specific clinical population and showed that rural drinkers were more likely than urban ones to report receipt of alcohol-related care across treatment settings in bivariate analyses, although patients receiving more alcohol-related care also had more severe alcohol use and thus greater need.³⁵ Another early study in an HIV-specific population showed that urban PLWH were more likely to receive alcohol related care.⁵² However, both of these studies are over 15 years old, limiting more recent comparison. Understanding what gaps in receipt of alcohol-related care exist among PLWH is necessary for focusing and developing interventions. Thus, in Chapter 4 we describe receipt of alcohol-related care across rurality. Specifically, we describe receipt of brief intervention, specialty addictions treatment, and AUD medications across rurality among PLWH with unhealthy alcohol use. Because specifically in the south, previous studies have shown that rural PLWH experience lack of transportation, lack of available services, and increased stigma,⁵³ we also test the moderating effect of region on the association between rurality and receipt of alcohol-related care. Additionally, due to the strong association between alcohol use and depression,^{54,55} and the

clinical importance of depression status affecting ART adherence,⁵⁶⁻⁵⁸ we tested moderation across depression status as well.

Differences in receipt of care have been more thoroughly documented across racial/ethnic groups. In non-HIV-specific populations, previous studies have demonstrated that black patients with unhealthy alcohol use are more likely than white to receive brief intervention,^{19,59,60} specialty addictions treatment,^{61,62} but less likely to receive pharmacotherapy for AUD, or AUD medications.⁶³ Given that alcohol use is particularly harmful for PLWH, and given the importance of alcohol use in modifying HIV-related risk, it is important to understand whether alcohol-related care is received equitably across racial/ethnic groups among PLWH, which is explored in Chapter 5. Variation across region and depression status is also considered.

1.6 SUMMARY

The proposed research in this dissertation begins to identify whether some subpopulations of PLWH are particularly vulnerable regarding alcohol-related outcomes by exploring differences in alcohol use, care, and outcomes across racial/ethnic groups and rural status. Specifically, we examine whether the association between level of alcohol use and mortality varies across racial/ethnic groups (Chapter 2), whether patterns of alcohol use vary across rurality (Chapter 3), and whether PLWH with unhealthy alcohol use equitably receive evidence-based care that may reduce drinking and improve outcomes across rurality (Chapter 4) and race/ethnicity (Chapter 5). This research will begin the work of identifying sub-populations of PLWH that should be targeted by interventions to decrease alcohol-related outcomes, as well as to assess equity of current efforts and identify populations for whom increased efforts may be needed to address unhealthy alcohol use within healthcare settings.

Importantly, discussion of all three aims together will also allow us to better understand how rurality and race/ethnicity shape alcohol-related risk among PLWH. These findings will provide support for future policies and interventions to help improve alcohol-related services for PLWH at the VA and in other healthcare settings. In assessing disparities in receipt of alcohol-related care in addition to disparities in prevalence of alcohol use and outcomes, we are able describe whether current interventions adequately address existing health disparities in alcohol-related outcomes among PLWH, or whether additional clinical efforts, or additional efforts outside of health care, are needed to effectively address alcohol use and prevent poor outcomes equitably across subpopulations of PLWH.

1.7 NOTES FOR CHAPTER 1

1. Room R, Babor T, Rehm J. Alcohol and public health. *Lancet*. 2005;365(9458):519-530. doi:10.1016/S0140-6736(05)17870-2.
2. Freiberg MS, McGinnis KA, Kraemer K, et al. The Association Between Alcohol Consumption and Prevalent Cardiovascular Diseases Among HIV-Infected and HIV-Uninfected Men: *JAIDS J Acquir Immune Defic Syndr*. 2010;53(2):247-253. doi:10.1097/QAI.0b013e3181c6c4b7.
3. Samet JH, Phillips SJ, Horton NJ, Traphagen ET, Freedberg KA. Detecting alcohol problems in HIV-infected patients: use of the CAGE questionnaire. *AIDS Res Hum Retroviruses*. 2004;20(2):151-155. doi:10.1089/088922204773004860.
4. Taylor B, Irving HM, Baliunas D, et al. Alcohol and hypertension: gender differences in dose-response relationships determined through systematic review and meta-analysis: Alcohol and hypertension: a meta-analysis. *Addiction*. 2009;104(12):1981-1990. doi:10.1111/j.1360-0443.2009.02694.x.
5. Moskal A, Norat T, Ferrari P, Riboli E. Alcohol intake and colorectal cancer risk: A dose-response meta-analysis of published cohort studies. *Int J Cancer*. 2007;120(3):664-671. doi:10.1002/ijc.22299.
6. Hahn JA, Samet JH. Alcohol and HIV Disease Progression: Weighing the Evidence. *Curr HIV/AIDS Rep*. 2010;7(4):226-233. doi:10.1007/s11904-010-0060-6.
7. Azar MM, Springer SA, Meyer JP, Altice FL. A systematic review of the impact of alcohol use disorders on HIV treatment outcomes, adherence to antiretroviral therapy and health care utilization. *Drug Alcohol Depend*. 2010;112(3):178-193. doi:10.1016/j.drugalcdep.2010.06.014.
8. Braithwaite RS, Conigliaro J, Roberts MS, et al. Estimating the impact of alcohol consumption on survival for HIV+ individuals. *AIDS Care*. 2007;19(4):459-466. doi:10.1080/09540120601095734.
9. Bryant KJ, Nelson S, Braithwaite RS, Roach D. Integrating HIV/AIDS and alcohol research. *Alcohol Res Health J Natl Inst Alcohol Abuse Alcohol*. 2010;33(3):167-178.
10. Schneider M, Chersich M, Neuman M, Parry C. Alcohol consumption and HIV/AIDS: the neglected interface. *Addict Abingdon Engl*. 2012;107(8):1369-1371. doi:10.1111/j.1360-0443.2012.03824.x.
11. Braithwaite RS, McGinnis KA, Conigliaro J, et al. A Temporal and Dose-Response Association Between Alcohol Consumption and Medication Adherence Among Veterans in Care: *Alcohol Clin Exp Res*. 2005;29(7):1190-1197. doi:10.1097/01.ALC.0000171937.87731.28.

12. Kinder LS, Bryson CL, Sun H, Williams EC, Bradley KA. Alcohol screening scores and all-cause mortality in male Veterans Affairs patients. *J Stud Alcohol Drugs*. 2009;70(2):253-260.
13. Wandeler G, Kraus D, Fehr J, et al. The J-curve in HIV: low and moderate alcohol intake predicts mortality but not the occurrence of major cardiovascular events. *J Acquir Immune Defic Syndr* 1999. October 2015. doi:10.1097/QAI.0000000000000864.
14. Braithwaite RS, Bryant KJ. Influence of alcohol consumption on adherence to and toxicity of antiretroviral therapy and survival. *Alcohol Res Health J Natl Inst Alcohol Abuse Alcohol*. 2010;33(3):280-287.
15. Braithwaite RS, Conigliaro J, Roberts MS, et al. Estimating the impact of alcohol consumption on survival for HIV+ individuals. *AIDS Care*. 2007;19(4):459-466. doi:10.1080/09540120601095734.
16. American Psychiatric Association, American Psychiatric Association, eds. *Diagnostic and Statistical Manual of Mental Disorders: DSM-5*. 5th ed. Washington, D.C: American Psychiatric Association; 2013.
17. Cohen E, Feinn R, Arias A, Kranzler HR. Alcohol treatment utilization: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug Alcohol Depend*. 2007;86(2-3):214-221. doi:10.1016/j.drugalcdep.2006.06.008.
18. Shield KD, Parry C, Rehm J. Chronic Diseases and Conditions Related to Alcohol Use. *Alcohol Res Curr Rev*. 2014;35(2):155-171.
19. Williams EC, Lapham GT, Hawkins EJ, et al. Variation in Documented Care for Unhealthy Alcohol Consumption Across Race/Ethnicity in the Department of Veterans Affairs Healthcare System. *Alcohol Clin Exp Res*. 2012;36(9):1614-1622. doi:10.1111/j.1530-0277.2012.01761.x.
20. Frohlich KL, Potvin L. Transcending the Known in Public Health Practice: The Inequality Paradox: The Population Approach and Vulnerable Populations. *Am J Public Health*. 2008;98(2):216-221. doi:10.2105/AJPH.2007.114777.
21. Link BG, Phelan J. Social conditions as fundamental causes of disease. *J Health Soc Behav*. 1995;Spec No:80-94.
22. Williams EC, Lapham GT, Shortreed SM, et al. Among patients with unhealthy alcohol use, those with HIV are less likely than those without to receive evidence-based alcohol-related care: A national VA study. *Drug Alcohol Depend*. 2017;174:113-120. doi:10.1016/j.drugalcdep.2017.01.018.
23. Mulia N, Ye Y, Greenfield TK, Zemore SE. Disparities in alcohol-related problems among white, black, and Hispanic Americans. *Alcohol Clin Exp Res*. 2009;33(4):654-662. doi:10.1111/j.1530-0277.2008.00880.x.

24. Zemore SE, Ye Y, Mulia N, Martinez P, Jones-Webb R, Karriker-Jaffe K. Poor, persecuted, young, and alone: Toward explaining the elevated risk of alcohol problems among Black and Latino men who drink. *Drug Alcohol Depend.* March 2016. doi:10.1016/j.drugalcdep.2016.03.008.
25. Williams EC, Bradley KA, Gupta S, Harris AHS. Association Between Alcohol Screening Scores and Mortality in Black, Hispanic, and White Male Veterans. *Alcohol Clin Exp Res.* 2012;36(12):2132-2140. doi:10.1111/j.1530-0277.2012.01842.x.
26. Kerr WC, Greenfield TK, Bond J, Ye Y, Rehm J. Racial and Ethnic Differences in All-Cause Mortality Risk According to Alcohol Consumption Patterns in the National Alcohol Surveys. *Am J Epidemiol.* 2011;174(7):769-778. doi:10.1093/aje/kwr147.
27. Venable PA, Carey MP, Blair DC, Littlewood RA. Impact of HIV-Related Stigma on Health Behaviors and Psychological Adjustment Among HIV-Positive Men and Women. *AIDS Behav.* 2006;10(5):473-482. doi:10.1007/s10461-006-9099-1.
28. Martin JK, Tuch SA, Roman PM. Problem Drinking Patterns among African Americans: The Impacts of Reports of Discrimination, Perceptions of Prejudice, and “Risky” Coping Strategies. *J Health Soc Behav.* 2003;44(3):408-425.
29. Power R, Koopman C, Volk J, et al. Social Support, Substance Use, and Denial in Relationship to Antiretroviral Treatment Adherence among HIV-Infected Persons. *AIDS Patient Care STDs.* 2003;17(5):245-252. doi:10.1089/108729103321655890.
30. Elliott JC, Aharonovich E, O’Leary A, Wainberg M, Hasin DS. Drinking motives as prospective predictors of outcome in an intervention trial with heavily drinking HIV patients. *Drug Alcohol Depend.* 2014;134:290-295. doi:10.1016/j.drugalcdep.2013.10.026.
31. Murphy DA, Greenwell L, Hoffman D. Factors associated with antiretroviral adherence among HIV-infected women with children. *Women Health.* 2002;36(1):97–111.
32. Singh N, Berman SM, Swindells S, et al. Adherence of Human Immunodeficiency Virus–Infected Patients to Antiretroviral Therapy. *Clin Infect Dis.* 1999;29(4):824-830. doi:10.1086/520443.
33. Hall HI, Li J, McKenna MT. HIV in predominantly rural areas of the United States. *J Rural Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc.* 2005;21(3):245-253.
34. Reif S, Pence BW, Hall I, Hu X, Whetten K, Wilson E. HIV Diagnoses, Prevalence and Outcomes in Nine Southern States. *J Community Health.* 2015;40(4):642-651. doi:10.1007/s10900-014-9979-7.
35. Booth BM, Kirchner J, Fortney J, Ross R, Rost K. Rural at-risk drinkers: correlates and one-year use of alcoholism treatment services. *J Stud Alcohol.* 2000;61(2):267-277.
36. 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 Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc.* 2007;23(4):314-321. doi:10.1111/j.1748-0361.2007.00109.x.
37. Williams EC, McFarland LV, Nelson KM. Alcohol consumption among urban, suburban, and rural Veterans Affairs outpatients. *J Rural Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc.* 2012;28(2):202-210. doi:10.1111/j.1748-0361.2011.00389.x.
 38. Vander Weg MW, Cai X. Variability in Veterans' Alcohol Use by Place of Residence: Alcohol Use in Veterans. *Am J Addict.* 2012;21(1):31-37. doi:10.1111/j.1521-0391.2011.00191.x.
 39. Spence RT, Wallisch LS. Alcohol and Drug Use in Rural Colonias and Adjacent Urban Areas of the Texas Border. *J Rural Health.* 2007;23(s1):55-60. doi:10.1111/j.1748-0361.2007.00124.x.
 40. Borders TF, Curran GM, Mattox R, Booth BM. Religiousness among at-risk drinkers: is it prospectively associated with the development or maintenance of an alcohol-use disorder? *J Stud Alcohol Drugs.* 2010;71(1):136-142.
 41. Coward RT, Krout JA, eds. *Aging in Rural Settings: Life Circumstances and Distinctive Features.* New York: Springer Pub. Co; 1998.
 42. Boso LA. Urban bias, rural sexual minorities, and the courts. *UCLA Rev.* 2012;60:562.
 43. Pereira G, Wood L, Foster S, Haggart F. Access to Alcohol Outlets, Alcohol Consumption and Mental Health. Mazza M, ed. *PLoS ONE.* 2013;8(1):e53461. doi:10.1371/journal.pone.0053461.
 44. Dixon MA, Chartier KG. Alcohol Use Patterns Among Urban and Rural Residents: Demographic and Social Influences. *Alcohol Res Curr Rev.* 2016;38(1):69-77.
 45. Zukoski AP, Thorburn S. Experiences of stigma and discrimination among adults living with HIV in a low HIV-prevalence context: a qualitative analysis. *AIDS Patient Care STDs.* 2009;23(4):267-276. doi:10.1089/apc.2008.0168.
 46. Florom-Smith AL, De Santis JP. Exploring the Concept of HIV-Related Stigma: HIV-Related Stigma. *Nurs Forum (Auckl).* 2012;47(3):153-165. doi:10.1111/j.1744-6198.2011.00235.x.
 47. Reif S, Golin CE, Smith SR. Barriers to accessing HIV/AIDS care in North Carolina: rural and urban differences. *AIDS Care.* 2005;17(5):558-565. doi:10.1080/09540120412331319750.
 48. Hatzenbuehler ML. How does sexual minority stigma "get under the skin"? A psychological mediation framework. *Psychol Bull.* 2009;135(5):707-730. doi:10.1037/a0016441.

49. Lapham GT, Achtmeyer CE, Williams EC, Hawkins EJ, Kivlahan DR, Bradley KA. Increased Documented Brief Alcohol Interventions With a Performance Measure and Electronic Decision Support: *Med Care*. 2012;50(2):179-187. doi:10.1097/MLR.0b013e3181e35743.
50. VA/DoD Clinical Guideline for the Management of Substance Use Disorders. Washington, D.C.: The Management of Substance Use Disorders Work Group; 2015. <https://www.healthquality.va.gov/guidelines/MH/sud/VADoDSUDCPGRevised22216.pdf>.
51. Jonas DE, Amick HR, Feltner C, et al. Pharmacotherapy for Adults With Alcohol Use Disorders in Outpatient Settings: A Systematic Review and Meta-analysis. *JAMA*. 2014;311(18):1889. doi:10.1001/jama.2014.3628.
52. Burnam MA, Bing EG, Morton SC, et al. Use of Mental Health and Substance Abuse Treatment Services Among Adults With HIV in the United States. *Arch Gen Psychiatry*. 2001;58(8):729. doi:10.1001/archpsyc.58.8.729.
53. Browne T, Priester MA, Clone S, Iachini A, DeHart D, Hock R. Barriers and Facilitators to Substance Use Treatment in the Rural South: A Qualitative Study: Substance Use Treatment Barriers and Facilitators. *J Rural Health*. 2016;32(1):92-101. doi:10.1111/jrh.12129.
54. Fergusson DM, Boden JM, Horwood LJ. Tests of Causal Links Between Alcohol Abuse or Dependence and Major Depression. *Arch Gen Psychiatry*. 2009;66(3):260. doi:10.1001/archgenpsychiatry.2008.543.
55. Sullivan LE, Fiellin DA, O'Connor PG. The prevalence and impact of alcohol problems in major depression: a systematic review. *Am J Med*. 2005;118(4):330-341. doi:10.1016/j.amjmed.2005.01.007.
56. Gonzalez JS, Batchelder AW, Psaros C, Safren SA. Depression and HIV/AIDS treatment nonadherence: a review and meta-analysis. *J Acquir Immune Defic Syndr* 1999. 2011;58(2):181-187. doi:10.1097/QAI.0b013e31822d490a.
57. Kong MC, Nahata MC, Lacombe VA, Seiber EE, Balkrishnan R. Association between race, depression, and antiretroviral therapy adherence in a low-income population with HIV infection. *J Gen Intern Med*. 2012;27(9):1159-1164. doi:10.1007/s11606-012-2043-3.
58. Krumme AA, Kaigamba F, Binagwaho A, Murray MB, Rich ML, Franke MF. Depression, adherence and attrition from care in HIV-infected adults receiving antiretroviral therapy. *J Epidemiol Community Health*. 2015;69(3):284-289. doi:10.1136/jech-2014-204494.
59. Arndt S, Acion L, White K. How the states stack up: disparities in substance abuse outpatient treatment completion rates for minorities. *Drug Alcohol Depend*. 2013;132(3):547-554. doi:10.1016/j.drugalcdep.2013.03.015.

60. Dobscha SK, Soleck GD, Dickinson KC, et al. Associations between race and ethnicity and treatment for chronic pain in the VA. *J Pain Off J Am Pain Soc.* 2009;10(10):1078-1087. doi:10.1016/j.jpain.2009.04.018.
61. Glass JE, Perron BE, Ilgen MA, Chermack ST, Ratliff S, Zivin K. Prevalence and correlates of specialty substance use disorder treatment for Department of Veterans Affairs Healthcare System patients with high alcohol consumption. *Drug Alcohol Depend.* 2010;112(1-2):150-155. doi:10.1016/j.drugalcdep.2010.06.003.
62. Bensley KM, Harris AHS, Gupta S, et al. Racial/ethnic Differences in Initiation of and Engagement with Addictions Treatment among Patients with Alcohol Use Disorders in the Veterans Health Administration. *J Subst Abuse Treat.* August 2016. doi:10.1016/j.jsat.2016.08.009.
63. Williams EC, Gupta S, Rubinsky AD, et al. Variation in receipt of pharmacotherapy for alcohol use disorders across racial/ethnic groups: A national study in the U.S. Veterans Health Administration. *Drug Alcohol Depend.* July 2017. doi:10.1016/j.drugalcdep.2017.06.011.

Chapter 2. RACIAL/ETHNIC DIFFERENCES IN THE ASSOCIATION BETWEEN ALCOHOL USE AND MORTALITY AMONG MEN LIVING WITH HIV

2.1 INTRODUCTION

Alcohol use is common among people living with human immunodeficiency virus (HIV) and has known adverse effects on HIV-related outcomes. Via both behavioral and biological mechanisms, alcohol use adversely influences health among patients living with HIV (PLWH) and is associated with worse engagement in and poorer outcomes of HIV treatment, and ultimately with mortality among PLWH.¹⁻⁵ While no level of alcohol use appears to be “safe” for PLWH, risk of adverse outcomes is generally increased for those with higher severity of alcohol use relative to those who drink at lower levels.^{1,6}

HIV infection disproportionately impacts vulnerable populations⁷ including racial/ethnic minorities. Mortality rates among PLWH also differ across racial/ethnic groups, with black PLWH having the highest mortality rates and Hispanic the lowest.⁸ Racial/ethnic minority PLWH experience increased HIV stigma,⁹ socioeconomic disadvantage and increased persecution,¹⁰ and decreased access to care³ that may make drinking consequences worse for racial/ethnic minority¹⁰ relative to white PLWH.¹¹⁻¹⁵ Due to these experiences, non-white PLWH may have increased risk of mortality associated with alcohol use relative to whites. Previous studies in non-HIV-specific populations demonstrate that racial/ethnic minorities have worse consequences at similar levels of drinking¹⁶ and higher risk of mortality at lower levels of drinking than whites.¹⁷ Because risk factors and influences of health behaviors are likely to vary across racial/ethnic groups depending on their lived experiences, experts have called for studies to examine alcohol-related risk among vulnerable sub-populations of PLWH.⁵ No prior study

has examined whether the association between alcohol use and mortality varies across race/ethnicity among PLWH. Therefore, we evaluated whether the association between level of alcohol use and mortality differs across racial/ethnic groups in a national sample of PLWH.

2.2 METHODS

Data Source: The data source for this study is the Veterans Aging Cohort Study (VACS) virtual cohort, an observational cohort of patients who receive care at the nationwide Veterans Health Administration (VA) starting October 1, 1997.¹⁸ VACS data were extracted from the VA Informatics and Computing Infrastructure data warehouse, a national VA repository that includes clinical and administrative data for all VA patients, as well as clinical alcohol screening data (collected using the Alcohol Use Disorders Identification Test Consumption (AUDIT-C) questionnaire) since 2008.

Sample: We included all male PLWH with a documented AUDIT-C alcohol screening between October 1, 2008 and March 30, 2012 who reported drinking in the past year (AUDIT-C scores >0) and were documented to be one or more of the three major racial/ethnic groups in the United States: black, Hispanic, and/or white. Women, other minority groups, and patients with AUDIT-C scores indicating non-drinker status (AUDIT-C = 0) were excluded. Though research of this type is needed among women and other minority groups, associations between alcohol use and outcomes vary based on gender,¹⁹⁻²¹ and the numbers of both women and other minorities with HIV who also drink at high levels are very small in VACS. Exclusion of non-drinkers was done because the AUDIT-C score of 0 (non-drinker) does not differentiate between lifetime abstainers and those who have become abstinent due to other reasons (e.g., declining health), thus creating measurement error in this group difficult.^{1,6}

Predictor: Alcohol use was measured using the AUDIT-C, a validated screen for unhealthy alcohol use²²⁻²⁴ and a measure of alcohol use severity.^{25,26} AUDIT-C scores range from 0 – 12; scores of 0 represent non-drinkers, and increasing scores are associated with increased risk of multiple medical outcomes,^{27,28} alcohol use disorder symptoms,^{23-25,29,30} and mortality.^{4,17,27,31} For this study, the first AUDIT-C documented during the study period for each patient was used to measure levels of alcohol use based on clinically meaningful AUDIT-C cut-off scores for male patients:^{24,25} lower-risk (AUDIT-C 1-3), moderate-risk (AUDIT-C 4-7), and high-risk (AUDIT-C 8-12). AUDIT-C screening is conducted as part of routine health screening at the VA, thus AUDIT-C scores are documented annually for over 90% of all established outpatients.

Outcome: Time to death by any cause was specified as the primary outcome. Survival time was measured from date of the first AUDIT-C screening during the study period until death or loss to follow-up/end of study censoring, July 23, 2014.³² Death was measured using a validated measure created by combining four databases tracking deaths among VA patients: the Patient Treatment File, tracking hospital deaths within the VA System; the Beneficiary Identification Records Locating System, tracking VA death benefits; the Medicare Vital Status File; and the Social Security Death Master File, which has comparable completeness and accuracy to the National Death Index.³³

Effect Modifier: Race/ethnicity was categorized as non-Hispanic black, Hispanic, and non-Hispanic white.³⁴ Because patients can identify with multiple racial/ethnic groups, race/ethnicity was hierarchically coded, first as Hispanic ethnicity, and then as black and then white, consistent with single-race/ethnicity classification by rarest to most common racial/ethnic groups.³⁵

Covariates:

Age was categorized as <50, 50-64, and 65 and older. Secondary measures of age were also derived: age as a continuous linear variable and age as a quadratic variable (age squared).

HIV Disease Severity. Because HIV disease severity may confound the association between alcohol use and mortality,³⁶ four measures of severity were described using the closest documented measure in the 6 months prior to and following AUDIT-C screening. These included: CD4 count (<200, 200-500, >500 cells/mm³), a binary measure of viral load suppression (HIV-1 RNA <200 copies/mL), and Hemoglobin (>14, 12-13.9, 10-11.9, and <10 g/dL). In adjusted models, CD4 count was used to account for HIV disease severity as these measures are highly correlated. A binary measure of receipt of highly active antiretroviral therapy (HAART) at baseline AUDIT-C measure (prior to or within seven days after baseline AUDIT-C measure) was described across racial ethnic groups. However, as this was suspected *a priori* to be in the pathway between alcohol use and mortality, this was not included as a covariate in adjusted models. Other comorbid conditions were measured based on International Classification of Diseases 9th Edition (ICD-9 CM) codes documented any time between the beginning of VACS (10/1/97) and the baseline AUDIT-C measure. These included: non-AIDS related cancers (bladder, breast, buccal cavity and pharynx, digestive system, Hodgkin's lymphoma, ill-defined cancer, kidney, leukemia, male genital system, melanomas, non-epithelial skin cancer, penile, prostate, stomach, testicular, ureter, urinary system), lung disease (chronic obstructive pulmonary disorder, asthma, or other lung disease), cardiovascular disease (congestive heart failure, myocardial infarction/coronary artery disease, peripheral vascular disease, ischemic stroke, stroke), hypertension, diabetes, hepatitis B, hepatitis C, anxiety, major depression, psychosis (e.g., schizophrenia), and post-traumatic stress disorder.³⁷ Body mass

index (underweight < 18.5, normal/overweight = 18.6 – 29.9, obese > 30) was also included as HIV disease progression is associated with weight loss and wasting,³⁸ and higher BMI is associated with better HIV prognosis.³⁹

Other substance use measures included tobacco use (current, never, ever), measured using health factors data,⁴⁰ and current drug use (based on ICD-9 codes within one year prior to or 6 months after AUDIT-C screening). These were also considered as covariates as both are associated with alcohol use and mortality.

Analyses: Population characteristics, as well as levels of alcohol use and mortality rates, were described and compared across racial/ethnic groups; comparisons were done using Chi square tests of independence. To test the racial/ethnic differences in the association between alcohol use and mortality, we fit a Cox Proportional Hazards model with time to death as the outcome and level of alcohol use as the predictor, and tested a multiplicative interaction between racial/ethnic group and level of alcohol use. A Wald test was used to evaluate the overall significance of the interaction at p-value < 0.05, and adjusted hazard ratios were calculated to estimate associations between level of alcohol use and mortality within each racial/ethnic group. Models were first unadjusted (Model 1) and then adjusted additionally for: age (Model 2), age and HIV disease severity based on CD4 count (Model 3), and age, HIV severity, and comorbidities (Model 4). The iterative modeling strategy allowed for hypothesis-generation regarding what factors may be driving associations observed. Multiple imputation models were used to account for missing data in Cox Proportional Hazards models, particularly missing values for CD4 count, BMI, and smoking. To assess whether including age as a continuous linear or quadratic variable would better fit the model (i.e., address any residual confounding by age), models using categorical, linear, quadratic variables for age were tested among complete

cases, and model fit was compared using Akaike Information Criterion. Tests of model fit indicated similar fits and results across models, thus age was used as a categorical variable in the primary analyses. To begin to interpret the effect size of hazard ratios, we considered the magnitude of the observed comparisons.⁴¹ All analyses were conducted in Stata Version 13.⁴²

2.3 RESULTS

Eligible patients included 17,239 male PLWH; 49.4% were black, 7.9% were Hispanic, and 42.7% were white. The mean follow-up time was 4.3 years [Standard deviation (SD) = 1.3] for black, 4.3 (SD = 1.2) for Hispanic, and 4.4 (SD = 1.2) years for white PLWH.

Patient characteristics and levels of alcohol use differed across racial/ethnic groups (Table 1). Black patients had the highest prevalence of patients age 50-64, and were generally sicker than both white and Hispanic patients, having lower CD4 cell counts, higher viral loads, lower hemoglobin, and higher proportions of current smoking, drug use, underweight or obese, hypertension, Hepatitis C, and PTSD. Black patients also included the highest proportion of patients who were high and moderate risk drinkers. Hispanic patients were generally younger, but had higher prevalence of hepatitis B than other racial/ethnic groups. White patients were generally older, and had better measures of HIV disease severity and receipt of HAART than black patients (but similar to Hispanic patients). White PLWH also included the highest proportion with a non-AIDS related cancer, lung disease, cardiovascular disease. White patients had the highest proportion of lower-risk drinkers.

Mortality rates varied across racial ethnic groups (Table 2.1). Among all drinkers and lower-risk drinkers, black patients had the highest mortality rates, relative to Hispanic and white patients ($p=0.01$ and >0.01 respectively). There were no significant differences in mortality rates

across racial/ethnic groups among patients in the moderate or high-risk drinking levels. As level of alcohol risk increased, mortality rate also increased overall and across all racial/ethnic groups.

In all Cox Proportional Hazards models, the association between levels of alcohol use and mortality varied significantly across racial/ethnic groups (p-value of overall interactions for Models 1-4 <0.001). Associations between level of alcohol use and mortality risk within racial/ethnic groups differed based on covariate adjustment (Table 2.2). In unadjusted models (Model 1), and models adjusted for age only (Model 2), moderate- relative to lower-risk drinking was associated with significantly increased mortality risk for all patients across racial/ethnic groups. In models additionally adjusted for disease severity (Model 3), moderate- relative to lower-risk drinking was significantly associated with increased mortality risk only for whites and Hispanics. In models adjusted additionally for comorbidities (Model 4), moderate- relative to lower-risk drinking was associated with significantly (and only slightly) increased mortality risk only for white patients (Table 2.3). For all racial/ethnic groups, across all models (Models 1-4), high-risk drinking had a moderately greater⁴¹ mortality risk relative to lower-risk drinking, although this was attenuated somewhat by adjusting for covariates. The magnitude of the association appeared to differ such that Hispanic and white PLWH had higher mortality risk than black PLWH at high-risk levels of drinking relative to lower-risk levels, although the confidence intervals overlapped in many cases.

To examine magnitude of associations across racial/ethnic differences, the effect of race/ethnicity on mortality risk within each AUDIT-C category was considered in secondary analysis (Table 2.4). Black patients had a significant but small higher mortality risk compared to white and Hispanic patients at lower-risk levels of drinking in unadjusted models (Model 1), when adjusted for age only (Model 2), and when adjusted for age and HIV disease severity

(Model 3). When comparing mortality risk across racial/ethnic groups at lower-risk levels of drinking in models adjusted for age, disease severity, and comorbidities (Model 4), black patients had significantly higher mortality risk than Hispanics, while Hispanics had lower mortality risk than white PLWH. Among moderate-risk drinkers, the only significant difference across racial ethnic groups was in fully adjusted models, such that both black and Hispanic patients had lower mortality risk than white patients. Among high-risk drinkers, there were no significant differences between Hispanic relative to white, nor among black relative to Hispanic patients (Models 1-4, Table 2.4). However, in all models (Models 1-4) among high-risk drinkers, black patients had significant and moderately strong lower mortality risk than white patients.

2.4 DISCUSSION

In this national sample of male PLWH who receive VA care, associations between alcohol use and mortality varied across racial/ethnic groups. For all racial/ethnic groups, high-risk relative to lower-risk drinking was associated with moderately strong increased risk of mortality. Moderate relative to lower-risk drinking was associated with small but statistically significant increased mortality risk for all racial ethnic groups in unadjusted models, but only among white patients in fully adjusted models. For black and Hispanic PLWH, point estimates suggested increased risk associated with moderate drinking, but no statistically significant associations were observed in fully adjusted models.

These findings expand on current understanding of alcohol-related risk among PLWH. While a previous study among PLWH identified greater risk of mortality for patients with both moderate- and high-risk drinking relative to those with lower-risk drinking,⁴ findings from the present study suggest that these associations may be strongest in white patients. Differences in the association between alcohol use and mortality may be driven by racial/ethnic differences in

high-risk or moderate-risk drinkers, by differences in mortality risk among lower-risk drinkers, which were used as a reference group in analyses comparing levels of alcohol use, or by residual confounding.

In this study, Hispanic PLWH had increased mortality among high-risk, but not moderate-risk drinkers, relative to lower-risk drinkers, but decreased mortality relative to black drinkers among lower-risk levels of drinking in all models and marginally decreased mortality risk relative to white patients in unadjusted and fully adjusted models. There were fewer Hispanic patients than other racial/ethnic groups in this sample, and the model may have been insufficiently powered to detect differences among Hispanic patients. Also, previous research on drinking among Hispanics identified differences in alcohol-related outcomes based on acculturation to the United States, with higher levels of acculturation being associated with poorer alcohol-related outcomes.^{43,44} In this secondary data analysis, we did not have access to measures regarding contextual or cultural factors, thus, there may be unmeasured protective factors in this group that build resiliency against the ill effects of alcohol use.

Among black drinkers, there was no significant difference in mortality risk among moderate-risk relative to lower-risk drinking in fully adjusted models, although there was significant moderately-strong increased risk of mortality for high- relative to lower-risk drinking. These findings are counterintuitive but not inconsistent with previous research in general (non-HIV specific) outpatients.¹⁷ Our comparisons of racial/ethnic groups within alcohol use levels may help explain these findings. In this study, we found that black patients had slightly higher increased mortality relative to white patients among lower risk drinkers, although this was attenuated by adjustment for comorbid conditions. Additionally, black patients had moderately decreased mortality risk relative to white patients at higher-risk levels of drinking.

Reasons for the lack of increased risk of mortality among moderate-risk relative to lower-risk drinkers among black PLWH are unknown, but may be due to contextual factors relating to alcohol use and competing health conditions. For example, previous studies have suggested that greater prevalence of adverse alcohol-related consequences among black relative to white persons^{10,16} relates to greater exposure to racism, and community-level contextual factors such as residence in low socioeconomic status areas leading to greater stress, lower drinking norms in black communities leading to increased stigma for drinkers, and surveillance by authorities leading to increased law enforcement involvement in black communities.^{10,45-47} However, there was no significant difference in mortality risk comparing black to white patients at lower-levels of drinking when additionally adjusting for comorbidities (Model 4; Table 2.4), suggesting that competing health conditions may account for lower apparent risk for black patients, and alcohol use may not be the strongest risk factor for death among black PLWH.

Competing health conditions may be more strongly associated with mortality, and may be bi-directionally associated with alcohol use. Thus, adjusting for health factors that may be exacerbated by alcohol use may have over-adjusted findings and attenuated the association between alcohol use and mortality. Black patients have increased risk of both prevalence of adverse health conditions and poor outcomes associated with these conditions relative to white patients, in part owing to substantial stigma and discrimination experienced by black persons due to racism.⁴⁸ For instance, in this sample, black patients had the highest proportion of hypertension, Hepatitis C, current tobacco use, and other drug use. These conditions may be more prevalent among black patients⁴⁹ or more strongly associated with poor outcomes among black patients^{50,51} due to contextual factors including racism,^{48,52} and all are strongly predictive of mortality among PLWH.⁵³⁻⁵⁶ Additionally, these conditions are bi-directionally associated

with alcohol use.^{57,58} These measures, included only in Model 4 and disproportionately distributed among black patients, may have inadvertently adjusted away some pathways (e.g., racism) via which alcohol use would be associated with mortality for black PLWH.

The overall patterns observed in the data across racial/ethnic groups replicate findings from a similar study regarding associations between alcohol use and mortality among non-HIV-specific VA patients.¹⁷ While previous studies show that non-white patients have been previously shown to have worse consequences of drinking at similar levels to white patients,^{10,16} there may be aspects of care at the VA that make this populations unique. Eligibility for VA services reduces disparities in access to care, which may reduce racial/ethnic disparities overall.⁵⁹

Findings confirm risks of drinking at moderate and high-risk levels for all racial/ethnic groups and affirm recommendations for clinical interventions, such as brief interventions for patients who drink above recommended limits, and specialty addictions treatment, for patients with more severe unhealthy alcohol use. High levels of alcohol use, relative to lower levels, were found to be associated with increased mortality risk among all racial/ethnic groups in this study. While findings from some adjusted models suggested that moderate, relative to lower-risk, drinking may not be as strongly associated with mortality in some racial/ethnic groups, it is possible these models were over-adjusted. Moreover, across all racial/ethnic groups, drinking at both moderate- and high-risk levels is known to be associated with poor adherence to HIV medications,^{2,60-62} and poorer medical outcomes.³¹

There are several limitations to this study. This study used secondary clinical data and was observational. Thus, residual confounding (e.g., by socioeconomic status, sexual orientation, or gender identity, which were unmeasured in this study) may be present. Socioeconomic status is a known risk factor for poor outcomes among PLWH for which we did not have a measure,⁶³ and

adjustment for it decreased the association between alcohol use and mortality in a previous study.¹⁷ While the AUDIT-C has been validated across racial/ethnic groups,²⁹ black patients may be more likely to under-report drinking due to stigma,⁶⁴ and to overestimate the size of a standard drink,⁶⁵ which may have misclassified drinking level among black patients in this study. Additionally, the AUDIT-C, while a validated screen for unhealthy alcohol use,²²⁻²⁴ is not an in-depth structured assessment of alcohol use. In this cohort, AUDIT-C is asked and documented by a clinician, and may be limited based on method of screening administration and results documentation,⁶⁶ as well as by patient recall or social desirability bias.⁶⁷ Further, though alcohol use varies over time within persons, alcohol use was also not considered to be a time-varying factor in this analysis. Additionally, missing data, which was accounted for in this study using multiple imputation, may not be missing at random. There are also limitations to the external validity of this study. This study is only among men receiving care at the VA, and may not be generalizable to women veterans living with HIV and/or non-veterans. Additionally, PLWH in this study are already linked with care, and results will not be generalizable to PLWH not linked with care. Finally, alcohol use data is only available from 2008, when the AUDIT-C screening data became widely available in the VA. Future studies are needed examining these issues among women, non-veterans, and people living with HIV not linked to healthcare.

Future research is also needed to determine which factors mediate the association between alcohol use and mortality to understand variation in the association across racial/ethnic groups, as well as the effect size and clinically meaningful implications of these differences. Our findings are hypothesis-generating regarding potential mechanisms. For instance, our findings suggest the possibility that there were competing risks for mortality among more vulnerable racial/ethnic groups, as comorbid conditions and greater HIV disease severity were over-

represented among black persons in this population. Future research exploring these hypotheses is needed.

Despite limitations and need for further research, this study—conducted in a national sample of racially/ethnically diverse PLWH receiving care from the largest single provider of HIV care in the United States—is the first to our knowledge to evaluate the influence of alcohol use on mortality across racial/ethnic minority groups of PLWH. Findings from this study suggest that, similar to studies among general outpatients,¹⁷ associations between alcohol use and mortality vary across racial/ethnic groups, although this variation is not large. While associations vary in magnitude across racial/ethnic groups and may be dependent on other patient level factors within racial/ethnic groups, overall patterns were similar across groups. This highlights the need to address high-risk alcohol use across all racial/ethnic groups to decrease mortality risk among PLWH, while considering potential that competing health conditions may account for increased mortality risk among racial/ethnic minority PLWH at lower-risk levels of drinking.

Table 2.1. Patient Characteristics and AUDIT-C Categories Across Racial/ethnic Groups and Overall (n = 17,239)

		Black n = 8,518 %	Hispanic n = 1,353 %	White n = 7,368 %	p-value**	Overall n = 17, 239 %
Demographic Characteristics						
Age	<50	38.2	39.5	37.7		38.1
	50-64	55.9	52.3	49.1	<0.001	52.7
	65+	5.9	8.1	13.2		9.2
HIV Disease Severity						
CD4 Count (<200)*	<200	17.8	13.7	13.7		14.7
	200-500	42.6	38.6	40.2	<0.001	41.3
	>500	39.7	47.7	48.5		44.0
Viral Load (≥500)*		32.1	22.6	19.4	<0.001	26.0
	Hemoglobin	46.8	67.2	72.5		59.3
	14+	40.5	26.8	22.6	<0.001	31.8
	12-13.9	10.5	5.1	4.1		7.3
	10-11.9	2.3	1.0	0.8		1.6
	3-9.9	73.4	76.1	76.7	<0.001	75.0
	HAART					
Comorbid Mental and Physical Health Conditions						
Smoking Status	Never	24.5	30.9	29.5		27.1
	Past	10.3	17.1	16.9	<0.001	13.6
	Current	65.3	51.9	53.6		59.3
Drug Use		24.3	8.6	14.5	<0.001	16.9
	BMI*	3.7	1.5	2.5		3.0
	Underweight	76.7	79.7	79.5	<0.001	78.2
	Normal & Overweight	19.6	18.8	18.0		18.8
	Obese	6.4	7.0	12.6	<0.001	9.1
Cancer (non-AIDS related)		17.5	17.6	19.9	<0.001	18.5
Lung Disease		12.2	11.8	15.1	<0.001	13.4
Cardiovascular Disease		49.2	38.4	40.3	<0.001	44.5
Hypertension		14.3	15.8	12.2	<0.001	13.5
Diabetes		10.2	13.2	8.1	<0.001	9.5
Hepatitis B		28.4	14.7	26.0	<0.001	22.3
Hepatitis C		11.6	18.9	18.8	<0.001	15.3
Anxiety		20.5	21.8	21.7	0.180	21.1
Major Depression		13.2	11.8	13.6	0.014	12.6
Psychosis		13.3	10.7	12.3	<0.001	12.1
PTSD						
AUDIT-C Categories						
AUDIT-C Category	Lower-risk (1-3)	74.2	76.9	78.2		76.1
	Moderate-risk (4-7)	18.3	16.9	17.1	<0.001	17.7
	High-risk (8-12)	7.5	6.3	4.8		6.2

* Missing Data about Disease Severity makes N = 14,880, N for BMI = 17,188, N for Smoking = 16, 958

** p-value for chi square test

Table 2.2. Mortality rates overall and by level of alcohol use and race for black, Hispanic, and white VA patients living with HIV

	Overall (n=17, 239)	Black (n=8,518)	Hispanic (n=1,353)	White (n=7,368)	p-value*
# of Deaths	2,041	1,042	128	871	0.014
	Mortality Rate** (95% CI)				p-value*
Overall (n = 17,239)	2.7 (2.6, 2.9)	2.9 (2.7, 3.1)	2.2 (1.8, 2.6)	2.7 (2.5, 2.9)	0.0111
Lower-risk (n=13,119)	2.4 (2.3, 2.6)	2.7 (2.5, 2.9)	1.8 (1.4, 2.2)	2.3 (2.1, 2.5)	0.0008
Moderate-risk (n=3,044)	3.3 (3.0, 3.7)	3.1 (2.7, 3.5)	2.9 (2.0, 4.2)	3.7 (3.2, 4.3)	0.1507
High risk (n=1,076)	5.0 (4.4, 5.7)	4.5 (3.7, 5.3)	5.0 (3.2, 8.0)	5.9 (4.8, 7.3)	0.1419

* p-value determined by chi-square test for difference in number of deaths and log-rank test for difference in mortality rate, **bolded** if significant

** mortality rate is calculated per 100 person-years

Table 2.3. Hazard ratios of mortality comparing moderate- and high-risk relative to lower-risk drinking among black, Hispanic, and white VA patients living with HIV: overall and by race/ethnicity (n = 17,239)

Drinking Categories	Iterative modeling strategy	HR (95% CI)							
		Overall (n=17,239)		Black (n=8,518)		Hispanic (n=1,354)		White (n=7,376)	
Lower-risk		<i>ref</i>							
Moderate-risk	Model 1	1.37	(1.23, 1.53)	1.17	(1.00, 1.36)	1.63	(1.06, 2.49)	1.60	(1.37, 1.88)
	Model 2	1.39	(1.25, 1.54)	1.20	(1.03, 1.40)	1.64	(1.07, 2.51)	1.59	(1.35, 1.86)
	Model 3	1.34	(1.21, 1.50)	1.15	(0.99, 1.34)	1.56	(1.02, 2.39)	1.56	(1.33, 1.84)
	Model 4	1.27	(1.14, 1.41)	1.09	(0.93, 1.27)	1.36	(0.89, 2.09)	1.51	(1.28, 1.77)
High-risk	Model 1	2.04	(1.77, 2.35)	1.68	(1.39, 2.04)	2.80	(1.68, 4.66)	2.55	(2.03, 3.20)
	Model 2	2.11	(1.83, 2.43)	1.66	(1.37, 2.02)	2.65	(1.59, 4.41)	2.85	(2.27, 3.58)
	Model 3	1.92	(1.66, 2.21)	1.52	(1.25, 1.85)	2.49	(1.49, 4.15)	2.61	(2.08, 3.29)
	Model 4	1.64	(1.41, 1.90)	1.36	(1.12, 1.66)	2.18	(1.30, 3.64)	2.04	(1.61, 2.58)

Model 1 is unadjusted

Model 2 is adjusted for age

Model 3 is adjusted for age and disease severity (CD4 count)

Model 4 is adjusted for age, disease severity (CD4 count), and comorbidities (non-AIDS related Cancers (bladder, breast, buccal cavity and pharynx, digestive system, Hodgkin's lymphoma, ill-defined cancer, kidney, leukemia, male genital system, melanomas, non-epithelial skin cancer, penile, prostate, stomach, testicular, ureter, urinary system), lung disease (COPD, asthma, or other lung disease), cardiovascular disease (congestive heart failure, MI/CAD, peripheral vascular disease, ischemic stroke, stroke), hypertension, diabetes, hepatitis B, hepatitis C, anxiety, psychosis (schizophrenia, schizoaffective disorder, other psychosis), PTSD, BMI, drug use, and lifetime tobacco use

Bolded results are significant at p-value < 0.05

Table 2.4. Hazard ratios comparing mortality between racial/ethnic groups within each AUDIT-C category (n = 17,239)

Comparison by Race/Ethnicity		Lower-risk (n=13,119)		Moderate-risk (n=3,044)		High-risk (n=1,076)	
		HR	95% CI	HR	95% CI	HR	95% CI
Black relative to white	Model 1	1.15	(1.03, 1.28)	0.84	(0.69, 1.01)	0.76	(0.57, 1.00)
	Model 2	1.25	(1.12, 1.39)	0.94	(0.77, 1.14)	0.73	(0.55, 0.96)
	Model 3	1.17	(1.05, 1.31)	0.86	(0.71, 1.05)	0.68	(0.52, 0.90)
	Model 4	0.98	(0.88, 1.11)	0.71	(0.58, 0.86)	0.66	(0.50, 0.87)
Hispanic relative to white	Model 1	0.78	(0.61, 0.98)	0.79	(0.53, 1.16)	0.85	(0.51, 1.41)
	Model 2	0.83	(0.66, 1.05)	0.86	(0.58, 1.27)	0.77	(0.46, 1.29)
	Model 3	0.81	(0.64, 1.02)	0.81	(0.55, 1.19)	0.77	(0.46, 1.28)
	Model 4	0.75	(0.59, 0.94)	0.67	(0.46, 1.00)	0.80	(0.48, 1.33)
Black relative to Hispanic	Model 1	1.48	(1.17, 1.86)	1.06	(0.72, 1.57)	0.89	(0.54, 1.46)
	Model 2	1.50	(1.19, 1.89)	1.09	(0.74, 1.61)	0.94	(0.57, 1.54)
	Model 3	1.45	(1.15, 1.82)	1.07	(0.73, 1.58)	0.89	(0.54, 1.46)
	Model 4	1.32	(1.05, 1.66)	1.05	(0.71, 1.55)	0.83	(0.50, 1.36)

Model 1 is unadjusted

Model 2 is adjusted for age

Model 3 is adjusted for age and disease severity (CD4 count)

Model 4 is adjusted for age, disease severity (CD4 count), and comorbidities (non-AIDS related Cancers (bladder, breast, buccal cavity and pharynx, digestive system, Hodgkin's lymphoma, ill-defined cancer, kidney, leukemia, male genital system, melanomas, non-epithelial skin cancer, penile, prostate, stomach, testicular, ureter, urinary system), lung disease (COPD, asthma, or other lung disease), cardiovascular disease (congestive heart failure, MI/CAD, peripheral vascular disease, ischemic stroke, stroke), hypertension, diabetes, hepatitis B, hepatitis C, anxiety, psychosis (schizophrenia, schizoaffective disorder, other psychosis), PTSD, BMI, drug use, and lifetime tobacco use

Bolded results are significant at p-value < 0.05

2.5 NOTES FOR CHAPTER 2

1. Braithwaite RS, Conigliaro J, Roberts MS, et al. Estimating the impact of alcohol 1. Braithwaite RS, Conigliaro J, Roberts MS, et al. Estimating the impact of alcohol consumption on survival for HIV+ individuals. *AIDS Care*. 2007;19(4):459-466. doi:10.1080/09540120601095734.
2. Braithwaite RS, Bryant KJ. Influence of alcohol consumption on adherence to and toxicity of antiretroviral therapy and survival. *Alcohol Res Health J Natl Inst Alcohol Abuse Alcohol*. 2010;33(3):280-287.
3. Hahn JA, Samet JH. Alcohol and HIV disease progression: weighing the evidence. *Curr HIV/AIDS Rep*. 2010;7(4):226-233. doi:10.1007/s11904-010-0060-6.
4. Justice AC, McGinnis KA, Tate JP, et al. Risk of mortality and physiologic injury evident with lower alcohol exposure among HIV infected compared with uninfected men. *Drug Alcohol Depend*. 2016;161:95-103. doi:10.1016/j.drugalcdep.2016.01.017.
5. Williams EC, Hahn JA, Saitz R, Bryant K, Lira MC, Samet JH. Alcohol Use and Human Immunodeficiency Virus (HIV) Infection: Current Knowledge, Implications, and Future Directions. *Alcohol Clin Exp Res*. September 2016. doi:10.1111/acer.13204.
6. Wandeler G, Kraus D, Fehr J, et al. The J-curve in HIV: low and moderate alcohol intake predicts mortality but not the occurrence of major cardiovascular events. *J Acquir Immune Defic Syndr 1999*. October 2015. doi:10.1097/QAI.0000000000000864.
7. Frohlich KL, Potvin L. Transcending the Known in Public Health Practice: The Inequality Paradox: The Population Approach and Vulnerable Populations. *Am J Public Health*. 2008;98(2):216-221. doi:10.2105/AJPH.2007.114777.
8. Centers for Disease Control and Prevention. *HIV Surveillance Report, 2014.*; 2015. <http://www.cdc.gov/hiv/library/reports/surveillance>. Accessed January 5, 2016.
9. Vanable PA, Carey MP, Blair DC, Littlewood RA. Impact of HIV-Related Stigma on Health Behaviors and Psychological Adjustment Among HIV-Positive Men and Women. *AIDS Behav*. 2006;10(5):473-482. doi:10.1007/s10461-006-9099-1.
10. Zemore SE, Ye Y, Mulia N, Martinez P, Jones-Webb R, Karriker-Jaffe K. Poor, persecuted, young, and alone: Toward explaining the elevated risk of alcohol problems among Black and Latino men who drink. *Drug Alcohol Depend*. March 2016. doi:10.1016/j.drugalcdep.2016.03.008.
11. Martin JK, Tuch SA, Roman PM. Problem Drinking Patterns among African Americans: The Impacts of Reports of Discrimination, Perceptions of Prejudice, and “Risky” Coping Strategies. *J Health Soc Behav*. 2003;44(3):408-425.

12. Power R, Koopman C, Volk J, et al. Social Support, Substance Use, and Denial in Relationship to Antiretroviral Treatment Adherence among HIV-Infected Persons. *AIDS Patient Care STDs*. 2003;17(5):245-252. doi:10.1089/108729103321655890.
13. Elliott JC, Aharonovich E, O’Leary A, Wainberg M, Hasin DS. Drinking motives as prospective predictors of outcome in an intervention trial with heavily drinking HIV patients. *Drug Alcohol Depend*. 2014;134:290-295. doi:10.1016/j.drugalcdep.2013.10.026.
14. Murphy DA, Greenwell L, Hoffman D. Factors associated with antiretroviral adherence among HIV-infected women with children. *Women Health*. 2002;36(1):97–111.
15. Singh N, Berman SM, Swindells S, et al. Adherence of Human Immunodeficiency Virus–Infected Patients to Antiretroviral Therapy. *Clin Infect Dis*. 1999;29(4):824-830. doi:10.1086/520443.
16. Mulia N, Ye Y, Greenfield TK, Zemore SE. Disparities in alcohol-related problems among white, black, and Hispanic Americans. *Alcohol Clin Exp Res*. 2009;33(4):654-662. doi:10.1111/j.1530-0277.2008.00880.x.
17. Williams EC, Bradley KA, Gupta S, Harris AHS. Association between alcohol screening scores and mortality in black, Hispanic, and white male veterans. *Alcohol Clin Exp Res*. 2012;36(12):2132-2140. doi:10.1111/j.1530-0277.2012.01842.x.
18. Fultz SL, Skanderson M, Mole LA, et al. Development and Verification of a “Virtual” Cohort Using the National VA Health Information System. *Med Care*. 2006;44(8):S25-S30.
19. Chartier KG, Hesselbrock MN, Hesselbrock VM. Ethnicity and gender comparisons of health consequences in adults with alcohol dependence. *Subst Use Misuse*. 2013;48(3):200-210. doi:10.3109/10826084.2013.747743.
20. Witbrodt J, Mulia N, Zemore SE, Kerr WC. Racial/Ethnic Disparities in Alcohol-Related Problems: Differences by Gender and Level of Heavy Drinking. *Alcohol Clin Exp Res*. 2014;38(6):1662-1670. doi:10.1111/acer.12398.
21. Zemore SE, Murphy RD, Mulia N, et al. A Moderating Role for Gender in Racial/Ethnic Disparities in Alcohol Services Utilization: Results from the 2000 to 2010 National Alcohol Surveys. *Alcohol Clin Exp Res*. 2014;38(8):2286-2296. doi:10.1111/acer.12500.
22. Bradley KA, Bush KR, Epler AJ, et al. Two brief alcohol-screening tests From the Alcohol Use Disorders Identification Test (AUDIT): validation in a female Veterans Affairs patient population. *Arch Intern Med*. 2003;163(7):821-829. doi:10.1001/archinte.163.7.821.
23. Bradley KA, DeBenedetti AF, Volk RJ, Williams EC, Frank D, Kivlahan DR. AUDIT-C as a Brief Screen for Alcohol Misuse in Primary Care. *Alcohol Clin Exp Res*. 2007;31(7):1208-1217. doi:10.1111/j.1530-0277.2007.00403.x.

24. Bush K. The AUDIT Alcohol Consumption Questions (AUDIT-C): An Effective Brief Screening Test for Problem Drinking. *Arch Intern Med.* 1998;158(16):1789. doi:10.1001/archinte.158.16.1789.
25. Rubinsky AD, Dawson DA, Williams EC, Kivlahan DR, Bradley KA. AUDIT-C scores as a scaled marker of mean daily drinking, alcohol use disorder severity, and probability of alcohol dependence in a U.S. general population sample of drinkers. *Alcohol Clin Exp Res.* 2013;37(8):1380-1390. doi:10.1111/acer.12092.
26. Bradley KA, Kivlahan DR, Zhou X-H, et al. Using Alcohol Screening Results and Treatment History to Assess the Severity of At-Risk Drinking in Veterans Affairs Primary Care Patients: *Alcohol Clin Exp Res.* 2004;28(3):448-455. doi:10.1097/01.ALC.0000117836.38108.38.
27. Kinder LS, Bryson CL, Sun H, Williams EC, Bradley KA. Alcohol screening scores and all-cause mortality in male Veterans Affairs patients. *J Stud Alcohol Drugs.* 2009;70(2):253-260.
28. Chavez LJ, Williams EC, Lapham G, Bradley KA. Association between alcohol screening scores and alcohol-related risks among female veterans affairs patients. *J Stud Alcohol Drugs.* 2012;73(3).
29. Frank D, DeBenedetti AF, Volk RJ, Williams EC, Kivlahan DR, Bradley KA. Effectiveness of the AUDIT-C as a screening test for alcohol misuse in three race/ethnic groups. *J Gen Intern Med.* 2008;23(6):781-787. doi:10.1007/s11606-008-0594-0.
30. Dawson DA, Grant BF, Stinson FS, Zhou Y. Effectiveness of the Derived Alcohol Use Disorders Identification Test (AUDIT-C) in Screening for Alcohol Use Disorders and Risk Drinking in the US General Population: *Alcohol Clin Exp Res.* 2005;29(5):844-854. doi:10.1097/01.ALC.0000164374.32229.A2.
31. Harris AHS, Bryson CL, Sun H, Blough D, Bradley KA. Alcohol Screening Scores Predict Risk of Subsequent Fractures. *Subst Use Misuse.* 2009;44(8):1055-1069. doi:10.1080/10826080802485972.
32. Breslow NE. Analysis of Survival Data under the Proportional Hazards Model. *Int Stat Rev Rev Int Stat.* 1975;43(1):45. doi:10.2307/1402659.
33. Sohn M-W, Arnold N, Maynard C, Hynes DM. Accuracy and completeness of mortality data in the Department of Veterans Affairs. *Popul Health Metr.* 2006;4(1). doi:10.1186/1478-7954-4-2.
34. Office of Budget and Management. *Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity.* Office of Budget and Management; 1997.
35. Mays VM, Ponce NA, Washington DL, Cochran SD. Classification of Race and Ethnicity: Implications for Public Health*. *Annu Rev Public Health.* 2003;24(1):83-110. doi:10.1146/annurev.publhealth.24.100901.140927.

36. Giordano TP, Morgan RO, Kramer JR, et al. Is there a race-based disparity in the survival of veterans with HIV? *J Gen Intern Med.* 2006;21(6):613-617. doi:10.1111/j.1525-1497.2006.00452.x.
37. Goulet JL, Fultz SL, Rimland D, et al. Do Patterns of Comorbidity Vary by HIV Status, Age, and HIV Severity? *Clin Infect Dis.* 2007;45(12):1593-1601. doi:10.1086/523577.
38. Wheeler DA, Gibert CL, Launer CA, et al. Weight loss as a predictor of survival and disease progression in HIV infection. Terry Bein Community Programs for Clinical Research on AIDS. *J Acquir Immune Defic Syndr Hum Retrovirology Off Publ Int Retrovirology Assoc.* 1998;18(1):80-85.
39. Jones CY, Hogan JW, Snyder B, et al. Overweight and human immunodeficiency virus (HIV) progression in women: associations HIV disease progression and changes in body mass index in women in the HIV epidemiology research study cohort. *Clin Infect Dis Off Publ Infect Dis Soc Am.* 2003;37 Suppl 2:S69-80. doi:10.1086/375889.
40. McGinnis KA, Brandt CA, Skanderson M, et al. Validating Smoking Data From the Veteran's Affairs Health Factors Dataset, an Electronic Data Source. *Nicotine Tob Res.* 2011;13(12):1233-1239. doi:10.1093/ntr/ntr206.
41. Azuero A. A note on the magnitude of hazard ratios: Correspondence. *Cancer.* 2016;122(8):1298-1299. doi:10.1002/cncr.29924.
42. StataCorp. *Stata Statistical Software: Release 13.* College Station, TX: StataCorp LP; 2013.
43. Zemore SE. Acculturation and alcohol among Latino adults in the United States: a comprehensive review. *Alcohol Clin Exp Res.* 2007;31(12):1968-1990. doi:10.1111/j.1530-0277.2007.00532.x.
44. Karriker-Jaffe KJ, Zemore SE. Associations between acculturation and alcohol consumption of Latino men in the United States. *J Stud Alcohol Drugs.* 2009;70(1):27-31.
45. Zapolski TCB, Pedersen SL, McCarthy DM, Smith GT. Less drinking, yet more problems: Understanding African American drinking and related problems. *Psychol Bull.* 2014;140(1):188-223. doi:10.1037/a0032113.
46. Jones-Webb R, Snowden L, Herd D, Short B, Hannan P. Alcohol-related problems among black, Hispanic and white men: the contribution of neighborhood poverty. *J Stud Alcohol.* 1997;58(5):539-545.
47. Karriker-Jaffe KJ, Zemore SE, Mulia N, Jones-Webb R, Bond J, Greenfield TK. Neighborhood disadvantage and adult alcohol outcomes: differential risk by race and gender. *J Stud Alcohol Drugs.* 2012;73(6):865-873.
48. Williams DR, Mohammed SA, Leavell J, Collins C. Race, socioeconomic status, and health: Complexities, ongoing challenges, and research opportunities: Race, SES, and health. *Ann N Y Acad Sci.* 2010;1186(1):69-101. doi:10.1111/j.1749-6632.2009.05339.x.

49. Hajjar I. Trends in Prevalence, Awareness, Treatment, and Control of Hypertension in the United States, 1988-2000. *JAMA*. 2003;290(2):199. doi:10.1001/jama.290.2.199.
50. Moolchan ET, Fagan P, Fernander AF, et al. Addressing tobacco-related health disparities. *Addiction*. 2007;102:30-42. doi:10.1111/j.1360-0443.2007.01953.x.
51. Cooper H, Friedman SR, Tempalski B, Friedman R, Keem M. Racial/Ethnic Disparities in Injection Drug Use in Large US Metropolitan Areas. *Ann Epidemiol*. 2005;15(5):326-334. doi:10.1016/j.annepidem.2004.10.008.
52. Williams DR, Jackson PB. Social Sources Of Racial Disparities In Health. *Health Aff (Millwood)*. 2005;24(2):325-334. doi:10.1377/hlthaff.24.2.325.
53. Altice FL, Kamarulzaman A, Soriano VV, Schechter M, Friedland GH. Treatment of medical, psychiatric, and substance-use comorbidities in people infected with HIV who use drugs. *The Lancet*. 2010;376(9738):367-387. doi:10.1016/S0140-6736(10)60829-X.
54. Fischer MJ, Wyatt CM, Gordon K, et al. Hepatitis C and the risk of kidney disease and mortality in veterans with HIV. *J Acquir Immune Defic Syndr* 1999. 2010;53(2):222-226. doi:10.1097/QAI.0b013e3181b980d4.
55. Freiberg MS, Chang C-CH, Kuller LH, et al. HIV Infection and the Risk of Acute Myocardial Infarction. *JAMA Intern Med*. 2013;173(8):614. doi:10.1001/jamainternmed.2013.3728.
56. Freiberg MS, McGinnis KA, Kraemer K, et al. The Association Between Alcohol Consumption and Prevalent Cardiovascular Diseases Among HIV-Infected and HIV-Uninfected Men: *JAIDS J Acquir Immune Defic Syndr*. 2010;53(2):247-253. doi:10.1097/QAI.0b013e3181c6c4b7.
57. Lieber CS. Alcohol and Hepatitis C. *Natl Inst Alcohol Abuse Alcohol*. 2001.
58. Kahler CW, Strong DR, Papandonatos GD, et al. Cigarette smoking and the lifetime alcohol involvement continuum. *Drug Alcohol Depend*. 2008;93(1-2):111-120. doi:10.1016/j.drugalcdep.2007.09.004.
59. Peterson K, McCleery E, Waldrip K. Evidence Brief: Update on Prevalence of and Interventions to Reduce Racial and Ethnic Disparities within the VA. In: *VA Evidence-Based Synthesis Program Evidence Briefs*. VA Evidence-based Synthesis Program Reports. Washington (DC): Department of Veterans Affairs (US); 2011. <http://www.ncbi.nlm.nih.gov/books/NBK384611/>. Accessed May 5, 2017.
60. Azar MM, Springer SA, Meyer JP, Altice FL. A systematic review of the impact of alcohol use disorders on HIV treatment outcomes, adherence to antiretroviral therapy and health care utilization. *Drug Alcohol Depend*. 2010;112(3):178-193. doi:10.1016/j.drugalcdep.2010.06.014.

61. Chander G, Lau B, Moore RD. Hazardous alcohol use: a risk factor for non-adherence and lack of suppression in HIV infection. *J Acquir Immune Defic Syndr* 1999. 2006;43(4):411-417. doi:10.1097/01.qai.0000243121.44659.a4.
62. Bryson CL. Alcohol Screening Scores and Medication Nonadherence. *Ann Intern Med*. 2008;149(11):795. doi:10.7326/0003-4819-149-11-200812020-00004.
63. Pellowski JA, Kalichman SC, Matthews KA, Adler N. A pandemic of the poor: social disadvantage and the U.S. HIV epidemic. *Am Psychol*. 2013;68(4):197-209. doi:10.1037/a0032694.
64. Keyes KM, Hatzenbuehler ML, McLaughlin KA, et al. Stigma and Treatment for Alcohol Disorders in the United States. *Am J Epidemiol*. 2010;172(12):1364-1372. doi:10.1093/aje/kwq304.
65. Kerr WC, Patterson D, Greenfield TK. Differences in the measured alcohol content of drinks between black, white and Hispanic men and women in a US national sample. *Addiction*. 2009;104(9):1503-1511. doi:10.1111/j.1360-0443.2009.02579.x.
66. Williams EC, Achtmeyer CE, Thomas RM, et al. Factors Underlying Quality Problems with Alcohol Screening Prompted by a Clinical Reminder in Primary Care: A Multi-site Qualitative Study. *J Gen Intern Med*. 2015;30(8):1125-1132. doi:10.1007/s11606-015-3248-z.
67. Williams EC, Rubinsky AD, Chavez LJ, et al. An early evaluation of implementation of brief intervention for unhealthy alcohol use in the US Veterans Health Administration: Early evaluation of VA's brief intervention. *Addiction*. 2014;109(9):1472-1481. doi:10.1111/add.12600.

Chapter 3. PATTERNS OF ALCOHOL USE ACROSS URBAN, LARGE RURAL, AND SMALL RURAL COMMUNITIES AMONG VETERANS LIVING WITH HIV

3.1 INTRODUCTION

Alcohol use is common among and particularly risky for people living with HIV (PLWH), as it is associated with a number of unhealthy HIV-related outcomes: increased risk of HIV transmission, delayed entry to treatment, non-adherence to ART, increased disease progression, and mortality.¹⁻³ Among PLWH, no level of alcohol use appears to be “safe”, and risk of adverse outcomes is generally increased for those with higher severity of alcohol use (i.e., “unhealthy alcohol use”) relative to those who drink at lower levels.^{1,4} Unhealthy alcohol use ranges from drinking above recommended limits to meeting diagnostic criteria for alcohol use disorder (AUD)⁵ and encompasses multiple patterns of drinking such as heavy episodic drinking and heavy average consumption that are negatively associated with outcomes.^{3,6-8} Unhealthy alcohol use is also strongly associated with increased HIV incidence.⁹⁻¹¹ Therefore, understanding patterns of alcohol use may be important to providing effective HIV interventions to both prevent and treat HIV.

While historically HIV has primarily affected those in urban communities,¹² HIV incidence in rural communities is growing rapidly, particularly in the South.¹³ Understanding variation in alcohol use patterns across rurality may lay an important foundation for decreasing HIV incidence in communities and improving alcohol- and HIV-related outcomes for PLWH. Rural individuals may have different drinking behaviors than urban individuals due to differences in religiosity,¹⁴ population age,¹⁵ geographic isolation,¹⁶ economic conditions,¹⁷ the

availability of alcohol,¹⁸ and the enforcement of alcohol laws.¹⁹ These factors differentially affect prevalence of any and unhealthy alcohol use in these communities. Understanding whether alcohol use differs across rurality may be particularly important because risk of transmission may be higher in rural communities where social networks are small and prevention resources are limited.

In general, rural individuals are more likely to abstain from alcohol use.^{20–22} However, while those in rural communities are less likely to drink, those that do drink often drink more per occasion,¹⁹ more often report heavy episodic drinking, and are more likely to drink frequently.²¹ PLWH have unique experiences that may affect patterns of alcohol use, through increased experience of HIV-related stigma. This experience of stigma may affect urban and rural PLWH in unique ways. While HIV prevalence is generally lower in rural communities, stigma and discrimination of PLWH are often higher in areas with low HIV prevalence.²³ Rural communities are often culturally homogenous and promote normative beliefs that stigmatize those most at risk of HIV,^{24,25} leading to increased intolerance and experience of HIV stigma among rural, relative to urban PLWH.^{23,26,27} Therefore, compared to urban PLWH, rural PLWH who do drink may drink more heavily to cope with the increased stigma they experience in rural communities.^{28–30}

Documenting differences across rurality is informative, but contextualizing differences across potential moderators of differences can provide important insight as to what may be driving observed differences. Several factors may be effect modifiers, or moderators, of differences in alcohol use patterns across rurality among PLWH. Region may be one key factor. A large previous study has documented that alcohol use varies in the general population across regions.²¹ There are also regional differences in urban/rural variation in incidence of HIV across

region,²⁷ such that HIV incidence in the northeast and south is higher than in the Midwest or west.³¹ These differences in HIV incidence that may be associated with different drinking behaviors. Poverty status may also be a key moderating factor. Communities that are disadvantaged generally have increased alcohol use.^{18,32} Neighborhood level poverty varies across rurality, with rural communities often experiencing higher poverty rates.³³ However, impoverished urban neighborhoods have increased alcohol availability,³⁴ which is associated with increased alcohol consumption.³⁵ Finally, depression status may be an important effect modifier. Depression is common,^{36,37} inextricably linked with alcohol use,³⁸⁻⁴⁰ and variable across rurality⁴¹ among PLWH.⁴² Thus, differences across rurality in patterns of alcohol use among PLWH could be driven by differences in depression status.

No previous study has described patterns of alcohol use across rurality among PLWH, nor examined factors that may moderate differential patterns of use across rurality. Therefore, we describe the patterns of alcohol use across rurality and examine factors that may moderate differential patterns of alcohol use across rurality in a national sample of PLWH who receive care from the Veterans Health Administration (VA).

3.2 METHODS

Data Source and Study Sample: The data source for this study is the Veterans Aging Cohort Study (VACS), which is a prospective, observational cohort study of VA patients, and includes all patients who were diagnosed with HIV (had at least two outpatient or one inpatient code for either AIDS: ICD-9 042 or HIV: ICD-9 V08 between 1997 and 2014.⁴³ Data for the VACS are obtained from the VA Corporate Data Warehouse (CDW), which is a national VA data repository that houses clinical and administrative data for all VA patients, and includes results of clinical alcohol screening with the Alcohol Use Disorders Identification Test Consumption (AUDIT-C)

questionnaire for patients nationwide since January 2008.^{44,45,46} For the present study, VACS data were obtained for all PLWH who had a documented residential zip code and documented AUDIT-C screening between 02/01/2008 and 9/30/2014.

Measures.

Rurality was defined using rural and urban commuting area (RUCA) codes, which are based on county or zip code, determined by patient residence.⁴⁷ RUCA codes are 33 codes developed by the Federal Office of Rural Health Policy, for which we assigned codes based on commuting times and proximity to urban areas⁴⁷ to create three categories: 1) urban, 2) large rural, and small rural (including small town/remote categories), as have been previously used⁴⁸ and established by the Washington, Wyoming, Alaska, Montana, and Idaho Rural Health Research Center.⁴⁹ Zip code was assessed on the closest available date to the AUDIT-C screening and RUCA codes were based on the 2010 decennial census and 2006-10 American Community Survey.⁵⁰

Four measures of alcohol use were derived using both AUDIT-C results from the first documented screen during the study period as well as ICD-9 codes. The AUDIT-C is comprised of 3 items that assess frequency of alcohol use, quantity of alcohol consumed, and frequency of heavy episodic drinking events. Scores range from 0 – 12, with scores of 0 representing non-drinkers, and increasing AUDIT-C scores reflecting increasing risk of multiple medical outcomes,^{51,52} and symptoms of alcohol use disorders.^{45,53–56} Among all eligible patients, any alcohol use was measured as AUDIT-C scores >0. Among those reporting alcohol use (those with AUDIT-C > 0), three measures of unhealthy alcohol use were assessed. Levels of alcohol use were measured using the AUDIT-C to categorize patients into gender-specific clinically meaningful levels of drinking.^{45,53,54,57} Levels include lower-risk: 1-2 (women) or 1-3 (men);

moderate risk: 3-5 (women) or 4-5 (men), high-risk: 6-7 (both men and women), and severe-risk: 8-12 (both men and women). A dichotomous measure of heavy episodic drinking was measured on report of consuming six or more drinks on at least one occasion in the past year, using the third AUDIT-C question. Experiencing any heavy drinking episodes is associated with increased risk of alcohol use disorders.⁵⁸ Finally, alcohol use disorder was measured based on documented ICD-9 codes for alcohol abuse or dependence (ICD-9 codes 303.9-303.92 or 305.0-305.02) in the year prior to the AUDIT-C.⁵⁹

Covariates in this study included variables that were suspected *a priori* to confound the association between rurality and patterns of alcohol use, including age, gender, race/ethnicity, and VA eligibility status. Covariates considered to be mediating factors or factors associated only with the outcome based on a review of the literature were not included in this model.

Covariates included age, which was categorized as <50, 50-64, and ≥65, gender, categorized as male and female, and race/ethnicity, measured as black, Hispanic, white, and other race. VA eligibility status was determined by a combination of service-connected disability and income, including categories of full coverage, <50% service connected coverage, or service connected coverage and was used as an imperfect proxy for socioeconomic status, similar to previous studies of alcohol prevalence⁶⁰ and receipt of alcohol-related care.⁶¹

Potential moderators. Rurality alone may not be a driver of alcohol use patterns. Specifically, the reasons that alcohol use may differ across rurality for persons living with HIV may depend not only on rurality of community but also on the context and social norms in which PLWH live. Three potential moderating factors (effect modifiers) were identified based on evidence that these factors may be associated with differences in alcohol use across rurality.^{18,19,21,32,34,35,40,41,62} For instance, social norms vary across regions of the country, thus region in which PLWH may

moderate the association between rurality and patterns of alcohol use. Relatedly, community-level socio-economic status may influence patterns of alcohol use by affecting both the environment (such as alcohol availability and density of alcohol outlets)³⁵ and individual alcohol use behaviors due to increased stress.^{62,63} Similarly, the compositional factors of individuals that make up their communities (e.g., depression) may also influence associations between rurality and alcohol use patterns. Region was measured as designated by the US Census, and included Northeast, Midwest, South, and West. Neighborhood level poverty was defined by quartiles of this sample based on % of households under the federal poverty guideline within a zip code tabulation area, as estimated by the five-year American Community Survey estimates for 2009-2013. Depression included clinically diagnosed depression, measured by documented ICD-9 codes for major depression in the year prior to the AUDIT-C screen.

Analyses. We described and compared population characteristics across rurality among all PLWH using chi square tests of independence. Next, logistic regression models were fit to compare any alcohol use across rurality. Among only PLWH reporting past-year alcohol use (AUDIT-C > 0), ordinal logit models were fit to compare PLWH from each level of drinking (estimated by AUDIT-C risk categories), and logistic regression models were fit to compare alcohol use disorders (relative to no alcohol use disorders) and heavy episodic drinking (relative to no heavy episodic drinking). For all models, recycled predictions were used to obtain predicted prevalence and 95% confidence intervals of each outcome across rurality.⁶⁴ Overall significance of rurality was compared using a Wald Test for each model. Models were unadjusted and then adjusted (primary model) for potential confounders including age, gender, race/ethnicity, and VA eligibility status. The effect size of observed differences was considered

by considering the magnitude of the differences in predicted prevalence along with the size of confidence intervals.

To better understand the association between rurality and alcohol use outcomes, we secondarily assessed effect modification. To do so, interactions between rurality and region, poverty, and depression were tested for all outcomes in each adjusted model using a Wald test to compare overall significance of the interaction. When interaction tests indicated a significant difference across rurality ($p < 0.05$), predicted prevalences were estimated stratified by modifiers in adjusted models.

3.3 RESULTS

Among 32,669 PLWH who met eligibility criteria, 29,540 (90.4%) were living in urban, 1,301 (4.0%) were living in from large rural, and 1,828 (5.6%) were living in small rural communities; 17,553 (54%) reported any alcohol use in the past year. Patient characteristics for all participants are described in Table 1 overall and across rurality. PLWH living in urban, large rural, and small rural communities differed in several key ways. Urban PLWH appeared to be more likely to be younger, of black and Hispanic race/ethnicity, and living in the Northeast and West than those in rural areas. Large rural PLWH appeared to be more likely to be from the oldest age group and from the South. Those living in small rural communities appeared to be more likely to be middle-aged, white, and living in the Midwest (Table 3.5).

There were also some differences in the unadjusted distribution of alcohol-related outcomes across rurality. Urban PLWH included a higher proportion consuming any alcohol than those in large and small rural communities. Across rurality there were no differences in drinking levels or heavy episodic drinking. However, among those reporting any alcohol use,

urban PLWH tended to have the highest percentage of those with an alcohol use disorder ($p = 0.002$ for chi square test; Table 3.6).

In both unadjusted and adjusted models, urban PLWH tended to have the highest predicted prevalence of any alcohol use ($p = 0.001$ for both Wald Test of overall significance). The adjusted predicted prevalence of any alcohol use for urban PLWH was 54.1 [95% Confidence Interval (CI): 53.5, 54.7], for large rural PLWH was 50.0 (95% CI: 47.3, 52.6), and for small rural PLWH was 50.5 (95% CI: 48.2, 52.7), demonstrating about a 4% absolute difference in predicted prevalence points between urban and rural drinkers. Among drinkers, there were differences in levels of drinking across rurality in adjusted analyses, such that urban PLWH appeared to have the highest predicted prevalence of the lower-risk drinking, with small rural PLWH tending to have the highest predicted prevalence of all levels of higher-risk drinking, but the differences weren't statistically significant at a $p < 0.05$ level ($p = 0.084$ for Wald Test of overall significance test) and the effect size was small. Most drinkers were lower-risk drinkers, with urban patients having a 3% higher predicted prevalence points of being a lower-risk drinker, while more rural patients had about a 3% higher predicted prevalence points of being in any of the other higher risk categories. There were no significant differences in the predicted prevalence of heavy episodic drinking or alcohol use disorders (Table 3.7).

Results of interaction tests from secondary analyses testing effect modification in the association between rurality and alcohol use outcomes across significant moderators are presented when significant in Figures 1-6. We identified significant effect modification by both region and poverty level in the association between rurality and any alcohol use. For any alcohol use, results were like those identified in primary analyses in the South (where rural urban patients had 7% higher predicted prevalence points of any drinking than those in small rural

communities) and the west (with a 4% point difference), but the prevalence of any alcohol use was similar across rurality in the Midwest and tended to be slightly lower (with a 6% point difference) among PLWH in urban communities in the northeast (p-value = 0.004 for overall interaction; Figure 1). In communities with lower poverty levels, any alcohol use appeared to be more likely among PLWH in small rural communities (with a 5% difference in absolute prevalence between urban and small rural PLWH) while in communities with high poverty levels, any alcohol use appeared to be more likely in urban communities, again with about a 5% absolute difference (p-value = 0.006 for overall interaction; Figure 2). Neither region nor neighborhood poverty modified the associations between rurality and measures of unhealthy alcohol use. However, while depression status did not modify the association between rurality and any alcohol use, it did modify the association between rurality and measures of unhealthy alcohol use.

Among PLWH who reported past-year alcohol use, depression status moderated the association between rurality and all remaining alcohol use outcomes, including levels of drinking (Figure 3.3 and 3.4), heavy episodic drinking (Figure 3.5), and alcohol use disorders (Figure 3.6; $p < 0.001$ for each interaction term). Specifically, while differences across rurality were observed among those without depression, these differences were reduced among those with depression. Among PLWH without depression, these measures appeared to be most common in small rural communities. Among those with depression, highest-risk drinking levels, as well as heavy episodic drinking and alcohol use disorders AUD, appeared to be slightly more common in urban communities (with a 1-5% difference in predicated probabilities), although trends were similar across rurality. Across all communities, PLWH with depression tended to be more likely than those without depression to be grouped into higher-risk levels of drinking, and to report

heavy episodic drinking or have a documented alcohol use disorder, again with small absolute differences between urban and more rural PLWH (Figures 3.3-3.6).

3.4 DISCUSSION

In this study, several differences in patterns of alcohol use were found across rurality among PLWH. Urban PLWH appeared to be the most likely to report any alcohol use, although this was moderated by region and neighborhood poverty level. Among drinkers, there were marginally significant differences across levels of drinking, such that PLWH in small rural communities tended to have higher predicted prevalence of higher-risk drinking levels, although there was no difference in predicted prevalence of heavy episodic drinking and alcohol use disorders. All measures of unhealthy alcohol use were moderated by depression status. For all measures, the magnitude of these differences is small. These findings indicate that while rural patients are less likely to drink, those that do drink at similar or higher levels to those in more urban communities, and there are important moderators that may help explain these differences.

Notably, the prevalence of any alcohol use across communities in this sample was quite high. Specifically, unlike previous studies in non-HIV-specific populations that showed prevalence of any alcohol use in the US general population between 30 and 40%,²¹ and in VA clinical population around 45%,²² prevalence of alcohol use among PLWH across rurality in this study ranged from 43% (95% CI: 37.2, 49.7) among PLWH in large rural communities that were in the fourth quartile of neighborhood poverty (most poverty), to 60.5% (95% CI: 55.0, 65.9) among PLWH in small rural communities in the lowest quartile of neighborhood poverty (least poverty). Prevalence of any alcohol use across rurality without considering modifiers was 54.1% (95% CI: 53.5, 54.7) urban, 50.0% (47.3, 52.6) large rural, and 50.5% (48.2, 52.7) small rural communities. In conjunction, these findings are similar to a previous study in general patients

with HIV that showed 50% prevalence of any alcohol use among PLWH.⁶⁵ These findings may be explained by prevalence of any drinking increasing over time.⁶⁵ Given that no level of alcohol use appears to be “safe” among PLWH, these findings are concerning.

Findings that more rural PLWH appear to be more likely to abstain from alcohol use are aligned with previous research in non-HIV specific populations, as are regional differences in this association.²¹ Similar to findings from a national study in the general U.S. population,²¹ PLWH in rural communities tended to have lower predicted prevalence of any alcohol use overall. However, while these findings hold in the South and Midwest, in the West the prevalence of any alcohol use were similar across rurality, and, in the Northeast, rural PLWH had the greatest prevalence of any alcohol use. Poverty level also appeared to modify these patterns--among the most advantaged PLWH (e.g., those with the lowest percentage of households under the poverty line), the prevalence of any alcohol use appeared to be greater in rural than urban areas, but with greater disadvantage, the prevalence of any alcohol use appeared to be greater in urban than rural areas. It is possible that increased alcohol availability and alcohol outlet density in urban communities with high rates of poverty accounts for this finding.^{18,62}

There were few differences across rurality in unhealthy alcohol use outcomes among PLWH who drink. Specifically, levels of heavy episodic drinking and alcohol use disorders were similar across communities, and while there was a trend toward a higher prevalence of higher-risk drinking among rural PLWH, these findings were not significant compared across rurality, and absolute differences in predicted prevalence were small. These findings were similar to a previous VA study among general outpatients that identified no difference in AUDIT-C categories across rurality,²² although different from previous studies from the U.S. general

population demonstrated similar or higher prevalence of unhealthy alcohol use among drinkers in rural communities.^{19,21} It is possible that our study was under-powered to identify differences across rurality in this association.

In the present study, depression was a key moderator of differences in alcohol use patterns across rurality. Because studies have demonstrated that depression may precede alcohol use etiologically,^{38,40} these findings may indicate that living in a rural community may be protective regarding the influence of depression on alcohol use outcomes. For example, in urban areas, alcohol use is more available, and depression is higher in areas with high alcohol outlet density.³⁵ These findings may also indicate that having depression equals prevalence of unhealthy alcohol use across rurality. Future research is needed to investigate this issue, which is beyond the scope of the present study.

There are a number of limitations to this study. Specifically, identification of eligible patients using clinically documented AUDIT-C screens may have resulted in under-identification of PLWH with unhealthy alcohol use due to methods of screening administration,⁶⁶⁻⁶⁸ or limited patient recall or been influenced by social desirability bias.⁶⁹ Similarly, alcohol use disorders may be under-recognized and thus under-documented.⁸ In addition, we relied on a proxy of socioeconomic status as an individual-level measure of socioeconomic status. Because individual-level socioeconomic status is a probable confounder in the association between rurality and both HIV alcohol-related outcomes,⁷⁰ residual confounding by socioeconomic status may be present. Finally, as participants in this study were veterans who were linked with care and had a zip code, these results may not be generalizable to non-veterans, veterans not linked with care, homeless veterans without a documented home zip code or address, or PLWH who are not veterans.

Despite these limitations, this study contributes to the literature in several key ways. First, the prevalence of any alcohol use across communities was high. Findings confirm similar associations between rurality and alcohol use among PLWH that have been found in non-HIV-specific populations, such that urban PLWH are more likely to drink, and that among those who drink, the prevalence of unhealthy alcohol use measures are similar or may be higher among more rural PLWH, and that these patterns vary by region, level of neighborhood poverty, and depression status, although the magnitude of these difference is not large. These findings show the need for future interventions to address high prevalence of alcohol use among all PLWH, but also that these drinking patterns do vary across rurality, and rural PLWH may experience alcohol risk factors like depression and neighborhood poverty differently than their urban counterparts. Future studies are needed to better understand why differences across rurality exist and how these might impact the need for and effectiveness of alcohol interventions being offered to PLWH across rurality.

Table 3.5. Patient characteristics and potential moderating factors among PLWH at first AUDIT-C during the study period (n = 32,669): Overall and across rurality

	Overall N=32,669 (%)	Urban N=29,540 (%)	Large Rural N=1,301 %	Small Rural N=1,828 %	p-value*
Potential Confounders among all PLWH with HIV (n = 32,669)					
Age					
<50	11,829 (36)	10,797 (37)	410 (32)	622 (34)	<0.001
50-64	17,462 (54)	15,737 (53)	709 (55)	1,016 (56)	
65+	3,378 (10)	3,006 (10)	182 (14)	190 (10)	
Female	967 (3)	880 (3)	30 (2)	57 (3)	0.344
VA Eligibility Status					
Full	8,449 (30)	7,599 (26)	356 (27)	494 (27)	0.042
<50% SC	6,433 (20)	5,877 (20)	245 (19)	311 (17)	
Service Connected	17,726 (54)	16,006 (54)	698 (54)	1,022 (56)	
Missing	61 (0.2)	58 (0.2)	2 (0.2)	1 (0.1)	
Race/ethnicity					
White	13,312 (41)	11,526 (39)	719 (55)	1,067 (58)	<0.001
Black	15,986 (49)	14,887 (50)	482 (37)	617 (34)	
Hispanic	2,220 (7)	2,099 (7)	47 (4)	74 (4)	
Other	1,151 (4)	1,028 (4)	53 (4)	70 (4)	
Potential Moderators among all PLWH with HIV (n = 32,669)					
Region					
Northeast	4,819 (15)	4,558 (15)	122 (9)	139 (8)	<0.001
Midwest	4,034 (12)	3,484 (12)	160 (12)	390 (21)	
South	17,304 (53)	15,493 (52)	855 (66)	956 (52)	
West	6,512 (20)	6,005 (20)	164 (13)	343 (19)	
Depression Status					
Depressed	9,268 (28)	8,361 (28)	388 (30)	519 (28)	0.493
Quartiles of % of Households under the Poverty Line					
Lowest Quartile	8,047 (25)	7,535 (26)	208 (16)	304 (17)	< 0.001
Second Quartile	8,031 (25)	7,044 (24)	390 (31)	597 (33)	
Third Quartile	7,925 (25)	6,921 (24)	435 (34)	569 (32)	
Fourth Quartile	7,903 (25)	7,348 (26)	234 (19)	321 (18)	

*p-value of significance of chi square test

Table 3.6. Description PLWH who drink any alcohol, and description of those who meet unhealthy alcohol use outcomes among drinkers at the first AUDIT-C during the study period: Overall and across rurality

	Overall n=32,669 (%)	Urban n=29,540 (%)	Large Rural n=1,301 %	Small Rural N=1,828 %	p-value*
Among all PLWH meeting eligibility criteria (n = 32,669)					
Any Alcohol Use	17,553 (53.7)	15,983 (54.1)	645 (49.6)	925 (50.6)	<0.001
Among PLWH reporting Past-year Alcohol Use (n = 17,553)					
Gender-specific AUDIT-C cut-off scores					
1-2 (men), 1-3 (women)	12,817 (73.0)	11,700 (73.2)	465 (72.1)	652 (70.5)	0.663
3-5 (men), 4-5 (women)	2,661 (15.2)	2,406 (15.1)	98 (15.2)	157 (17.0)	
6-7 (all)	868 (4.9)	784 (4.9)	34 (5.3)	50 (5.4)	
8-12 (all)	1,207 (6.9)	1,093 (6.8)	48 (7.4)	66 (7.1)	
Heavy Episodic Drinking	4,205 (19.2)	3,815 (19.2)	155 (18.3)	235 (19.5)	0.793
Alcohol Use Disorder	4,640 (14.2)	4,262 (14.4)	153 (11.8)	225 (12.3)	0.002

*p-value for significance of chi square test

Table 3.7. Predicted prevalence of any alcohol use among all PLWH with HIV (n = 32,669), and of levels of alcohol use, heavy episodic drinking, and alcohol use disorder and among drinkers (n = 17,553) in a national sample of VA patients living with HIV across rurality measured at first AUDIT-C during the study period

Among all PLWH with HIV (n = 32,669)							
	Urban (n = 29,540)		Large Rural (n = 1,301)		Small Rural (n = 1,828)		p-value*
	PP	(95% CI)	PP	(95% CI)	PP	(95% CI)	
Any Alcohol Use							
Unadjusted	54.1	(53.5, 54.7)	49.6	(46.9, 52.3)	50.6	(48.3, 52.9)	<0.001
Adjusted	54.1	(53.5, 54.7)	50.0	(47.3, 52.6)	50.5	(48.2, 52.7)	<0.001
Among Drinkers (n = 17,553)							
	Urban (n = 15,983)		Large Rural (n = 645)		Small Rural (n = 925)		p-value
	PP	(95% CI)	PP	(95% CI)	PP	(95% CI)	
AUDIT-C categories (unadjusted)							
1-2 (men), 1-3 (women)	73.2	(72.5, 73.9)	72.0	(68.6, 75.4)	70.7	(67.8, 73.6)	0.196
3-5 (men), 4-5 (women)	15.1	(14.5, 15.6)	15.6	(14.0, 17.3)	16.2	(14.9, 17.6)	
6-7 (all)	4.9	(4.6, 5.2)	5.2	(4.4, 5.9)	5.4	(4.7, 6.1)	
8-12 (all)	6.8	(6.4, 7.2)	7.2	(6.0, 8.4)	7.6	(6.6, 8.7)	
AUDIT-C Categories (adjusted)							
1-2 (men), 1-3 (women)	73.2	(72.5, 73.9)	71.3	(67.9, 74.8)	70.2	(67.3, 73.1)	0.084
3-5 (men), 4-5 (women)	15.1	(14.5, 15.6)	15.9	(14.3, 17.6)	16.4	(15.1, 17.8)	
6-7 (all)	4.9	(4.6, 5.2)	5.3	(4.5, 6.1)	5.5	(4.8, 6.2)	
8-12 (all)	6.8	(6.4, 7.2)	7.4	(6.2, 8.6)	7.8	(6.7, 8.9)	
Any Heavy Episodic Drinking							
Unadjusted	23.9	(23.2, 24.6)	24.0	(20.7, 27.3)	25.4	(22.6, 28.2)	0.575
Adjusted	23.8	(23.2, 24.5)	25.2	(21.8, 28.6)	26.0	(23.2, 28.9)	0.239
Alcohol Use Disorder							
Unadjusted	17.1	(16.5, 17.7)	14.4	(11.7, 17.1)	16.5	(14.1, 18.9)	0.197
Adjusted	17.0	(16.4, 17.6)	15.5	(12.7, 18.4)	17.5	(15.0, 20.0)	0.579

PP = predicted prevalence

CI = confidence interval

* p-value for Wald Test for overall significance across rurality

Adjusted = adjusted for gender, race/ethnicity, age categories, VA eligibility status

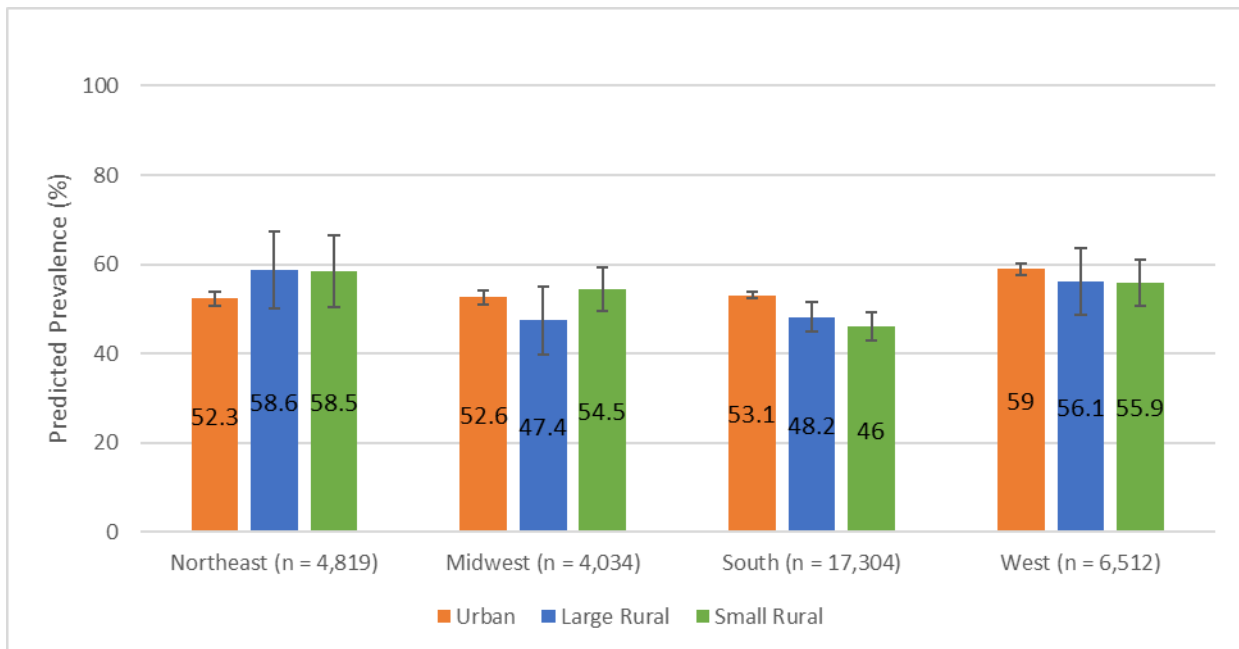


Figure 3.1. Adjusted predicted prevalence and 95% confidence intervals for any alcohol use across rurality, stratified by region (p-value for significance of interaction = 0.004)

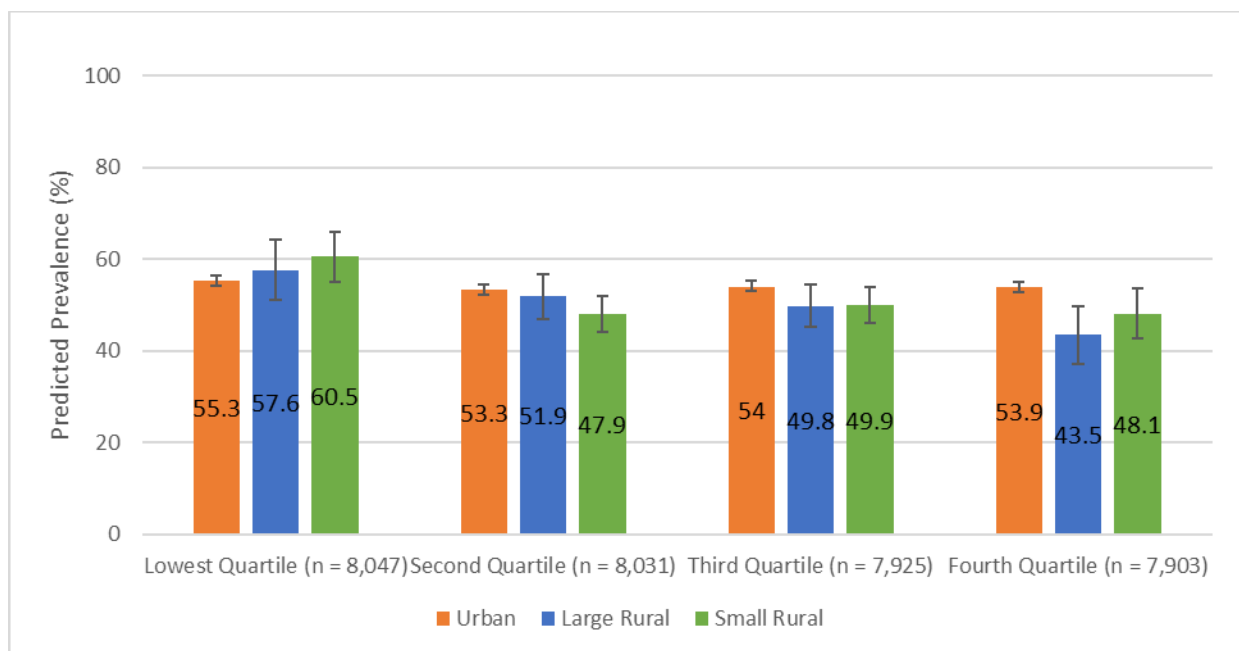


Figure 3.2 Adjusted predicted prevalence and 95% confidence intervals for any alcohol use across rurality, stratified by quartiles of neighborhood poverty (p-value for overall interaction = 0.006)

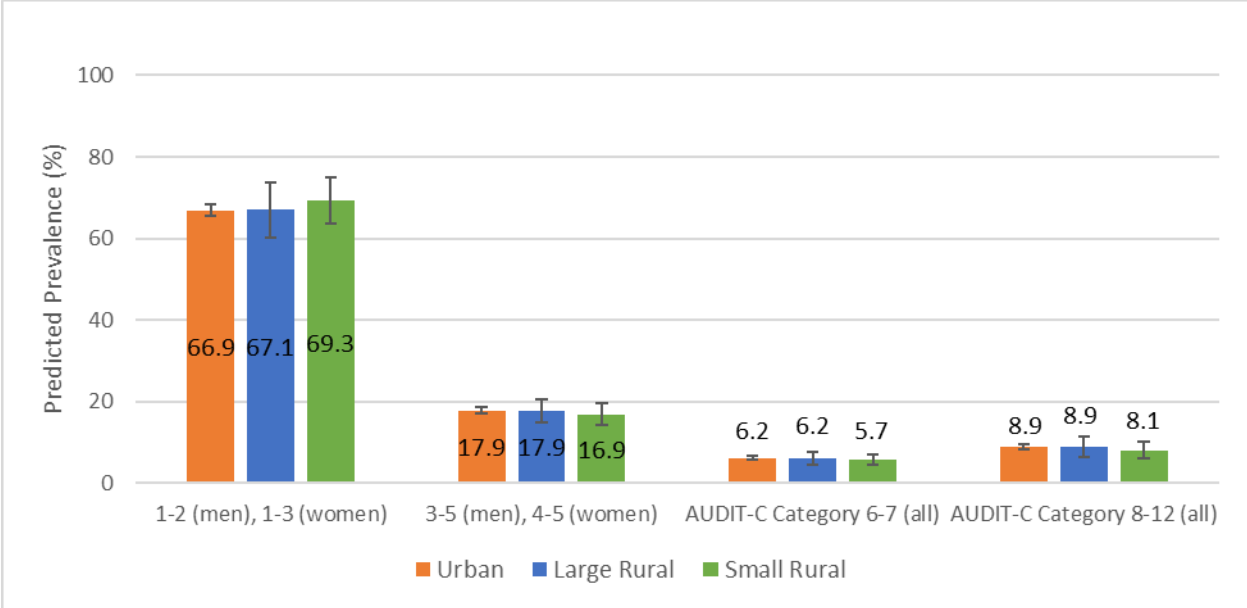


Figure 3.3. Adjusted predicted prevalence and 95% confidence intervals for AUDIT-C categories across rurality among PLWH with depression who reported any drinking in the past year, ($p < 0.001$ for overall interaction)

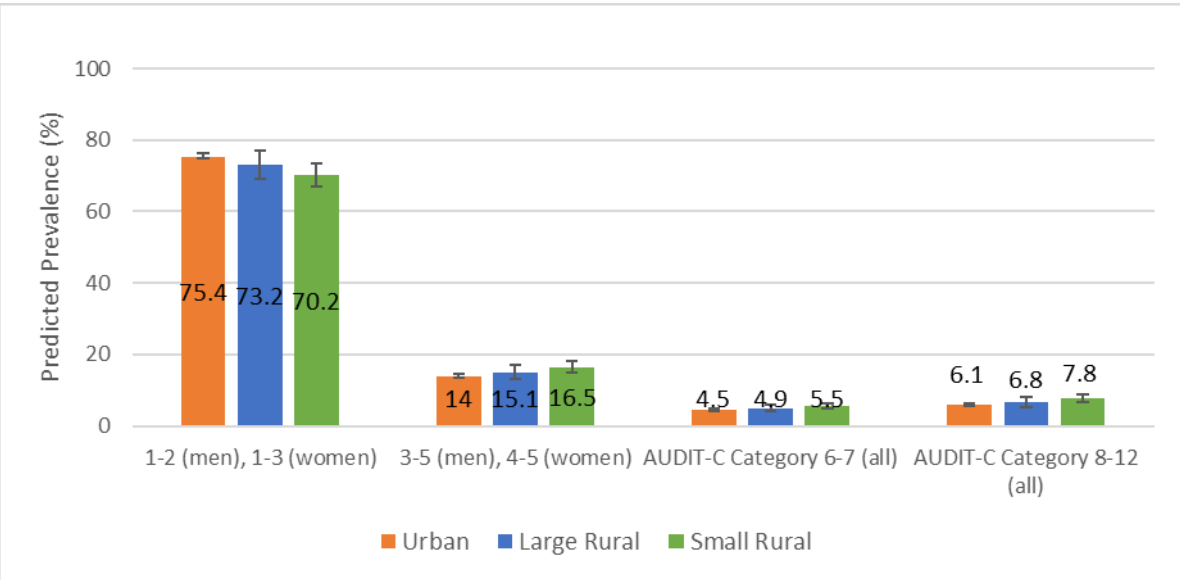


Figure 3.4. Adjusted predicted prevalence and 95% confidence intervals for AUDIT-C categories across rurality among PLWH without depression who reported any drinking in the past year ($p < 0.001$ for overall interaction)

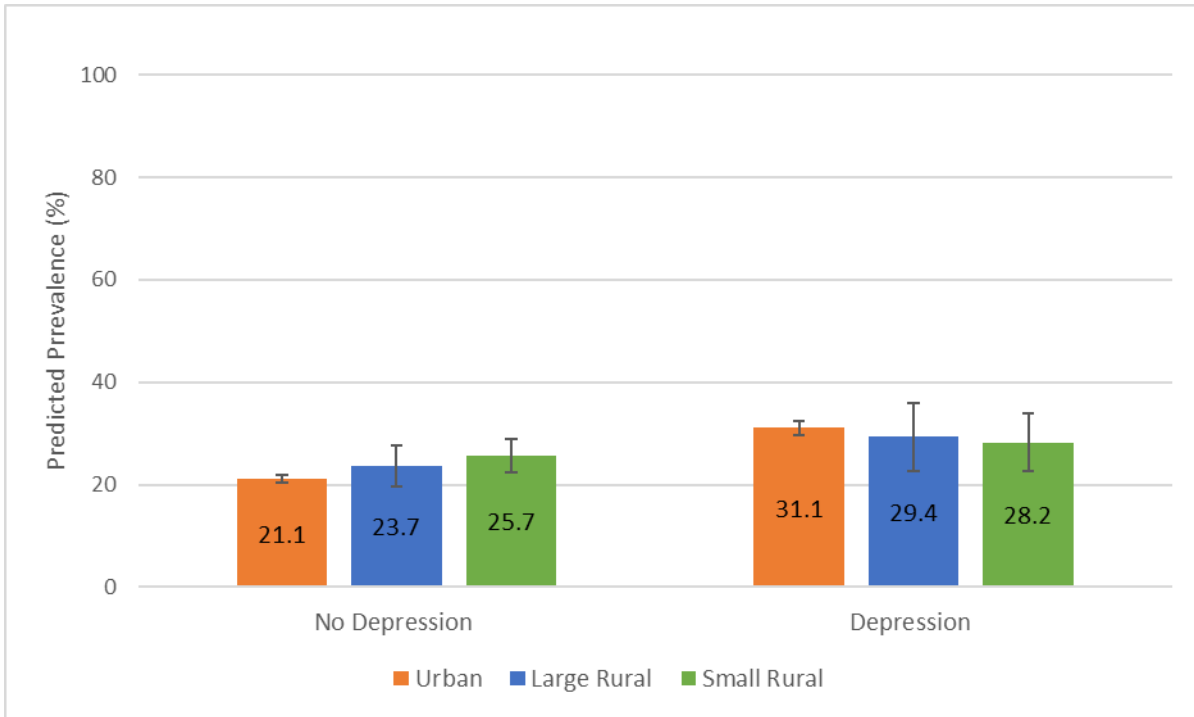


Figure 3.5. Adjusted predicted prevalence and 95% confidence intervals for heavy episodic drinking across rurality among PLWH with and without depression who reporting any drinking in the past year ($p < 0.001$ for overall interaction)

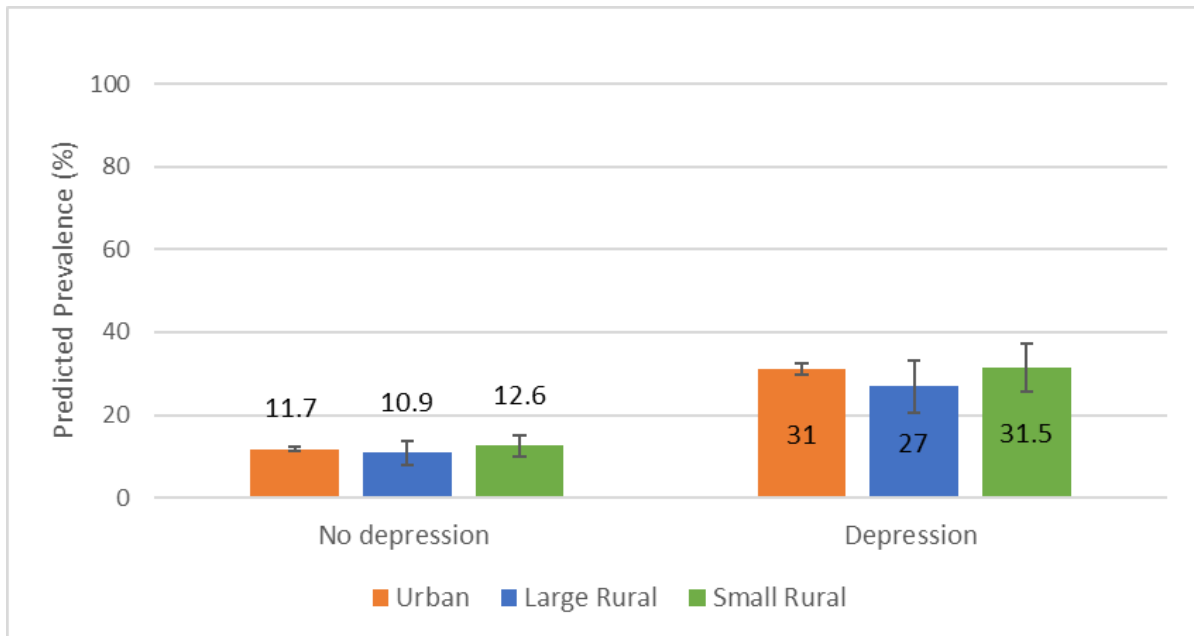


Figure 3.6. Predicted Prevalence of AUD across rurality among PLWH with and without depression who reported any drinking in the past year ($p < 0.001$ for overall interaction)

3.5 NOTES FOR CHAPTER 3

1. Braithwaite RS, Conigliaro J, Roberts MS, et al. Estimating the impact of alcohol consumption on survival for HIV+ individuals. *AIDS Care*. 2007;19(4):459-466. doi:10.1080/09540120601095734.
2. Braithwaite RS, Bryant KJ. Influence of alcohol consumption on adherence to and toxicity of antiretroviral therapy and survival. *Alcohol Res Health J Natl Inst Alcohol Abuse Alcohol*. 2010;33(3):280-287.
3. Hahn JA, Samet JH. Alcohol and HIV disease progression: weighing the evidence. *Curr HIV/AIDS Rep*. 2010;7(4):226-233. doi:10.1007/s11904-010-0060-6.
4. Wandeler G, Kraus D, Fehr J, et al. The J-curve in HIV: low and moderate alcohol intake predicts mortality but not the occurrence of major cardiovascular events. *J Acquir Immune Defic Syndr 1999*. October 2015. doi:10.1097/QAI.0000000000000864.
5. Saitz R. Unhealthy Alcohol Use. *N Engl J Med*. 2005;352(6):596-607. doi:10.1056/NEJMcp042262.
6. Azar MM, Springer SA, Meyer JP, Altice FL. A systematic review of the impact of alcohol use disorders on HIV treatment outcomes, adherence to antiretroviral therapy and health care utilization. *Drug Alcohol Depend*. 2010;112(3):178-193. doi:10.1016/j.drugalcdep.2010.06.014.
7. Galvan FH, Bing EG, Fleishman JA, et al. The prevalence of alcohol consumption and heavy drinking among people with HIV in the United States: results from the HIV Cost and Services Utilization Study. *J Stud Alcohol*. 2002;63(2):179-186. doi:10.15288/jsa.2002.63.179.
8. Williams EC, Hahn JA, Saitz R, Bryant K, Lira MC, Samet JH. Alcohol Use and Human Immunodeficiency Virus (HIV) Infection: Current Knowledge, Implications, and Future Directions. *Alcohol Clin Exp Res*. September 2016. doi:10.1111/acer.13204.
9. Shuper PA, Neuman M, Kanteres F, Baliunas D, Joharchi N, Rehm J. Causal Considerations on Alcohol and HIV/AIDS -- A Systematic Review. *Alcohol Alcohol*. 2010;45(2):159-166. doi:10.1093/alcalc/agg091.
10. Rehm J, Probst C, Shield KD, Shuper PA. Does alcohol use have a causal effect on HIV incidence and disease progression? A review of the literature and a modeling strategy for quantifying the effect. *Popul Health Metr*. 2017;15(1). doi:10.1186/s12963-017-0121-9.
11. Woolf SE, Maisto SA. Alcohol Use and Risk of HIV infection among Men Who Have Sex with Men. *AIDS Behav*. 2009;13(4):757-782. doi:10.1007/s10461-007-9354-0.
12. Hall HI, Li J, McKenna MT. HIV in predominantly rural areas of the United States. *J Rural Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc*. 2005;21(3):245-253.

13. Reif S, Pence BW, Hall I, Hu X, Whetten K, Wilson E. HIV Diagnoses, Prevalence and Outcomes in Nine Southern States. *J Community Health*. 2015;40(4):642-651. doi:10.1007/s10900-014-9979-7.
14. Borders TF, Curran GM, Mattox R, Booth BM. Religiousness among at-risk drinkers: is it prospectively associated with the development or maintenance of an alcohol-use disorder? *J Stud Alcohol Drugs*. 2010;71(1):136-142.
15. Coward RT, Krout JA, eds. *Aging in Rural Settings: Life Circumstances and Distinctive Features*. New York: Springer Pub. Co; 1998.
16. Boso LA. Urban bias, rural sexual minorities, and the courts. *UCLA Rev*. 2012;60:562.
17. Farrigan T. Rural Poverty & Well-being. USDA Economic Research Service. <http://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/poverty-overview.aspx>. Published December 17, 2015. Accessed June 5, 2016.
18. McKinney CM, Chartier KG, Caetano R, Harris TR. Alcohol Availability and Neighborhood Poverty and Their Relationship to Binge Drinking and Related Problems Among Drinkers in Committed Relationships. *J Interpers Violence*. 2012;27(13):2703-2727. doi:10.1177/0886260512436396.
19. Dixon MA, Chartier KG. Alcohol Use Patterns Among Urban and Rural Residents: Demographic and Social Influences. *Alcohol Res Curr Rev*. 2016;38(1):69-77.
20. Booth BM, Kirchner J, Fortney J, Ross R, Rost K. Rural at-risk drinkers: correlates and one-year use of alcoholism treatment services. *J Stud Alcohol*. 2000;61(2):267-277.
21. 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 Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc*. 2007;23(4):314-321. doi:10.1111/j.1748-0361.2007.00109.x.
22. Williams EC, McFarland LV, Nelson KM. Alcohol consumption among urban, suburban, and rural Veterans Affairs outpatients. *J Rural Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc*. 2012;28(2):202-210. doi:10.1111/j.1748-0361.2011.00389.x.
23. Zukoski AP, Thorburn S. Experiences of stigma and discrimination among adults living with HIV in a low HIV-prevalence context: a qualitative analysis. *AIDS Patient Care STDs*. 2009;23(4):267-276. doi:10.1089/apc.2008.0168.
24. Bouffard LA, Muftic LR. The "Rural Mystique": Social Disorganization and Violence beyond Urban Communities. *West Criminol Rev*. 2006;7(3):56-66.
25. Websdale N, Johnson B. An Ethnostatistical Comparison of the Forms and Levels of Woman Battering in Urban and Rural Areas of Kentucky. *Crim Justice Rev*. 1998;23(2):161-196. doi:10.1177/073401689802300203.

26. Florum-Smith AL, De Santis JP. Exploring the Concept of HIV-Related Stigma: HIV-Related Stigma. *Nurs Forum (Auckl)*. 2012;47(3):153-165. doi:10.1111/j.1744-6198.2011.00235.x.
27. Reif S, Golin CE, Smith SR. Barriers to accessing HIV/AIDS care in North Carolina: rural and urban differences. *AIDS Care*. 2005;17(5):558-565. doi:10.1080/09540120412331319750.
28. Martin JK, Tuch SA, Roman PM. Problem Drinking Patterns among African Americans: The Impacts of Reports of Discrimination, Perceptions of Prejudice, and “Risky” Coping Strategies. *J Health Soc Behav*. 2003;44(3):408-425.
29. Hatzenbuehler ML. How does sexual minority stigma “get under the skin”? A psychological mediation framework. *Psychol Bull*. 2009;135(5):707-730. doi:10.1037/a0016441.
30. Power R, Koopman C, Volk J, et al. Social Support, Substance Use, and Denial in Relationship to Antiretroviral Treatment Adherence among HIV-Infected Persons. *AIDS Patient Care STDs*. 2003;17(5):245-252. doi:10.1089/108729103321655890.
31. Vyavaharkar M, Glover S, Leonhirth D, Probst J. *HIV/AIDS in Rural America: Prevalence and Service Availability*. South Carolina Rural Health Research Center; 2013.
32. Cerda M, Diez-Roux AV, Tchetgen Tchetgen E, Gordon-Larsen P, Kiefe C. The Relationship Between Neighborhood Poverty and Alcohol Use: Estimation by Marginal Structural Models. *Epidemiology*. 2010;21(4):482-489. doi:10.1097/EDE.0b013e3181e13539.
33. Farrigan T. Geography of Poverty. USDA Economic Research Service. <https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/geography-of-poverty/>. Published March 1, 2017. Accessed June 26, 2017.
34. Bernstein KT, Galea S, Ahern J, Tracy M, Vlahov D. The built environment and alcohol consumption in urban neighborhoods. *Drug Alcohol Depend*. 2007;91(2-3):244-252. doi:10.1016/j.drugalcdep.2007.06.006.
35. Pereira G, Wood L, Foster S, Haggard F. Access to Alcohol Outlets, Alcohol Consumption and Mental Health. Mazza M, ed. *PLoS ONE*. 2013;8(1):e53461. doi:10.1371/journal.pone.0053461.
36. Gonzalez JS, Batchelder AW, Psaros C, Safren SA. Depression and HIV/AIDS treatment nonadherence: a review and meta-analysis. *J Acquir Immune Defic Syndr* 1999. 2011;58(2):181-187. doi:10.1097/QAI.0b013e31822d490a.
37. Krumme AA, Kaigamba F, Binagwaho A, Murray MB, Rich ML, Franke MF. Depression, adherence and attrition from care in HIV-infected adults receiving antiretroviral therapy. *J Epidemiol Community Health*. 2015;69(3):284-289. doi:10.1136/jech-2014-204494.

38. Sullivan LE, Goulet JL, Justice AC, Fiellin DA. Alcohol consumption and depressive symptoms over time: a longitudinal study of patients with and without HIV infection. *Drug Alcohol Depend.* 2011;117(2-3):158-163. doi:10.1016/j.drugalcdep.2011.01.014.
39. Sullivan LE, Fiellin DA, O'Connor PG. The prevalence and impact of alcohol problems in major depression: a systematic review. *Am J Med.* 2005;118(4):330-341. doi:10.1016/j.amjmed.2005.01.007.
40. Fergusson DM, Boden JM, Horwood LJ. Tests of Causal Links Between Alcohol Abuse or Dependence and Major Depression. *Arch Gen Psychiatry.* 2009;66(3):260. doi:10.1001/archgenpsychiatry.2008.543.
41. Probst JC, Laditka SB, Moore CG, Harun N, Powell MP, Baxley EG. Rural-urban differences in depression prevalence: implications for family medicine. *Fam Med.* 2006;38(9):653-660.
42. Sheth SH, Jensen PT, Lahey T. Living in rural New England amplifies the risk of depression in patients with HIV. *BMC Infect Dis.* 2009;9(1). doi:10.1186/1471-2334-9-25.
43. Justice AC, Dombrowski E, Conigliaro J, et al. Veterans Aging Cohort Study (VACS): Overview and description. *Med Care.* 2006;44(8 Suppl 2):S13-24. doi:10.1097/01.mlr.0000223741.02074.66.
44. Achtmeyer CE, Bradley KA. Using AUDIT-C Alcohol Screening Data in VA Research: Interpretation, Strengths, Limitations, and Sources. 2011.
45. Bradley KA, DeBenedetti AF, Volk RJ, Williams EC, Frank D, Kivlahan DR. AUDIT-C as a Brief Screen for Alcohol Misuse in Primary Care. *Alcohol Clin Exp Res.* 2007;31(7):1208-1217. doi:10.1111/j.1530-0277.2007.00403.x.
46. Fultz SL, Skanderson M, Mole LA, et al. Development and Verification of a "Virtual" Cohort Using the National VA Health Information System. *Med Care.* 2006;44(8):S25-S30.
47. Morrill R, Cromartie J, Hart G. METROPOLITAN, URBAN, AND RURAL COMMUTING AREAS: TOWARD A BETTER DEPICTION OF THE UNITED STATES SETTLEMENT SYSTEM. *Urban Geogr.* 1999;20(8):727-748. doi:10.2747/0272-3638.20.8.727.
48. Ohl ME, Perencevich E, McInnes DK, et al. Antiretroviral Adherence Among Rural Compared to Urban Veterans with HIV Infection in the United States. *AIDS Behav.* 2013;17(1):174-180. doi:10.1007/s10461-012-0325-8.
49. WWAMI Rural Health Research Center. Rural Urban Commuting Area Codes Data. <http://depts.washington.edu/uwruca/ruca-uses.php>. Accessed April 18, 2016.
50. Cromartie J, Hart G. Rural-Urban Commuting Area Codes. Center for Rural Health. <http://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes.aspx#.U20K1F50H0A>. Published June 2, 2014. Accessed October 4, 2016.

51. Kinder LS, Bryson CL, Sun H, Williams EC, Bradley KA. Alcohol screening scores and all-cause mortality in male Veterans Affairs patients. *J Stud Alcohol Drugs*. 2009;70(2):253-260.
52. Chavez LJ, Williams EC, Lapham G, Bradley KA. Association between alcohol screening scores and alcohol-related risks among female veterans affairs patients. *J Stud Alcohol Drugs*. 2012;73(3).
53. Frank D, DeBenedetti AF, Volk RJ, Williams EC, Kivlahan DR, Bradley KA. Effectiveness of the AUDIT-C as a screening test for alcohol misuse in three race/ethnic groups. *J Gen Intern Med*. 2008;23(6):781-787. doi:10.1007/s11606-008-0594-0.
54. Bush K. The AUDIT Alcohol Consumption Questions (AUDIT-C): An Effective Brief Screening Test for Problem Drinking. *Arch Intern Med*. 1998;158(16):1789. doi:10.1001/archinte.158.16.1789.
55. Dawson DA, Grant BF, Stinson FS, Zhou Y. Effectiveness of the Derived Alcohol Use Disorders Identification Test (AUDIT-C) in Screening for Alcohol Use Disorders and Risk Drinking in the US General Population: *Alcohol Clin Exp Res*. 2005;29(5):844-854. doi:10.1097/01.ALC.0000164374.32229.A2.
56. Rubinsky AD, Dawson DA, Williams EC, Kivlahan DR, Bradley KA. AUDIT-C scores as a scaled marker of mean daily drinking, alcohol use disorder severity, and probability of alcohol dependence in a U.S. general population sample of drinkers. *Alcohol Clin Exp Res*. 2013;37(8):1380-1390. doi:10.1111/acer.12092.
57. Bradley KA, Bush KR, Epler AJ, et al. Two brief alcohol-screening tests From the Alcohol Use Disorders Identification Test (AUDIT): validation in a female Veterans Affairs patient population. *Arch Intern Med*. 2003;163(7):821-829. doi:10.1001/archinte.163.7.821.
58. Smith PC, Schmidt SM, Allensworth-Davies D, Saitz R. Primary Care Validation of a Single-Question Alcohol Screening Test. *J Gen Intern Med*. 2009;24(7):783-788. doi:10.1007/s11606-009-0928-6.
59. National Institute of Alcohol Abuse and Alcoholism. Alcohol Use Disorder. National Institute on Alcohol Abuse and Alcoholism. <http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-use-disorders>. Accessed April 8, 2015.
60. Williams EC, Gupta S, Rubinsky AD, et al. Racial/Ethnic Differences in the Prevalence of Clinically Recognized Alcohol Use Disorders Among Patients from the U.S. Veterans Health Administration. *Alcohol Clin Exp Res*. 2016;40(2):359-366. doi:10.1111/acer.12950.
61. Bensley KM, Harris AHS, Gupta S, et al. Racial/ethnic Differences in Initiation of and Engagement with Addictions Treatment among Patients with Alcohol Use Disorders in the Veterans Health Administration. *J Subst Abuse Treat*. August 2016. doi:10.1016/j.jsat.2016.08.009.

62. Karriker-Jaffe KJ, Zemore SE, Mulia N, Jones-Webb R, Bond J, Greenfield TK. Neighborhood disadvantage and adult alcohol outcomes: differential risk by race and gender. *J Stud Alcohol Drugs*. 2012;73(6):865-873.
63. Robert SA. SOCIOECONOMIC POSITION AND HEALTH: The Independent Contribution of Community Socioeconomic Context. *Annu Rev Sociol*. 1999;25(1):489-516. doi:10.1146/annurev.soc.25.1.489.
64. Williams R. Using the margins command to estimate and interpret adjusted predictions and marginal effects. *Stata J*. 2012;12(2):308.
65. Williams EC, Joo YS, Lipira L, Glass JE. Psychosocial stressors and alcohol use, severity, and treatment receipt across human immunodeficiency virus (HIV) status in a nationally representative sample of US residents. *Subst Abuse*. December 2016:1-9. doi:10.1080/08897077.2016.1268238.
66. Williams EC, Achtmeyer CE, Thomas RM, et al. Factors Underlying Quality Problems with Alcohol Screening Prompted by a Clinical Reminder in Primary Care: A Multi-site Qualitative Study. *J Gen Intern Med*. 2015;30(8):1125-1132. doi:10.1007/s11606-015-3248-z.
67. Bradley KA, Lapham GT, Hawkins EJ, et al. Quality concerns with routine alcohol screening in VA clinical settings. *J Gen Intern Med*. 2011;26(3). doi:10.1007/s11606-010-1509-4.
68. McGinnis KA, Tate JP, Williams EC, et al. Comparison of AUDIT-C collected via electronic medical record and self-administered research survey in HIV infected and uninfected patients. *Drug Alcohol Depend*. 2016;168:196-202. doi:10.1016/j.drugalcdep.2016.09.015.
69. Williams EC, Rubinsky AD, Chavez LJ, et al. An early evaluation of implementation of brief intervention for unhealthy alcohol use in the US Veterans Health Administration: Early evaluation of VA's brief intervention. *Addiction*. 2014;109(9):1472-1481. doi:10.1111/add.12600.
70. Pellowski JA, Kalichman SC, Matthews KA, Adler N. A pandemic of the poor: social disadvantage and the U.S. HIV epidemic. *Am Psychol*. 2013;68(4):197-209. doi:10.1037/a0032694.

Chapter 4. DIFFERENCES IN RECEIPT OF ALCOHOL-RELATED CARE ACROSS RURALITY AMONG VA PATIENTS LIVING WITH HIV AND UNHEALTHY ALCOHOL USE

4.1 INTRODUCTION

Among people living with HIV (PLWH), unhealthy alcohol use is associated with increased risk of HIV transmission, delayed entry to treatment, non-adherence to ART, increased disease progression, and mortality.¹⁻³ There are currently a number of clinical practices available that have been shown to decrease alcohol use: brief interventions are recommended for primary care patients who screen positive for unhealthy alcohol use,⁴⁻⁶ while specialty addictions treatment^{7,8} and/or alcohol use disorder (AUD) medications⁹ are recommended for those with the most severe unhealthy alcohol use, those with AUD.

Previous research has shown that, among patients with unhealthy alcohol use, PLWH are vulnerable to under-receipt of alcohol-related care¹⁰ and are less likely to receive recommended alcohol-related care than patients without HIV.¹¹ Among PLWH with unhealthy alcohol use, receipt of alcohol-related care may be even less likely among certain vulnerable subpopulations of PLWH. As a population with unique barriers to health care services,¹² PLWH who live in more rural communities may be less likely to receive alcohol-related care than those living in urban communities. Rural PLWH have delayed or decreased access to HIV testing and treatment, often due to geographic barriers.¹³⁻¹⁵ Rural drinkers experience decreased accessibility to alcohol-related care,¹⁶ along with an increased perceived lack of anonymity in seeking alcohol-related care in a primary care setting relative to urban drinkers.¹⁷

There are also differences in stigma that may differentially influence receipt of alcohol-related care across rurality among PLWH. While HIV prevalence is generally lower in rural communities, stigma and experience of discrimination among PLWH are often higher in areas with low HIV prevalence, like rural communities.¹⁸ Rural PLWH may experience increased HIV stigma relative to urban PLWH.^{18–20} These factors could lead to less willingness among PLWH to seek treatment for a stigmatized condition like unhealthy alcohol use.^{21,22} However, despite well-known barriers to care in rural areas, as well as expected alcohol- and HIV-related stigma in rural areas, and increased alcohol-related risk for PLWH, no studies have described differences in receipt of alcohol-related care based on place of residence among PLWH.

In the national Veterans Health Administration (VA)—the largest integrated healthcare system in the U.S.— delivery of both preventive alcohol screening (to identify patients with unhealthy alcohol use) and brief intervention (for those screening positive for unhealthy alcohol use) are incentivized by national performance measures.^{4,23,24} Specialty addictions treatment and AUD medications are recommended in VA’s clinical guideline for treatment of substance use disorders and routinely monitored.²⁵ The VA is also a large national healthcare system that serves enough rural veterans to make this comparison possible. Therefore, national VA data provide a unique opportunity to describe differences in receipt of alcohol-related care based on place of residence among PLWH with unhealthy alcohol use. The aim of the present study was to describe receipt of three elements of evidence-based alcohol-related care across rural status among PLWH who screened positive for unhealthy alcohol use at the VA over a five-year period.

4.2 METHODS

Data Source and Study Sample. Data from VA's Corporate Data Warehouse (CDW), a national data repository that mirrors the VA's electronic health record (EHR) and contains clinical, enrollment, financial administrative, pharmacy, and utilization data were used. CDW data were extracted for all patients who had: 1) an outpatient appointment between October 1, 2009 and May 30, 2013, 2) one or more positive screens for unhealthy alcohol use, 3) a documented diagnosis for HIV/AIDS in the two years prior to positive alcohol screening, and 4) a documented residential zip code that corresponded to a Rural Urban Commuting Area (RUCA) code. There were 4,649 positive screens identified, of which 98.5% (n = 4,581) had a documented zip code. Positive alcohol screens were defined as a score of 5 or more on the Alcohol Use Disorders Identification Test Consumption (AUDIT-C) questionnaire consistent with the denominator specification for VA's performance measure for brief intervention;^{24,25} HIV status was based on International Classification of Disease Ninth Revision, Clinical Modification (ICD-9-CM) codes, consistent with prior VA research on HIV.²⁶ All positive AUDIT-C screens between October 1, 2009 and May 30, 2013 were followed for one year (up to May 30, 2014) to assess outcomes.

Predictors: Rurality was measured by applying rural and urban commuting area (RUCA) codes, developed by the Federal Office of Rural Health Policy to assess commuting times and proximity to urban areas,²⁷ to patient zip codes. Patient zip code was assessed on the closest available date to the AUDIT-C screening within 1 year prior to each positive AUDIT-C. RUCA codes were based on the 2010 decennial census and 2006-2010 American Community Survey to categorize patients into three groups: 1) urban, 2) large rural, and small/isolated rural (including

small town/remote categories), as recommended by the Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI) Region Rural Health Research Center.²⁸

Outcomes: Three measures reflecting elements of evidence-based care for unhealthy alcohol use were used. Receipt of brief intervention (BI) was measured based on EHR documentation of advice to reduce or abstain drinking within 14 days of a positive AUDIT-C screen,²⁴ derived from text data generated when care is documented in electronic clinical decision support. This measure is a routinely used measure of BI,^{6,11,29} and is consistent with the VA's national performance measure requiring brief intervention consisting of advice and feedback for patients that screen positive for unhealthy alcohol use.^{6,24} Additionally, in the year following each positive screen, we measured both whether patients received recommended care, including receipt of specialty addictions treatment based on documented visits to any VA specialty addictions treatment (measured by VA clinic stop and bed section codes along with an AUD diagnosis). VA specialty addictions treatment included a variety of treatment options (from detox to psychosocial interventions and twelve step programs) for those with AUD. VA clinical guidelines suggest that these treatments vary based on an individual's current needs and should be agreed on by physicians and patients using shared decision making.²⁵ Receipt of AUD medications based on a filled prescription for acamprosate, disulfiram, topiramate, or oral or injectable naltrexone,¹¹ which could be prescribed in any treatment setting and have demonstrated effectiveness at helping to decrease alcohol use by decreasing cravings, relieving withdrawal symptoms, or increasing experience of adverse acute reactions to alcohol (to dissuade use).²⁵ These medications were selected based on having FDA approval for treatment of AUD or strong meta-analytic support for their use in the treatment of AUD.⁹

Covariates: The model included several groups of covariates, measured at the time of positive screening, that are known to be associated with rurality and receipt of care and thus may confound their association. These variables included age,³⁰ gender,³¹ race/ethnicity,^{32,33} VA eligibility status,¹² marital status,³⁴ and region.^{12,33} Variables were not included as covariates if they were suspected to be mediators or only associated with the outcome variable. Additionally, all models were adjusted for fiscal year of screening during the study period between October 2009 and May 2013 (ex. Fiscal year 2010 = October 1, 2009 to September 30, 2010) to account for variation in receipt of care over time across annual AUDIT-C screens among PLWH with more than one screen included in this study

Socio-Demographics: Age was measured in years, categorized as <50, 50-64, and ≥65. Gender was measured as male or female based on EHR documentation. Race/ethnicity was categorized as non-Hispanic black, Hispanic, non-Hispanic white, or other as recommended by the US Office of Management and Budget (OMB).³⁵ VA eligibility status is determined by a combination of service-connected disability and income, and was measured in categories including full coverage, <50% service connected coverage, or service connected coverage and used as an imperfect proxy for socioeconomic status, similar to previous VA studies of prevalence of alcohol use³⁶ and alcohol-related treatment.³⁷ Marital Status was obtained from the EHR and categorized as divorced/separated, never married/single, married, or widowed. Region was measured consistent with Census definitions as West, Midwest, South, and Northeast, derived using zip codes.

Additional Measures. Several other factors were measured for descriptive purposes, though not included in analytic models because they were determined *a priori* to be potentially mediating factors.^{38,39} HIV disease severity was measured at closest available measure in six months prior

and six months following the time of the AUDIT-C using CD4 count (<200, 200-500, >500 cells/mm³), consistent with Centers for Disease Control (CDC) classification system for HIV-infected adults and adolescents.⁴⁰ All comorbid mental health and substance use diagnoses were measured using ICD-9 codes and included if documented in the 0-365 days prior to a positive alcohol screen. Diagnosed mental health disorders included depressive disorders, PTSD, other anxiety disorders, or serious mental illnesses (bipolar, psychosis, and schizophrenia). Non-alcohol substance use disorders included any stimulant use, opioid use, or other (cannabis, hallucinogen, or sedative) abuse or dependence. Tobacco use was measured based on documented tobacco use disorder or documentation of tobacco screening data indicating current smoker status.⁴¹ Severity of unhealthy alcohol use included past year AUD (abuse or dependence, ICD-9 codes: 303.9-303.92) and past year alcohol-specific condition (ICD-9 codes: 357.5 425.5 535.30 535.31 571.0 571.1 571.2 571.3). Finally, two measures of health services utilization were derived: 1) number of outpatient visits (categorized as 0, 1-4, 5-10, 11-24, or ≥ 25 visits), and 2) number of inpatient days (categorized as 0, 1, 2, 3, and ≥4 days), both measured in the 0-365 days prior to any positive alcohol screen.

ANALYSES

Main Analysis: Patient-level descriptive analyses compared population characteristics, based patients' first positive screen for unhealthy alcohol, across rurality for all eligible PLWH with positive screens for unhealthy alcohol use using chi-square tests of independence. Next, among all positive screens, Poisson regression models were used to compare relative risk of receipt of alcohol-related care for urban, relative to large and small rural, PLWH using Wald tests ($p < 0.05$). Recycled predictions were used to obtain predicted prevalence and 95% confidence intervals of each outcome by comparing the effect on the conditional mean prevalence of receipt

of alcohol-related care of a change in each category of rurality.⁴² Unadjusted and adjusted models were run, with both models adjusting for fiscal year to account for differences over time within patients with multiple screens. Overall significance of any differences across rurality were compared using a Wald Test for each model ($p < 0.05$). All Poisson models were clustered by facility to account correlation within VA facilities, and to account for conservative estimates due to use of Poisson with binary data.⁴³ To assess if differences existed when adjusting for within-patient correlation, models were compared that were clustered on patient, clustered on facility, and clustered on multiple levels using a three part model.⁴⁴ All models produced similar results, although clustering on facility provided the most conservative estimates and was used in the final model, along with adjustment for fiscal year to account for time trends.

Secondary Analyses. Analyses evaluating the association between receipt of specialty addiction treatment and AUD medications across rurality were repeated in the subsample of PLWH with documented AUD - the specific population for whom they are recommended.^{45,46} Additionally, as previous studies have found that alcohol-use varies by region,^{47,48} we assessed, for each model described above, whether the association between rurality and receipt of alcohol-related care varied across region by testing the significance of a multiplicative interaction between rurality and region. For secondary analyses examining effect modification by region and depression status, sample sizes were too small to adequately assess effect modification using the three-category measure of rurality for specialty addiction treatment and AUD medications. Therefore, a dichotomous measure, combining large and small rural categories into one “rural” category was created and compared with urban PLWH to test interactions between rurality and region and rurality and depression status. Interactions were only tested between region and rurality, and between rurality and depression, in the fully adjusted models.

4.3 RESULTS

There were 4,581 positive screens among PLWH during the study period representing 3,458 individuals, including 3,112 urban, 130 large rural, and 216 small rural PLWH. There were no significant differences in age, gender, marital status, and VA eligibility status across rurality. However, both region and race/ethnicity differed across rurality. These results are described in Table 4.8. Specifically, within this sample of PLWH with unhealthy alcohol use, urban patients appeared have a highest proportion of black patients, while small rural patients appeared to have the highest proportion of white patients (p -value < 0.001). There tended to also be a greater proportion of PLWH in urban communities in the Northeast and West, a greater proportion of PLWH from small rural communities in the Midwest, and a greater proportion of PLWH from large rural communities in the South (p -value < 0.001). There were no significant differences across rurality in depression, other anxiety, severe mental illness, other drug use, current tobacco use, AUD, past-year alcohol specific conditions, past year alcohol-related conditions, total outpatient visits, or total inpatient visits across rural status. However, urban patients appeared to have the highest prevalence of PTSD, stimulant use, and opioid use while patients in small rural communities appeared to have the highest prevalence of tobacco use.

Results of Poisson models assessing receipt of alcohol-related care across rurality are presented in Table 4.9. Among all PLWH with unhealthy alcohol use, receipt of brief intervention did not differ across rurality in the unadjusted model ($p = 0.194$ from overall significance test). After adjusting for potential confounders, differences in receipt of brief interventions across rurality were observed using a Wald test of overall significance (p -value = 0.048). In the adjusted model, PLWH in large rural communities appeared to have the highest prevalence of receipt of brief interventions [Urban: 56.3% (95% Confidence Interval: 50.9%,

61.7%); Large Rural: 65.7% (56.8%, 74.6%); Small Rural: 60.9% (52.5%, 69.3%)]. Using a Wald Test to compare relative risk between urban and large rural communities, large rural communities had significantly higher receipt of brief interventions than those in urban communities in the unadjusted model ($p < 0.05$), although the relative risk of receipt of care between the two groups was small. There was no significant difference between urban and small rural PLWH in the adjusted model ($p > 0.05$).

Using an overall test for significance, we found significant differences in receipt of specialty addictions treatment across rurality (p-values of overall significance for both models < 0.001). After adjusting for all covariates, urban patients appeared to have the highest predicted probability of receiving specialty addictions treatment. Prevalence of receipt of care were 28.3% (25.9%, 30.8%) for urban; 19.7% (12.6%, 26.8%) for large rural; and 19.5% (13.8%, 25.1%) for PLWH in small rural communities, showing almost a 10%-point difference in receipt of care. Using a Wald Test to compare relative risk between urban and large rural, and urban and small rural communities, both small and large rural PLWH had significantly and strongly lower receipt of specialty addictions treatment than urban PLWH ($p < 0.05$), IRR = 0.69 (95% CI: 0.52, 0.92) comparing receipt of specialty care between small and urban PLWH (Table 4.10).

. While predicted prevalence of receiving AUD medications was low across rurality, no statistically significant differences in relative risk of receipt of AUD medications were observed (p-values for overall significance of unadjusted and adjusted models > 0.05 ; Table 4.10).

In secondary analyses examining differences across rurality in receipt of specialty addictions treatment and AUD medications among those with diagnosed AUD, results were similar. Significant differences were found across rurality using an overall test of significance for in the unadjusted model, although this differences was attenuated by adjusting for all

covariates. Urban patients appeared to have the highest predicted prevalence of receiving specialty addictions treatment, and by comparing relative risk of receipt of brief intervention between urban and small rural communities, we found that urban PLWH were more likely to receive specialty addictions than PLWH from small rural communities ($p < 0.05$), although the relative risk in receipt of care was smaller than in the full sample. Overall difference across all rurality categories were significant in the unadjusted model (Wald test for overall significance $p = 0.007$), but adjustment of all covariates attenuated the significance of these differences in the adjusted model ($p = 0.064$). No significant differences in receipt of AUD medications were observed across rurality among PLWH with documented AUD.

A marginally significant interaction was observed between rurality and region, modifying the association between rurality and brief interventions (p -value for interaction = 0.077). The results of stratified analyses are presented in Table 4.11. These results show that while in the Midwest and South, rural PLWH appeared to have higher receipt of BI than urban PLWH, in the West, receipt of care appeared to be similar, and in the Northeast, urban PLWH appeared to have higher receipt of BI than rural PLWH. No differences in the association between rurality and receipt of specialty addictions treatment or AUD medication were observed across region (p -values for interactions = 0.413 and 0.105, respectively). Among those with diagnosed AUD, there was also no difference in the association between rurality and receipt of specialty addictions treatment or AUD medication across region (p -values for interactions = 0.772 and 0.874, respectively). Depression status was not a statistically significant modifier of the association between rurality and receipt of alcohol related care for any of the outcomes.

4.4 DISCUSSION

In this national sample of PLWH with unhealthy alcohol use receiving care at the VA, we identified differences in receipt of evidence-based alcohol-related care across rural status. Findings suggest that receipt of brief intervention may be more common among PLWH living in large rural communities than in urban communities, although the association may vary by region, with differences least pronounced in the west and reversed in the northeast. Specialty addictions treatment is more common among PLWH living in urban areas, highlighting rural PLWH, particularly small rural PLWH, as a potentially under-served population regarding receipt of specialty addictions treatment. AUD medications appear to be substantially under-utilized among PLWH, with no differences across communities.

Because VA has a national performance measure for brief intervention,²⁴ we would expect there to be little variation in the prevalence of these services across rurality and region. Brief interventions may be more common in rural areas because there may be less access in rural areas to specialty addictions treatment and AUD medications.^{9,45,49,50} Hence, clinics in rural areas may increase the provision of brief interventions because it may be the only option perceived to be available. Unfortunately, brief alcohol interventions are not known to be efficacious among patients with unhealthy alcohol use who have AUD.⁵¹ Therefore, it is critical to increase access to specialty addictions treatment and AUD medications so that more PLWH with unhealthy alcohol use in rural areas -- particularly those with more severe drinking or AUD -- can benefit from evidence-based treatments.

Findings related to specialty addictions treatment are similar to studies of care for patients with other mental health disorders.⁵² Previous studies not specific to HIV have demonstrated that people living in rural communities may have unique barriers to receipt of

alcohol-related care,¹⁶ including decreased availability of services, geographic proximity, stigma, and access to technologies to support care.^{17,30,33,53,54} Studies have also demonstrated that patients living in rural areas receive less follow-up care after positive alcohol screening than urban counterparts.⁵⁵ In combination with very low rates of AUD medication receipt, findings from this study are concerning regarding access to evidence-based treatment for AUD among the population of PLWH living in more rural areas. While specialty addictions treatment is considered evidence based, it may be difficult to increase access in rural communities, and may patients prefer not to engage in specialty care.^{25,56} However, new technologies (e.g., electronic or mobile app-based brief interventions) have potential to address lack of access. Computer-based brief interventions have shown promise in reaching PLWH with unhealthy alcohol use and detectable viral loads.⁵⁷ Similarly, telemedicine and other health system interventions may be important areas of study for increasing access to alcohol-related care among rural PLWH. Most evidence-based behavioral treatments (e.g., motivational enhancement therapy or cognitive behavioral therapy) can be offered through phone or tele-video conferencing and can provide access to alcohol-related care by removing geographic barriers and increasing confidentiality of care.^{58,59} Travel reimbursements have been shown to increase healthcare utilization among rural patients.⁶⁰ High adherence rates have also been observed when HIV medications have been mailed directly to patients,⁶¹ and a similar model may increase access to AUD medications for very rural PLWH with AUD. In addition, AUD medications have been shown to be as effective as specialty addictions treatment when prescribed along with ongoing medical management,^{62–64} and thus may be a viable option for provision in primary care settings. Thus, increased support for provision of AUD medications and ongoing medical monitoring may be an important mechanism for increasing receipt of evidence-based care among more rural PLWH with AUD.

However, there are likely many barriers to provision of AUD medications in primary care or among HIV providers offering primary care. HIV primary-care providers report several barriers to prescribing AUD medications, including insufficient training and perceived lack of research on efficacy of AUD medications.¹⁰ Further, while barriers indicate a need for more training about the importance of offering alcohol-related care to PLWH and the efficacy of AUD medications, HIV providers report ambivalence about receiving training in treatment of addictions.⁶⁵ Thus, provider-level barriers may need to be addressed in order to optimize provision of AUD treatment in rural areas.

There are several limitations to this study. Use of secondary clinical and administrative data may have limited measurement. Specifically, identification of eligible patients using clinically documented AUDIT-C screens may have resulted in under-identification of PLWH with unhealthy alcohol use due to methods of screening administration,⁶⁶⁻⁶⁸ social desirability bias, or limited patient recall.⁶ Measurement of brief interventions using text data generated via use of electronic clinical decision support may be limited for capturing brief intervention receipt,^{5,67} and secondary data did not enable assessment of the quality of brief intervention delivered.⁶ In addition, we relied on VA eligibility to be an imperfect proxy of socioeconomic status. Because socioeconomic status is a known confounder in the association between rurality and both HIV alcohol-related outcomes,⁶⁹ residual confounding by socioeconomic status may be present. Finally, results may not be generalizable to non-veterans, veterans not linked with care, homeless veterans without a documented home zip code or address, or all PLWH who are not VA patients.

Despite these limitations, this study has noteworthy strengths. It is the first study to evaluate differences in receipt of alcohol-related care across rurality among PLWH with

unhealthy alcohol use. Use of a large national sample of PLWH with unhealthy alcohol use builds on previous literature of rural differences in alcohol-related care, which has focused on experiences of PLWH in a specific region or on general outpatients (non-HIV specific).^{50,53,54,70} This study found that, across all communities, receipt of alcohol-related care was very low. These findings are consistent with other studies,^{10,11,71} and again highlight the need to increase receipt of alcohol-related care for all PLWH with unhealthy alcohol use, due to heightened risk of alcohol-related harms in this population.^{11,72-74} This study adds to current literature by highlighting that PLWH with unhealthy alcohol use who live in rural communities may be particularly vulnerable to under-receipt of specialty addictions treatment. Future research is needed to understand the reasons for these differences and to promote solutions that increase receipt of alcohol-related care for all PLWH. Supporting physicians practicing in rural areas in provision of AUD medications, as well as increasing access to the services using offered in specialty addictions treatment for interested patients in the most rural communities using innovative methods may be key areas for study.

Table 4.8. Patient characteristics among PLWH with unhealthy alcohol use at first positive screen during the study period (n = 3,459): overall and across rurality

		Overall N=3,459 (%)	Urban N=3,113 (%)	Large Rural N=130 (%)	Small Rural N=216 (%)	p-value*
Potential Confounders						
Age	<50	1,173 (33.9)	1,057 (34.0)	38 (29.2)	78 (36.1)	0.721
	50-64	2,039 (58.9)	1,836 (59.0)	82 (63.1)	121 (56.0)	
	65+	247 (7.1)	220 (7.1)	10 (7.7)	17 (7.9)	
Female		70 (2.0)	60 (1.9)	3 (2.3)	7 (3.2)	0.404
VA Eligibility Status	Full	574 (16.6)	516 (16.5)	20 (15.4)	38 (17.6)	0.510
	<50% SC	718 (20.8)	645 (20.7)	34 (26.2)	39 (18.1)	
	Service Connected	2,167 (62.7)	1,952 (62.7)	76 (58.5)	139 (64.4)	
Marital Status	Divorced/Separated	1,127 (33.0)	1,009 (32.8)	39 (30.0)	79 (36.7)	0.317
	Never married/ Single	401 (11.7)	352 (11.4)	20 (15.4)	29 (13.5)	
	Married	1,779 (51.4)	1,616 (51.9)	65 (50.0)	98 (45.4)	
	Widowed	114 (3.3)	99 (3.2)	6 (4.6)	9 (4.2)	
	Missing	38 (1.1)	37 (1.2)	0 (0.0)	1 (0.5)	
Race/ethnicity	Black	1,968 (56.9)	1,814 (58.3)	72 (55.4)	83 (38.4)	<0.001
	White	1,085 (31.4)	925 (29.7)	50 (38.5)	110 (50.9)	
	Hispanic	257 (7.4)	239 (7.7)	5 (3.8)	13 (6.0)	
	Other	148 (4.3)	135 (4.3)	3 (2.3)	10 (4.6)	
Region	Northeast	526 (15.2)	495 (15.9)	11 (8.5)	20 (9.3)	<0.001
	Midwest	470 (13.6)	404 (13.0)	13 (10.0)	53 (24.5)	
	Southeast	1,880 (54.4)	1,681 (54.0)	92 (70.8)	108 (50.0)	
	West	582 (16.8)	533 (17.1)	14 (10.8)	35 (16.2)	
Fiscal Year of First AUDIT-C screen	2010	1,302 (37.6)	1,162 (37.3)	50 (38.5)	90 (41.7)	0.195
	2011	961 (27.8)	862 (27.7)	33 (25.4)	66 (30.6)	
	2012	797 (23.0)	721 (23.2)	29 (22.3)	47 (21.8)	
	2013	399 (11.5)	368 (11.8)	18 (13.8)	13 (6.0)	
Additional Factors (not included in models)						
Depression		545 (15.8)	498 (16.0)	18 (13.8)	29 (13.4)	0.501
PTSD		477 (13.8)	444 (14.3)	11 (8.5)	22 (10.2)	0.050
Other Anxiety		427 (12.3)	373 (12.0)	17 (13.1)	37 (17.1)	0.079
SMI		522 (15.1)	470 (15.1)	15 (11.5)	37 (17.1)	0.371
Stimulant Use		978 (28.3)	901 (28.9)	29 (22.3)	48 (22.2)	0.033
Opioid Use		289 (8.4)	277 (8.9)	3 (2.3)	9 (4.2)	0.002
Other Drug Use		481 (13.9)	442 (14.2)	16 (12.3)	23 (10.6)	0.305
Tobacco Use Disorder		1,353 (39.1)	1,201 (38.6)	48 (36.9)	104 (48.2)	0.018
Current Tobacco Use		2,165 (62.6)	1,947 (62.5)	82 (63.1)	136 (63.0)	0.985
Alcohol Use Disorder		1,699 (49.1)	1,539 (49.4)	54 (41.5)	106 (49.1)	0.212
Past-year alcohol specific condition		83 (2.4)	77 (2.5)	1 (0.8)	5 (2.3)	0.459
Past-year alcohol related condition		310 (9.0)	289 (9.3)	9 (6.9)	12 (5.6)	0.126
Total Outpatient visits in prior year	0	39 (1.1)	34 (1.1)	2 (1.5)	3 (1.4)	0.073
	1-4	428 (12.4)	371 (11.9)	21 (16.2)	36 (16.7)	
	5-10	847 (24.5)	749 (24.1)	41 (31.5)	57 (26.4)	
	11-24	1,101 (31.8)	1,002 (32.2)	32 (24.6)	67 (31.0)	
	>=25	1,044 (30.2)	957 (30.7)	34 (26.2)	53 (24.5)	
Total inpatient visits in prior year	0	2,619 (75.7)	2,353 (75.6)	96 (73.8)	170 (78.7)	0.936
	1	492 (14.2)	445 (14.3)	21 (16.2)	26 (12.0)	
	2-3	256 (7.4)	233 (7.5)	9 (6.9)	14 (6.5)	
	>=4	92 (2.7)	82 (2.6)	4 (3.1)	6 (2.8)	

*p-value for overall test of significance of chi square test

Table 4.9. Predicted prevalence of receipt of alcohol-related care across urban, large rural, and small rural screens among those with unhealthy alcohol use (n = 4,581) and those with documented AUD (n = 2,370)

Outcome		Urban		Large Rural		Small Rural		p-value†
		PP (%)	95% CI	PP (%)	95% CI	PP (%)	95% CI	
Among those with Unhealthy Alcohol Use (N = 4,581)								
Brief Intervention	Unadjusted	56.4	(50.1, 62.8)	63.7	(55.4, 72.1)	59.9	(51.6, 68.1)	0.194
	Adjusted	56.3	(50.9, 61.7)	65.7	(56.8, 74.6)	60.9	(52.5, 69.3)	0.048
Specialty Addictions Treatment	Unadjusted	28.8	(25.8, 31.7)	17.8	(11.0, 24.6)	16.6	(11.6, 21.7)	<0.001
	Adjusted	28.3	(25.9, 30.8)	19.7	(12.6, 26.8)	19.5	(13.8, 25.1)	0.007
AUD Medications	Unadjusted	3.9	(3.1, 4.6)	3.5	(0.7, 6.1)	3.3	(1.2, 5.4)	0.878
	Adjusted	3.8	(3.1, 4.6)	3.9	(0.9, 6.9)	3.3	(1.2, 5.5)	0.927
Among only those with AUD (N = 2,370)								
Specialty Addictions Treatment	Unadjusted	47.1	(43.2, 51.1)	37.5	(24.7, 50.4)	33.0	(24.9, 41.0)	0.007
	Adjusted	46.8	(43.4, 50.3)	38.5	(25.5, 51.5)	36.0	(27.1, 44.8)	0.064
AUD Medications	Unadjusted	6.3	(5.0, 7.6)	6.9	(0.8, 12.9)	5.0	(1.7, 8.3)	0.784
	Adjusted	6.3	(5.0, 7.6)	7.3	(0.8, 13.8)	4.8	(1.6, 8.0)	0.696

PP = predicted prevalence

Unadjusted: adjusted for fiscal year

Adjusted: adjusted for fiscal year of AUDIT-C screen, age, sex, race/ethnicity, marital status, VA eligibility status, and region

† p-value of Wald Test for overall significance

Table 4.10. Incidence rate ratio (IRR) of receipt of alcohol-related care across urban, large rural, and small rural screens among those with unhealthy alcohol use (n = 4,581) and those with documented AUD (n = 2,370)

Outcome		Large Rural Relative to Urban		Small Rural Relative to Urban		Large Rural Relative to Small Rural	
		IRR	95% CI	IRR	95% CI	IRR	95% CI
Among those with Unhealthy Alcohol Use (N = 4581)							
Receipt of Brief Intervention	Unadjusted	1.13	(0.98, 1.30)	1.06	(0.92, 1.22)	1.06	(0.89, 1.28)
	Adjusted	1.17	(1.02, 1.34)	1.08	(0.95, 1.23)	1.08	(0.90, 1.30)
Receipt of Specialty Addictions Treatment	Unadjusted	0.62	(0.42, 0.91)	0.58	(0.43, 0.78)	1.07	(0.66, 1.74)
	Adjusted	0.70	(0.49, 1.00)	0.69	(0.52, 0.92)	1.01	(0.65, 1.59)
Receipt of AUD Medications	Unadjusted	0.90	(0.41, 1.95)	0.85	(0.43, 1.69)	1.05	(0.39, 2.81)
	Adjusted	1.01	(0.46, 2.22)	0.87	(0.44, 1.74)	1.16	(0.42, 3.21)
Among only those with AUD (N = 2370)							
Receipt of Specialty Addictions Treatment	Unadjusted	0.80	(0.55, 1.14)	0.70	(0.55, 0.89)	1.14	(0.74, 1.76)
	Adjusted	0.82	(0.58, 1.17)	0.77	(0.60, 0.98)	1.07	(0.70, 1.63)
Receipt of AUD Medications	Unadjusted	1.09	(0.45, 2.62)	0.80	(0.40, 1.58)	1.37	(0.47, 3.98)
	Adjusted	1.16	(0.48, 2.82)	0.76	(0.38, 1.53)	1.52	(0.51, 4.51)

Unadjusted: adjusted for fiscal year

Adjusted: adjusted for fiscal year of AUDIT-C screen, age, sex, race/ethnicity, marital status, VA eligibility status, and region

p-values of < 0.05 are bolded

Table 4.11. Predicted prevalence of receipt of brief interventions across urban and rural* positive screens stratified by region in fully adjusted models (n = 4,581)

Outcome		Urban		Rural*		p-value†
		PP (%)	95% CI	PP (%)	95% CI	
Among those with Unhealthy Alcohol Use (N = 4,581)						
Receipt of Brief Intervention	Northeast	77.5	(68.3, 86.7)	65.3	(53.0, 77.6)	0.077
	Midwest	52.7	(41.9, 63.5)	60.8	(44.7, 77.0)	
	South	49.7	(41.3, 58.2)	59.1	(51.2, 67.0)	
	West	60.9	(50.3, 71.4)	62.3	(48.0, 76.6)	

PP = predicted prevalence

† p-value for Wald Test of overall significance

* Includes PLWH from both large and small rural communities

Adjusted for fiscal year of AUDIT-C screen, age, sex, race/ethnicity, marital status, and VA eligibility status

4.5 NOTES FOR CHAPTER 4

1. Braithwaite RS, Conigliaro J, Roberts MS, et al. Estimating the impact of alcohol consumption on survival for HIV+ individuals. *AIDS Care*. 2007;19(4):459-466. doi:10.1080/09540120601095734.
2. Braithwaite RS, Bryant KJ. Influence of alcohol consumption on adherence to and toxicity of antiretroviral therapy and survival. *Alcohol Res Health J Natl Inst Alcohol Abuse Alcohol*. 2010;33(3):280-287.
3. Hahn JA, Samet JH. Alcohol and HIV disease progression: weighing the evidence. *Curr HIV/AIDS Rep*. 2010;7(4):226-233. doi:10.1007/s11904-010-0060-6.
4. Bradley KA, Williams EC, Achtmeyer CE, et al. Measuring Performance of Brief Alcohol Counseling in Medical Settings: A Review of the Options and Lessons from the Veterans Affairs (VA) Health Care System. *Subst Abuse*. 2007;28(4):133-149. doi:10.1300/J465v28n04_05.
5. Lapham GT, Rubinsky AD, Shortreed SM, et al. Comparison of provider-documented and patient-reported brief intervention for unhealthy alcohol use in VA outpatients. *Drug Alcohol Depend*. 2015;153:159-166. doi:10.1016/j.drugalcdep.2015.05.027.
6. Williams EC, Rubinsky AD, Chavez LJ, et al. An early evaluation of implementation of brief intervention for unhealthy alcohol use in the US Veterans Health Administration: Early evaluation of VA's brief intervention. *Addiction*. 2014;109(9):1472-1481. doi:10.1111/add.12600.
7. Dawson DA, Grant BF, Stinson FS, Chou PS. Estimating the effect of help-seeking on achieving recovery from alcohol dependence. *Addiction*. 2006;101(6):824-834. doi:10.1111/j.1360-0443.2006.01433.x.
8. Weisner C, Matzger H, Kaskutas LA. How important is treatment? One-year outcomes of treated and untreated alcohol-dependent individuals. *Addict Abingdon Engl*. 2003;98(7):901-911.
9. Jonas DE, Amick HR, Feltner C, et al. Pharmacotherapy for Adults With Alcohol Use Disorders in Outpatient Settings: A Systematic Review and Meta-analysis. *JAMA*. 2014;311(18):1889. doi:10.1001/jama.2014.3628.
10. Chander G, Monroe AK, Crane HM, et al. HIV primary care providers—Screening, knowledge, attitudes and behaviors related to alcohol interventions. *Drug Alcohol Depend*. January 2016. doi:10.1016/j.drugalcdep.2016.01.015.
11. Williams EC, Lapham GT, Shortreed SM, et al. Among patients with unhealthy alcohol use, those with HIV are less likely than those without to receive evidence-based alcohol-related care: A national VA study. *Drug Alcohol Depend*. 2017;174:113-120. doi:10.1016/j.drugalcdep.2017.01.018.

12. Hartley D. Rural Health Disparities, Population Health, and Rural Culture. *Am J Public Health*. 2004;94(10):1675-1678.
13. Wroth TH, Pathman DE. Primary medication adherence in a rural population: the role of the patient-physician relationship and satisfaction with care. *J Am Board Fam Med JABFM*. 2006;19(5):478-486.
14. Ohl M, Tate J, Duggal M, et al. Rural residence is associated with delayed care entry and increased mortality among veterans with human immunodeficiency virus infection. *Med Care*. 2010;48(12):1064-1070. doi:10.1097/MLR.0b013e3181ef60c2.
15. Ohl ME, Perencevich E. Frequency of human immunodeficiency virus (HIV) testing in urban vs. rural areas of the United States: Results from a nationally-representative sample. *BMC Public Health*. 2011;11(1):681. doi:10.1186/1471-2458-11-681.
16. Booth BM, Kirchner J, Fortney J, Ross R, Rost K. Rural at-risk drinkers: correlates and one-year use of alcoholism treatment services. *J Stud Alcohol*. 2000;61(2):267-277.
17. Fortney J, Mukherjee S, Curran G, Fortney S, Han X, Booth BM. Factors associated with perceived stigma for alcohol use and treatment among at-risk drinkers. *J Behav Health Serv Res*. 2004;31(4):418-429.
18. Zukoski AP, Thorburn S. Experiences of stigma and discrimination among adults living with HIV in a low HIV-prevalence context: a qualitative analysis. *AIDS Patient Care STDs*. 2009;23(4):267-276. doi:10.1089/apc.2008.0168.
19. Florom-Smith AL, De Santis JP. Exploring the Concept of HIV-Related Stigma: HIV-Related Stigma. *Nurs Forum (Auckl)*. 2012;47(3):153-165. doi:10.1111/j.1744-6198.2011.00235.x.
20. Reif S, Golin CE, Smith SR. Barriers to accessing HIV/AIDS care in North Carolina: rural and urban differences. *AIDS Care*. 2005;17(5):558-565. doi:10.1080/09540120412331319750.
21. Durvasula R, Miller TR. Substance Abuse Treatment in Persons with HIV/AIDS: Challenges in Managing Triple Diagnosis. *Behav Med*. 2014;40(2):43-52. doi:10.1080/08964289.2013.866540.
22. Levi-Minzi MA, Surratt HL. HIV Stigma Among Substance Abusing People Living with HIV/AIDS: Implications for HIV Treatment. *AIDS Patient Care STDs*. 2014;28(8):442-451. doi:10.1089/apc.2014.0076.
23. Bush K. The AUDIT Alcohol Consumption Questions (AUDIT-C): An Effective Brief Screening Test for Problem Drinking. *Arch Intern Med*. 1998;158(16):1789. doi:10.1001/archinte.158.16.1789.
24. Lapham GT, Achtmeyer CE, Williams EC, Hawkins EJ, Kivlahan DR, Bradley KA. Increased Documented Brief Alcohol Interventions With a Performance Measure and

Electronic Decision Support: *Med Care*. 2012;50(2):179-187.
doi:10.1097/MLR.0b013e3181e35743.

25. VA/DoD Clinical Guideline for the Management of Substance Use Disorders. Washington, D.C.: The Management of Substance Use Disorders Work Group; 2015.
<https://www.healthquality.va.gov/guidelines/MH/sud/VADoDSUDCPGRevised22216.pdf>.
26. Fultz SL, Skanderson M, Mole LA, et al. Development and Verification of a “Virtual” Cohort Using the National VA Health Information System. *Med Care*. 2006;44(8):S25-S30.
27. Morrill R, Cromartie J, Hart G. METROPOLITAN, URBAN, AND RURAL COMMUTING AREAS: TOWARD A BETTER DEPICTION OF THE UNITED STATES SETTLEMENT SYSTEM. *Urban Geogr*. 1999;20(8):727-748. doi:10.2747/0272-3638.20.8.727.
28. Cromartie J, Hart G. Rural-Urban Commuting Area Codes. Center for Rural Health.
<http://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes.aspx#.U20K1F50H0A>. Published June 2, 2014. Accessed October 4, 2016.
29. Williams EC, Lapham GT, Hawkins EJ, et al. Variation in Documented Care for Unhealthy Alcohol Consumption Across Race/Ethnicity in the Department of Veterans Affairs Healthcare System. *Alcohol Clin Exp Res*. 2012;36(9):1614-1622. doi:10.1111/j.1530-0277.2012.01761.x.
30. Arcury TA, Gesler WM, Preisser JS, Sherman J, Spencer J, Perin J. The Effects of Geography and Spatial Behavior on Health Care Utilization among the Residents of a Rural Region. *Health Serv Res*. 2005;40(1):135-156. doi:10.1111/j.1475-6773.2005.00346.x.
31. Willging CE, Salvador M, Kano M. Brief Reports: Unequal Treatment: Mental Health Care for Sexual and Gender Minority Groups in a Rural State. *Psychiatr Serv*. 2006;57(6):867-870. doi:10.1176/appi.ps.57.6.867.
32. Slifkin R, Goldsmith L, Ricketts T. Race and Place: Urban-Rural Differences in Health for Racial and Ethnic Minorities. 2000;(66).
http://www.shepscenter.unc.edu/rural/pubs/finding_brief/fb61.pdf. Accessed January 21, 2016.
33. Arcury TA, Preisser JS, Gesler WM, Powers JM. Access to transportation and health care utilization in a rural region. *J Rural Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc*. 2005;21(1):31-38.
34. Blazer DG, Landerman LR, Fillenbaum G, Horner R. Health services access and use among older adults in North Carolina: urban vs rural residents. *Am J Public Health*. 1995;85(10):1384-1390.
35. Office of Budget and Management. *Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity*. Office of Budget and Management; 1997.

36. Williams EC, Gupta S, Rubinsky AD, et al. Racial/Ethnic Differences in the Prevalence of Clinically Recognized Alcohol Use Disorders Among Patients from the U.S. Veterans Health Administration. *Alcohol Clin Exp Res*. 2016;40(2):359-366. doi:10.1111/acer.12950.
37. Bensley KM, Harris AHS, Gupta S, et al. Racial/ethnic Differences in Initiation of and Engagement with Addictions Treatment among Patients with Alcohol Use Disorders in the Veterans Health Administration. *J Subst Abuse Treat*. August 2016. doi:10.1016/j.jsat.2016.08.009.
38. Fergusson DM, Boden JM, Horwood LJ. Tests of Causal Links Between Alcohol Abuse or Dependence and Major Depression. *Arch Gen Psychiatry*. 2009;66(3):260. doi:10.1001/archgenpsychiatry.2008.543.
39. Azar MM, Springer SA, Meyer JP, Altice FL. A systematic review of the impact of alcohol use disorders on HIV treatment outcomes, adherence to antiretroviral therapy and health care utilization. *Drug Alcohol Depend*. 2010;112(3):178-193. doi:10.1016/j.drugalcdep.2010.06.014.
40. Centers for Disease Control and Prevention (CDC). Revised surveillance case definition for HIV infection--United States, 2014. *MMWR Recomm Rep Morb Mortal Wkly Rep Recomm Rep*. 2014;63(RR-03):1-10.
41. McGinnis KA, Brandt CA, Skanderson M, et al. Validating Smoking Data From the Veteran's Affairs Health Factors Dataset, an Electronic Data Source. *Nicotine Tob Res*. 2011;13(12):1233-1239. doi:10.1093/ntr/ntr206.
42. Williams R. Using the margins command to estimate and interpret adjusted predictions and marginal effects. *Stata J*. 2012;12(2):308.
43. Zou G. A Modified Poisson Regression Approach to Prospective Studies with Binary Data. *Am J Epidemiol*. 2004;159(7):702-706. doi:10.1093/aje/kwh090.
44. Miglioretti DL, Heagerty PJ. Marginal Modeling of Nonnested Multilevel Data using Standard Software. *Am J Epidemiol*. 2006;165(4):453-463. doi:10.1093/aje/kwk020.
45. Harris AHS, Kivlahan DR, Bowe T, Humphreys KN. Pharmacotherapy of alcohol use disorders in the Veterans Health Administration. *Psychiatr Serv Wash DC*. 2010;61(4):392-398. doi:10.1176/appi.ps.61.4.392.
46. Harris AHS, Humphreys K, Finney JW. Veterans Affairs facility performance on Washington Circle indicators and casemix-adjusted effectiveness. *J Subst Abuse Treat*. 2007;33(4):333-339. doi:10.1016/j.jsat.2006.12.015.
47. 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 Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc*. 2007;23(4):314-321. doi:10.1111/j.1748-0361.2007.00109.x.

48. Vander Weg MW, Cai X. Variability in Veterans' Alcohol Use by Place of Residence: Alcohol Use in Veterans. *Am J Addict*. 2012;21(1):31-37. doi:10.1111/j.1521-0391.2011.00191.x.
49. Mark TL, Kassed CA, Vandivort-Warren R, Levit KR, Kranzler HR. Alcohol and opioid dependence medications: Prescription trends, overall and by physician specialty. *Drug Alcohol Depend*. 2009;99(1-3):345-349. doi:10.1016/j.drugalcdep.2008.07.018.
50. Pullen E, Oser C. Barriers to Substance Abuse Treatment in Rural and Urban Communities: Counselor Perspectives. *Subst Use Misuse*. 2014;49(7):891-901. doi:10.3109/10826084.2014.891615.
51. Jonas DE, Garbutt JC, Amick HR, et al. Behavioral Counseling After Screening for Alcohol Misuse in Primary Care: A Systematic Review and Meta-analysis for the U.S. Preventive Services Task Force. *Ann Intern Med*. 2012;157(9):645. doi:10.7326/0003-4819-157-9-201211060-00544.
52. Mott JM, Grubbs KM, Sansgiry S, Fortney JC, Cully JA. Psychotherapy Utilization Among Rural and Urban Veterans From 2007 to 2010: Psychotherapy Use Among Rural Veterans. *J Rural Health*. 2015;31(3):235-243. doi:10.1111/jrh.12099.
53. Browne T, Priester MA, Clone S, Iachini A, DeHart D, Hock R. Barriers and Facilitators to Substance Use Treatment in the Rural South: A Qualitative Study: Substance Use Treatment Barriers and Facilitators. *J Rural Health*. 2016;32(1):92-101. doi:10.1111/jrh.12129.
54. Fortney J, Booth BM. Access to Substance Abuse Services in Rural Areas. In: *Alcoholism*. Boston, MA: Springer US; 2002:177-197. http://link.springer.com/10.1007/978-0-306-47193-3_10. Accessed April 17, 2016.
55. Chan Y-F, Lu S-E, Howe B, Tieben H, Hoeft T, Unützer J. Screening and Follow-Up Monitoring for Substance Use in Primary Care: An Exploration of Rural–Urban Variations. *J Gen Intern Med*. 2016;31(2):215-222. doi:10.1007/s11606-015-3488-y.
56. Glass JE, Perron BE, Ilgen MA, Chermack ST, Ratliff S, Zivin K. Prevalence and correlates of specialty substance use disorder treatment for Department of Veterans Affairs Healthcare System patients with high alcohol consumption. *Drug Alcohol Depend*. 2010;112(1-2):150-155. doi:10.1016/j.drugalcdep.2010.06.003.
57. Yang C, M Crane H. Implementation of Computer-delivered Brief Alcohol Intervention in HIV Clinical Settings: Who Agrees to Participate? *J Addict Res Ther*. 2016;07(02). doi:10.4172/2155-6105.1000276.
58. Baca CT, Alverson DC, Manuel JK, Blackwell GL. Telecounseling in Rural Areas for Alcohol Problems. *Alcohol Treat Q*. 2007;25(4):31-45. doi:10.1300/J020v25n04_03.

59. Staton-Tindall M, Wahler E, Webster JM, Godlaski T, Freeman R, Leukefeld C. Telemedicine-based alcohol services for rural offenders. *Psychol Serv.* 2012;9(3):298-309. doi:10.1037/a0026772.
60. Nelson RE, Hicken B, West A, Rupper R. The Effect of Increased Travel Reimbursement Rates on Health Care Utilization in the VA: Effect of Increased Travel Reimbursement Rates on Health Care Utilization. *J Rural Health.* 2012;28(2):192-201. doi:10.1111/j.1748-0361.2011.00387.x.
61. Gross R, Zhang Y, Grossberg R. Medication refill logistics and refill adherence in HIV. *Pharmacoepidemiol Drug Saf.* 2005;14(11):789-793. doi:10.1002/pds.1109.
62. Spithoff S, Kahan M. Primary care management of alcohol use disorder and at-risk drinking: Part 2: counsel, prescribe, connect. *Can Fam Physician.* 2015;61(6):515-521.
63. Anton RF, O'Malley SS, Ciraulo DA, et al. Combined Pharmacotherapies and Behavioral Interventions for Alcohol Dependence: The COMBINE Study: A Randomized Controlled Trial. *JAMA.* 2006;295(17):2003. doi:10.1001/jama.295.17.2003.
64. Miller PM, Book SW, Stewart SH. Medical Treatment of Alcohol Dependence: A Systematic Review. *Int J Psychiatry Med.* 2011;42(3):227-266. doi:10.2190/PM.42.3.b.
65. Montague BT, Kahler CW, Colby SM, et al. Attitudes and Training Needs of New England HIV Care and Addiction Treatment Providers: Opportunities for Better Integration of HIV and Alcohol Treatment Services. *Addict Disord Their Treat.* 2015;14(1):16-28. doi:10.1097/ADT.0000000000000040.
66. Williams EC, Achtmeyer CE, Thomas RM, et al. Factors Underlying Quality Problems with Alcohol Screening Prompted by a Clinical Reminder in Primary Care: A Multi-site Qualitative Study. *J Gen Intern Med.* 2015;30(8):1125-1132. doi:10.1007/s11606-015-3248-z.
67. Bradley KA, Lapham GT, Hawkins EJ, et al. Quality concerns with routine alcohol screening in VA clinical settings. *J Gen Intern Med.* 2011;26(3). doi:10.1007/s11606-010-1509-4.
68. McGinnis KA, Tate JP, Williams EC, et al. Comparison of AUDIT-C collected via electronic medical record and self-administered research survey in HIV infected and uninfected patients. *Drug Alcohol Depend.* 2016;168:196-202. doi:10.1016/j.drugalcdep.2016.09.015.
69. Pellowski JA, Kalichman SC, Matthews KA, Adler N. A pandemic of the poor: social disadvantage and the U.S. HIV epidemic. *Am Psychol.* 2013;68(4):197-209. doi:10.1037/a0032694.
70. Williams EC, McFarland LV, Nelson KM. Alcohol consumption among urban, suburban, and rural Veterans Affairs outpatients. *J Rural Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc.* 2012;28(2):202-210. doi:10.1111/j.1748-0361.2011.00389.x.

71. Chokron Garneau H, Venegas A, Rawson R, Ray LA, Glasner S. Barriers to initiation of extended release naltrexone among HIV-infected adults with alcohol use disorders. *J Subst Abuse Treat*. May 2017. doi:10.1016/j.jsat.2017.05.004.
72. Williams EC, Hahn JA, Saitz R, Bryant K, Lira MC, Samet JH. Alcohol Use and Human Immunodeficiency Virus (HIV) Infection: Current Knowledge, Implications, and Future Directions. *Alcohol Clin Exp Res*. September 2016. doi:10.1111/acer.13204.
73. Justice AC, McGinnis KA, Tate JP, et al. Risk of mortality and physiologic injury evident with lower alcohol exposure among HIV infected compared with uninfected men. *Drug Alcohol Depend*. 2016;161:95-103. doi:10.1016/j.drugalcdep.2016.01.017.
74. The Veterans Aging Cohort Study, McGinnis KA, Fiellin DA, et al. Number of Drinks to 'Feel a Buzz?' by HIV Status and Viral Load in Men. *AIDS Behav*. 2016;20(3):504-511. doi:10.1007/s10461-015-1053-7.

Chapter 5. DIFFERENCES IN RECEIPT OF ALCOHOL-RELATED CARE ACROSS RACE/ETHNICITY AMONG MALE VA PATIENTS LIVING WITH HIV AND UNHEALTHY ALCOHOL USE

5.1 INTRODUCTION

Alcohol use is common and associated with poor health outcomes.¹⁻³ Specifically, among people living with HIV (PLWH), alcohol use may be particularly harmful,⁴ as it is associated with decreased adherence to HIV medication needed to prevent disease progression.⁵⁻¹² Alcohol-related use patterns and risks vary across racial/ethnic groups. While most studies in the general population show that black and Hispanic individuals have similar¹³ or lower¹⁴ prevalence of unhealthy alcohol use and alcohol use disorders (AUD) than whites, among VA patients, black patients have a higher prevalence of AUD.¹⁵ However, even at similar or lower levels of drinking, alcohol use may be particularly harmful for racial/ethnic minorities relative to their white counterparts.¹⁶⁻¹⁸ While differences in alcohol-related consequences have not previously been studied among PLWH, given trends in non-HIV specific populations, addressing unhealthy alcohol use among racial/ethnic minority PLWH is important to decrease alcohol-related risks disproportionately experienced in these populations.

To decrease alcohol consumption in patient populations, there are several evidence-based clinical interventions available for patients with unhealthy alcohol use: brief interventions for those with unhealthy alcohol use, and specialty addictions treatment or alcohol use disorder medications for those with alcohol use disorders (AUD). In non-HIV specific populations, racial/ethnic differences in receipt of alcohol-related care have been documented. Though black patients appear to be more likely than white patients to receive brief interventions^{19,20} and

specialty addictions treatment,²¹ black patients are less likely than white patients to receive AUD medications.²² Hispanic patients appear to receive alcohol-related care at similar levels as white patients after accounting for other factors that may influence receipt of care. While the precise mechanisms underlying these differences are unknown, social norms across racial/ethnic groups,²³ differences in policing in communities with greater neighborhood disadvantage,^{24–26} and in provider or facility-level factors^{27,28} may be responsible for observed racial/ethnic differences in receipt of care. Additionally, as the HIV epidemic in the United States has affected racial/ethnic groups differently across regions including through different experiences of HIV-related stigma, and because drinking behaviors and norms vary across regions, it is possible that the association between race/ethnicity and receipt of care could vary across regions. Given that alcohol use is particularly harmful for people living with HIV, it is important to assess whether alcohol-related care is being received equitably across racial/ethnic groups among PLWH.

The purpose of this study is to compare whether receipt of alcohol-related care varies across racial/ethnic groups among PLWH with unhealthy alcohol use, and to estimate prevalence of receipt of care among different racial/ethnic groups of PLWH. This study was conducted in the Veterans Health Administration (VA), which is the largest provider of HIV care in the United States²⁹ and is a leader in implementing both alcohol screening and alcohol-related care.^{30,31} The results of this study are important to understanding whether alcohol-related care is received equitably across racial/ethnic groups among PLWH, for whom alcohol use is particularly harmful.

5.2 METHODS

Data Source and Sample: Data from VA's Corporate Data Warehouse (CDW) were used for this study. The CDW is a national data repository mirroring the electronic health record in the

VA and contains clinical, enrollment, financial administrative, pharmacy, and utilization data. CDW data were included in this study for all PLWH who had: 1) an outpatient appointment between October 2009 and May 2013, 2) one or more positive screens for unhealthy alcohol use, 3) a documented diagnosis for HIV/AIDS in the two years prior to positive alcohol screening, and 4) had a residential zip code documented that corresponded to a Rural Urban Commuting Area Code.^{33,34} Positive alcohol screening was defined as a score of 5 or higher on the Alcohol Use Disorders Identification Test Consumption (AUDIT-C) questionnaire.³⁴ HIV status was based on International Classification of Disease Ninth Revision, Clinical Modification (ICD-9-CM) codes, consistent with prior VA research among PLWH.²⁹ All positive AUDIT-C screens between October 1, 2009 and May 30, 2013 were followed for one year (up to May 30, 2014) to assess outcomes. Only male patients were included in this study because previous studies have demonstrated that racial/ethnic differences in alcohol-related care are often moderated by gender differences,^{35,36} and the number of eligible female patients in this sample was too small to examine independently across racial/ethnic groups (n=69; including 49 black women, 5 Hispanic women, and 10 white women).

Predictors: Three racial/ethnic groups were assessed: non-Hispanic black, Hispanic, and non-Hispanic white patients, classified as single racial/ethnic group from least common to most common, consistent with other studies using single race/ethnicity classification.^{37,38} Other racial/ethnic groups were not included in this study due to limitations in sample size.

Outcomes: Three measures reflecting elements of evidence-based care for unhealthy alcohol use were used. Receipt of brief intervention (BI) was measured based on EHR documentation of advice to reduce or abstain drinking within 14 days of a positive AUDIT-C screen,³⁴ derived from text data generated when care is documented in electronic clinical decision support. This

measure is a routinely used measure of BI,^{20,39,40} and is consistent with the VA's national performance measure requiring brief intervention consisting of advice and feedback for patients that screen positive for unhealthy alcohol use.^{34,39} Additionally, in the year following each positive screen, we measured both whether patients received recommended care, including receipt of specialty addictions treatment based on documented visits to any VA specialty addictions treatment (measured by VA clinic stop and bed section codes along with an AUD diagnosis). VA specialty addictions treatment included a variety of treatment options (from detox to psychosocial interventions and twelve step programs) for those with AUD. VA clinical guidelines suggest that these treatments vary based on an individual's current needs and should be agreed on by physicians and patients using shared decision making.⁴¹ Receipt of AUD medications based on a filled prescription for acamprosate, disulfiram, topiramate, or oral or injectable naltrexone,⁴⁰ which could be prescribed in any treatment setting. These medications were selected based on having FDA approval for treatment of AUD or strong meta-analytic support for their use in the treatment of AUD⁴² and have demonstrated effectiveness at helping to decrease alcohol use by decreasing cravings, relieving withdrawal symptoms, or increasing experience of adverse acute reactions to alcohol (to dissuade use).⁴¹

Covariates: Covariates in this study included variables that were suspected *a priori* to confound the association between race/ethnicity and receipt of alcohol-related care among PLWH with unhealthy alcohol use, including age, marital status, VA eligibility status, rurality, and region. Covariates considered to be mediating factors or factors associated only with the outcome based on a review of the literature were not included in this model. Additionally, all models were adjusted for fiscal year of screening for each year during study period between October 2009 and May 2013 (ex. Fiscal year 2010 = October 1, 2009 to September 30, 2010). This accounted for

variation in likelihood of receipt of care across annual AUDIT-C screens among PLWH with more than one screen included in this study. Age was measured in years at time of AUDIT-C and considered as a categorical variable (<50 years, 50-64 years, ≥65 years). Rurality was defined using rural and urban commuting area (RUCA) codes^{32,33} to create three categories of rurality: 1) urban, 2) large rural, and small/isolated rural (including small town/remote categories), as recommended by the WWAMI Rural Health Research Center. Zip codes used to create these codes were assessed based on place of residence on the closest available date to the AUDIT-C screening within 1 year prior to each positive AUDIT-C screen during the study period. VA eligibility status is determined by a combination of service-connected disability and income, and was measured in categories including full coverage, <50% service connected coverage, or service connected coverage and used as an imperfect proxy for socioeconomic status, similar to previous VA studies of prevalence of alcohol use¹⁵ and alcohol-related treatment.²¹ Marital Status was obtained from the EHR and categorized as divorced/separated, never married/single, married, or widowed. Region was measured consistent with Census definitions as West, Midwest, South, and Northeast, derived using zip codes.

Additional Measures. Several other factors were measured for descriptive purposes, though not included in analytic models because they were determined *a priori* to be potentially mediating factors.^{5,43} HIV disease severity was measured at closest available measure in six months prior and six months following the time of the AUDIT-C using CD4 count (<200, 200-500, >500 cells/mm³), consistent with Centers for Disease Control (CDC) classification system for HIV-infected adults and adolescents.⁴⁴ All comorbid mental health and substance use diagnoses were measured using ICD-9 codes and included if documented in the 0-365 days prior to a positive alcohol screen. Diagnosed mental health disorders included depressive disorders, PTSD, other

anxiety disorders, or serious mental illnesses (bipolar, psychosis, and schizophrenia). Non-alcohol substance use disorders included any stimulant use, opioid use, or other (cannabis, hallucinogen, or sedative) abuse or dependence. Tobacco use was measured based on documented tobacco use disorder or documentation of tobacco screening data indicating current smoker status.⁴⁵ Severity of unhealthy alcohol use included past year AUD (abuse or dependence, ICD-9 codes: 303.9-303.92) and past year alcohol-specific condition (ICD-9 codes: 357.5 425.5 535.30 535.31 571.0 571.1 571.2 571.3). Finally, two measures of health services utilization were derived: 1) number of outpatient visits (categorized as 0, 1-4, 5-10, 11-24, or \geq 25 visits), and 2) number of inpatient days (categorized as 0, 1, 2, 3, and \geq 4 days), both measured in the 0-365 days prior to any positive alcohol screen.

Main Analysis: Among PLWH with unhealthy alcohol use, we first described patient characteristics across race/ethnicity and compared them using chi square tests. Poisson regression models were fit to obtain the relative rate of receipt of alcohol-related care across racial/ethnic groups and to compare relative risk of receipt of alcohol related care between racial/ethnic groups (comparing black to Hispanic, black to white, and Hispanic to white patients), which were each compared with a Wald test. Analyses were repeated in subsamples of those with documented alcohol use disorder to assess receipt of specialty addictions treatment and alcohol use disorder medication across race/ethnicity. Recycled predictions were used to obtain predicted prevalence and 95% confidence intervals of each outcome by comparing the effect on the conditional mean prevalence of receipt of alcohol-related care of a change in each category of rurality.⁴⁶ Overall differences by race/ethnicity were compared using a Wald test for each model.

Poisson models were clustered on facility to account for correlated measures within facilities and to correct the standard error for dependency.⁴⁷ Both unadjusted and adjusted models were run, although both models were adjusted for fiscal year to account for differences in receipt of care within patients over time. To assess if differences existed when adjusting for within-patient correlation, models were compared that were clustered on patient, clustered on facility, and clustered on multiple levels using a three part model.⁴⁸ All models produced similar results, although clustering on facility provided the most conservative estimates and was used in the final model, along with adjustment for fiscal year to account for time trends.

As previous studies have found differences across region in receipt of mental health and substance use-related care across race/ethnicity in bivariate analyses,^{49,50} and alcohol use is strongly associated with depression status, we assessed this variation among PLWH by testing the significance of an interaction between race/ethnicity and region, and between race/ethnicity and depression status in models adjusted for other covariates.

5.3 RESULTS

There were 4,296 positive screens for unhealthy alcohol use included in this study, representing 3,242 PLWH. Of the 3,242 PLWH in this study, 1,920 were black, 252 were Hispanic, and 1,070 were white. Of all PLWH with unhealthy alcohol use, 49.5% of them had an alcohol use disorder. Among PLWH with unhealthy alcohol use, there were many differences between racial/ethnic groups, which are described in Table 5.12. Black patients appeared to be most likely to be between ages 50-64, married, live in the south, to have any substance use disorder (including stimulant, opioid, other drug, tobacco, or alcohol use disorders) and to have the highest number of inpatient and outpatient visits. Hispanic PLWH appeared to be most likely to be under age 50, married or have PTSD. White PLWH appeared to be most likely to be age 65

or older, live in a large or small rural community, be divorced, have an anxiety disorder, and have few outpatient or no inpatient visits.

Receipt of alcohol-related care differed across racial/ethnic groups among PLWH with unhealthy alcohol use. There were marginally significant racial/ethnic differences in receipt of any brief interventions in the unadjusted model (p-value = 0.059 for overall significance), with Hispanic patients appearing to have highest, and black patients appearing to have the lowest, receipt of BI. Though patterns were similar after adjustment for all covariates, the significant difference was attenuated (p-value = 0.291 for overall significance). In this model, predicted prevalence of receipt of brief interventions was 55.9% [95% confidence interval: (49.9%, 61.9%)] among black PLWH, 59.7% (53.5%, 66.0%) among Hispanic PLWH, and 59.0% (53.7%, 64.4%) among white PLWH (Table 5.13). Comparing relative risk of receipt of brief interventions between racial/ethnic groups, black patients had slightly lower receipt of brief interventions than Hispanic patients (p-value from Wald test < 0.05), although these differences were attenuated by adjusting for covariates (Table 5.14). There was no significant difference in relative risk of receipt of brief interventions between Hispanic and white PLWH, nor between black and white patients.

Racial/ethnic differences in receipt of specialty addictions treatment were found in both models among those with unhealthy alcohol use (adjusted p-value < 0.001 for overall significance). In fully adjusted models, the predicted prevalence was 34.0% (30.7%, 37.3%) for black patients, 21.6% (16.5%, 26.7%) for Hispanic patients, and 17.0% (14.4%, 19.6%) for white patients, showing a 17%-point absolute difference between black and white patients (Table 5.13). Comparing receipt of specialty addictions treatment across racial/ethnic groups, black patients had strong and significantly higher relative risk of receipt of specialty addictions

treatment than Hispanic or white patients (Wald test p-values < 0.05). Hispanic patients also had statistically significantly but only slightly higher relative risk of receipt of specialty addictions treatment than white patients in the unadjusted model (Wald test p-value < 0.05), although this was attenuated by adjusting for covariates. There were no racial/ethnic differences in receipt of AUD medications (p-value = 0.908 for Wald test overall significance). Receipt of AUD medications were low in all racial/ethnic groups. In adjusted models, prevalence of receipt of AUD medications was 3.8% (2.8%, 4.7%) among black patients, 3.5% (1.0%, 5.9%) among Hispanic patients, and 3.4% (2.3%, 4.5%) among white patients.

Findings in a subsample of PLWH with alcohol use disorders were similar to those in the full sample with unhealthy alcohol use. There were racial/ethnic differences in receipt of specialty addictions treatment across racial/ethnic groups in all models among those with alcohol use disorders (p-value < 0.001 for Wald test for overall significance). In the adjusted model, predicted prevalence of specialty addictions treatment was 51.8% (47.9%, 55.6%) for black patients, 39.9% (32.1%, 47.8%) for Hispanic patients, and 32.9% (28.1%, 37.7%) for white patients. There were no racial/ethnic differences in receipt of AUD medications among those with alcohol use disorder (p-value = 0.653 for Wald test for overall significance). Prevalence of AUD medications remained low in the subsample of PLWH with a clinically documented AUD. Predicted prevalence was 5.6% (4.1%, 7.1%) among black patients, 7.9% (2.6%, 13.1%) among Hispanic patients, and 6.1% (4.0%, 8.3%) among white patients. Neither the interaction between race/ethnicity and region, nor the interaction between race/ethnicity and depression status, was not significant for any measure of alcohol-related care, either in the full sample or in the subsample of PLWH with alcohol use disorders.

5.4 DISCUSSION

In this study, we found that there were racial/ethnic differences in receipt of alcohol-related care among PLWH with unhealthy alcohol use. There were racial/ethnic differences in receipt of brief interventions such that Hispanic patients tended to be slightly more likely to receipt brief interventions than black patients, although this association was attenuated in adjusted models. In both the full sample of PLWH with unhealthy alcohol use, as well as the subsample of PLWH with AUD, black patients tended to be more likely than Hispanic or white patients to receive specialty addictions treatment, but there were no differences in receipt of AUD medications across race/ethnicity.

Unlike previous studies in the general population, which show black patients have an increased receipt of brief interventions relative to other racial/ethnic groups,²⁰ in this study, black PLWH had significantly decreased receipt of brief interventions relative to Hispanic patients, and appeared to have lower receipt of brief intervention relative to white patients. It is unclear why black patients have lower receipt of brief interventions among PLWH, but this may be due to unique patient or provider level barriers that PLWH experience, including provider-stigma and competing health conditions. Black PLWH experience increased community stigma around alcohol use,²³ and high levels of stress related to their HIV status,⁵¹ which could lead to decreased comfort in discussing alcohol use with providers. Additionally, in this study, black PLWH appeared to have high prevalence of other drug comorbidities (stimulant, opioid, tobacco, or other drug use), and the highest numbers of inpatient and outpatient visits. Providers may have deprioritized brief interventions when treating PLWH with multiple substance use or other comorbidities, leading to decreased receipt of brief interventions.

Similar to previous studies, there were differences in receipt of specialty addictions treatment such that black patients appeared to have the highest receipt, and had a statistically significantly higher receipt of treatment than Hispanic or white patients, with similar receipt of care observed for Hispanic and white patients^{21,52} This may be because black patients appeared to be more likely to experience multiple substance use, and to experience alcohol use disorders, perhaps indicating greater severity or complexity of drug use disorders and increasing the likelihood of referral to specialty addictions treatment. Differences may also be explained by contextual factors around alcohol-related risk: black communities are more likely to have social norms encouraging alcohol-related care,^{23,53} and law enforcement is likely to have increased presence in black communities²³ leading to greater criminalization and court-mandated alcohol treatment.^{54,55}

There are several limitations to this study. Alcohol use was measured using a validated alcohol screening tool, the AUDIT-C,⁵⁶⁻⁵⁸ but there may be limitations to the AUDIT-C as it was delivered by a clinician, which could have increased social desirability bias³⁹ and could have been impacted by patient recall or problems in clinician documentation.⁵⁹ Brief interventions were measured using clinician reported receipt of brief intervention following a prompt from an electronic clinical reminder. This method of measuring brief intervention may not fully capture receipt of brief interventions,^{60,61} and quality of brief interventions was not assessed in this study.³⁹ Residual confounding may also exist due to limitations to important covariates not included in this dataset, including socioeconomic status, known confounder in the association between rurality and both HIV alcohol-related outcomes.⁶² Finally, results may not be generalizable to non-veterans, veterans not linked with care, homeless veterans without a documented home zip code or address, or PLWH not included in these three racial/ethnic groups.

Even with these limitations, there several implications of this study. While results were similar to non-HIV specific populations such that black patients were more likely to receive specialty addictions treatment than white patients,²¹ in this sample of PLWH, black patients were less likely to receive brief interventions, a finding that is different from a similar study in a non-HIV specific VA sample.²⁰ These differences are important and future research is needed to better understand observed difference. As black patients may have decreased receipt of brief interventions due to competing risk factors, engagement with providers may be needed to encourage increased focus on brief interventions. Additionally, increased engagement with patients and providers may be needed to encourage use of evidence based AUD medications across all racial/ethnic groups. Given the increased risks for PLWH posed by alcohol use, across all racial/ethnic groups, effective interventions are needed to increase receipt of alcohol-related among PLWH with unhealthy alcohol use.

Table 5.12. Descriptive characteristics among male PLWH with unhealthy alcohol use overall and across race/ethnicity at first AUDIT-C during the study period (n = 3,242)

		Overall n=3,242 (%)	Black n=1,968 (%)	Hispanic n=257 (%)	White n=1,085 (%)	p-value
Covariates						
Age	<50	1,059 (32.7)	563 (29.3)	97 (38.5)	399 (37.3)	<0.001
	50-64	1,946 (60.0)	1,257 (65.5)	135 (53.6)	554 (51.8)	
	65+	237 (7.3)	100 (5.2)	20 (7.9)	117 (10.9)	
VA Eligibility Status	Full	534 (16.5)	313 (16.3)	51 (20.2)	170 (15.9)	0.003
	<50% SC	670 (20.7)	413 (21.5)	56 (22.2)	201 (18.8)	
	Service Connected	2,038 (62.9)	1,194 (62.2)	145 (57.5)	699 (65.3)	
Marital Status	Divorced/Separated	1,064 (32.8)	594 (30.9)	81 (32.1)	389 (36.4)	0.111
	Never married/Single	370 (11.4)	216 (11.3)	38 (15.1)	116 (10.8)	
	Married	1,664 (51.3)	1,008 (52.5)	120 (47.6)	536 (50.1)	
	Widowed	109 (3.4)	80 (4.2)	10 (4.0)	19 (1.8)	
	Missing	35 (1.1)	22 (1.1)	3 (1.2)	10 (0.9)	
Rurality	Urban	2,919 (90.0)	1,773 (92.3)	234 (92.9)	912 (85.2)	<0.001
	Large Rural	124 (3.8)	69 (3.6)	5 (2.0)	50 (4.7)	
	Small Rural	199 (6.1)	78 (4.1)	13 (5.2)	108 (10.1)	
Region	Northeast	500 (15.4)	312 (16.3)	54 (21.4)	134 (12.5)	<0.001
	Midwest	448 (13.8)	235 (12.2)	15 (6.0)	198 (18.5)	
	Southeast	1,763 (54.4)	1,215 (63.3)	106 (42.1)	442 (41.3)	
	West	531 (16.4)	158 (8.2)	77 (30.6)	296 (27.7)	
Fiscal year of screen	2010	1,217 (37.5)	689 (35.9)	102 (40.5)	426 (39.8)	0.029
	2011	918 (28.3)	529 (27.6)	75 (29.8)	314 (29.3)	
	2012	739 (22.8)	472 (24.6)	54 (21.4)	213 (19.9)	
	2013	368 (11.4)	230 (12.0)	21 (8.3)	117 (10.9)	
Additional Factors (not included in models)						
Depression		515 (15.9)	308 (16.0)	42 (16.7)	165 (15.4)	0.851
PTSD		443 (13.7)	285 (14.8)	44 (17.5)	114 (10.7)	0.001
Other Anxiety		394 (12.2)	166 (8.6)	32 (12.7)	196 (18.3)	<0.001
SMI		488 (15.1)	296 (15.4)	39 (15.5)	153 (14.3)	0.701
Stimulant Use		928 (28.6)	740 (38.5)	53 (21.0)	135 (12.6)	<0.001
Opioid Use		279 (8.6)	208 (10.8)	21 (8.3)	50 (4.7)	<0.001
Other Drug Use		446 (13.8)	319 (16.6)	28 (11.1)	99 (9.3)	<0.001
Tobacco Use Disorder		1,271 (39.2)	776 (40.4)	80 (31.7)	415 (38.8)	0.028
Current Tobacco Use (Health Factor)		2,036 (62.8)	1,299 (67.7)	127 (50.4)	610 (57.0)	<0.001
Alcohol Use Disorder		1,605 (49.5)	1,050 (54.7)	112 (44.4)	443 (41.4)	<0.001
Past-year alcohol specific condition		80 (2.5)	42 (2.2)	8 (3.2)	30 (2.8)	0.438
Past-year alcohol related condition		297 (9.2)	189 (9.8)	24 (9.5)	84 (7.9)	0.190
Total Outpatient visits in prior year	0	36 (1.1)	24 (1.3)	3 (1.2)	9 (0.8)	<0.001
	1-4	392 (12.1)	214 (11.1)	32 (12.7)	146 (13.6)	
	5-10	788 (24.3)	431 (22.4)	47 (18.7)	310 (29.0)	
	11-24	1,035 (31.9)	607 (31.6)	89 (35.3)	339 (31.7)	
	>=25	991 (30.6)	644 (33.5)	81 (32.1)	266 (24.9)	
Total inpatient visits in prior year	0	2,437 (75.2)	1,380 (71.9)	191 (75.8)	866 (80.9)	<0.001
	1	472 (14.6)	317 (16.5)	32 (12.7)	123 (11.5)	
	2-3	243 (7.5)	161 (8.4)	25 (9.9)	57 (5.3)	
	>=4	90 (2.8)	62 (3.2)	4 (1.6)	24 (2.2)	

Table 5.13. Predicted prevalence of receipt of alcohol-related care across male white, black, and Hispanic positive screens for unhealthy alcohol use (n = 4,296) and alcohol use disorder (n = 2,233)

Outcome	Black		Hispanic		White		p-value
	PP (%)	95% CI	PP (%)	95% CI	PP (%)	95% CI	
Among those with Unhealthy Alcohol Use (N = 4,296)							
Receipt of Brief Intervention							
Unadjusted	55.0***	(47.8, 62.1)	62.9	(53.5, 72.2)	59.9	(54.2, 65.6)	0.059
Adjusted	55.9	(49.9, 61.9)	59.7	(53.5, 66.0)	59.0	(53.7, 64.4)	0.291
Receipt of Specialty Addictions Treatment							
Unadjusted	35.1***	(31.5, 38.6)	21.7**	(15.5, 27.8)	16.1*	(13.5, 18.6)	<0.001
Adjusted	34.0***	(30.7, 37.3)	21.6	(16.5, 26.7)	17.0*	(14.4, 19.6)	<0.001
Receipt of Alcohol Use Disorder Medications							
Unadjusted	3.9	(3.0, 4.8)	3.5	(1.2, 5.7)	3.2	(2.1, 4.2)	0.606
Adjusted	3.8	(2.8, 4.7)	3.5	(1.0, 5.9)	3.4	(2.3, 4.5)	0.908
Among only those with Alcohol Use Disorder (N = 2,233)							
Receipt of Specialty Addictions Treatment							
Unadjusted	52.1***	(48.2, 56.1)	40.2	(31.0, 49.3)	32.3*	(27.4, 37.2)	<0.001
Adjusted	51.8***	(47.9, 55.6)	39.9	(32.1, 47.8)	32.9*	(28.1, 37.7)	<0.001
Receipt of AUD Medications							
Unadjusted	5.6	(4.2, 7.1)	7.6	(3.0, 12.2)	6.1	(4.0, 8.3)	0.670
Adjusted	5.6	(4.1, 7.1)	7.9	(2.6, 13.1)	6.1	(4.0, 8.3)	0.653

PP = predicted prevalence

CI = confidence interval

Unadjusted: Only adjusted for fiscal year of screen

Adjusted: adjusted for fiscal year of screen, age, rurality, marital status, VA eligibility status, and region

* Significant difference in relative risk between black and white PLWH at a p < 0.05 level using Wald Test

** Significant difference in relative risk between Hispanic and white PLWH at a p < 0.05 level using Wald Test

*** Significant difference in relative risk between black and Hispanic PLWH at a p < 0.05 level using Wald Test

Table 5.14. Incidence rate ratios of receipt of alcohol-related care comparing male white, black, and Hispanic positive screens for unhealthy alcohol use (n = 4,296) and alcohol use disorder (n = 2,233)

Outcome		Black relative to White		Hispanic relative to White		Black relative to Hispanic	
		Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Among those with Unhealthy Alcohol Use (N = 4,296)							
Receipt of Brief Intervention	Unadjusted	0.92	(0.83, 1.01)	1.05	(0.92, 1.20)	0.87	(0.77, 0.99)
	Adjusted	0.95	(0.87, 1.02)	1.01	(0.93, 1.10)	0.94	(0.85, 1.03)
Receipt of Specialty Addictions Treatment	Unadjusted	2.18	(1.83, 2.60)	1.35	(1.01, 1.80)	1.62	(1.24, 2.11)
	Adjusted	2.00	(1.69, 2.37)	1.28	(0.99, 1.64)	1.57	(1.24, 1.99)
Receipt of AUD Medications	Unadjusted	1.23	(0.81, 1.88)	1.10	(0.59, 2.03)	1.12	(0.55, 2.29)
	Adjusted	1.10	(0.72, 1.68)	1.01	(0.52, 1.97)	1.09	(0.50, 2.40)
Among only those with AUD (N = 2,233)							
Receipt of Specialty Addictions Treatment	Unadjusted	1.61	(1.37, 1.89)	1.24	(0.97, 1.59)	1.30	(1.04, 1.62)
	Adjusted	1.57	(1.35, 1.84)	1.21	(0.97, 1.51)	1.30	(1.07, 1.58)
Receipt of AUD Medications	Unadjusted	0.92	(0.59, 1.43)	1.24	(0.68, 2.28)	0.74	(0.38, 1.43)
	Adjusted	0.91	(0.58, 1.44)	1.28	(0.67, 2.44)	0.71	(0.35, 1.46)

Unadjusted: adjusted for fiscal year
Adjusted: adjusted for fiscal year of AUDIT-C screen, age, sex, rurality, marital status, VA eligibility status, and region
p-values of < 0.05 are bolded

5.5 NOTES FOR CHAPTER 5

1. Kinder LS, Bryson CL, Sun H, Williams EC, Bradley KA. Alcohol screening scores and all-cause mortality in male Veterans Affairs patients. *J Stud Alcohol Drugs*. 2009;70(2):253-260.
2. Roerecke M, Rehm J. Alcohol use disorders and mortality: a systematic review and meta-analysis. *Addict Abingdon Engl*. 2013;108(9):1562-1578. doi:10.1111/add.12231.
3. Harris AHS, Bryson CL, Sun H, Blough D, Bradley KA. Alcohol Screening Scores Predict Risk of Subsequent Fractures. *Subst Use Misuse*. 2009;44(8):1055-1069. doi:10.1080/10826080802485972.
4. Justice AC, McGinnis KA, Tate JP, et al. Risk of mortality and physiologic injury evident with lower alcohol exposure among HIV infected compared with uninfected men. *Drug Alcohol Depend*. 2016;161:95-103. doi:10.1016/j.drugalcdep.2016.01.017.
5. Azar MM, Springer SA, Meyer JP, Altice FL. A systematic review of the impact of alcohol use disorders on HIV treatment outcomes, adherence to antiretroviral therapy and health care utilization. *Drug Alcohol Depend*. 2010;112(3):178-193. doi:10.1016/j.drugalcdep.2010.06.014.
6. Braithwaite RS, Bryant KJ. Influence of alcohol consumption on adherence to and toxicity of antiretroviral therapy and survival. *Alcohol Res Health J Natl Inst Alcohol Abuse Alcohol*. 2010;33(3):280-287.
7. Bryson CL. Alcohol Screening Scores and Medication Nonadherence. *Ann Intern Med*. 2008;149(11):795. doi:10.7326/0003-4819-149-11-200812020-00004.
8. Chander G, Lau B, Moore RD. Hazardous alcohol use: a risk factor for non-adherence and lack of suppression in HIV infection. *J Acquir Immune Defic Syndr 1999*. 2006;43(4):411-417. doi:10.1097/01.qai.0000243121.44659.a4.
9. Hendershot CS, Stoner SA, Pantalone DW, Simoni JM. Alcohol use and antiretroviral adherence: review and meta-analysis. *J Acquir Immune Defic Syndr 1999*. 2009;52(2):180-202. doi:10.1097/QAI.0b013e3181b18b6e.
10. Kalichman SC, Amaral CM, White D, et al. Alcohol and Adherence to Antiretroviral Medications: Interactive Toxicity Beliefs Among People Living With HIV. *J Assoc Nurses AIDS Care*. 2012;23(6):511-520. doi:10.1016/j.jana.2011.11.005.
11. Samet JH, Horton NJ, Meli S, Freedberg KA, Palepu A. Alcohol Consumption and Antiretroviral Adherence Among HIV-Infected Persons With Alcohol Problems: *Alcohol Clin Exp Res*. 2004;28(4):572-577. doi:10.1097/01.ALC.0000122103.74491.78.

12. Kalichman SC, Grebler T, Amaral CM, et al. Intentional Non-Adherence to Medications among HIV Positive Alcohol Drinkers: Prospective Study of Interactive Toxicity Beliefs. *J Gen Intern Med.* 2013;28(3):399-405. doi:10.1007/s11606-012-2231-1.
13. Vaeth PAC, Wang-Schweig M, Caetano R. Drinking, Alcohol Use Disorder, and Treatment Access and Utilization Among U.S. Racial/Ethnic Groups. *Alcohol Clin Exp Res.* December 2016. doi:10.1111/acer.13285.
14. Grant BF, Dawson DA, Stinson FS, Chou SP, Dufour MC, Pickering RP. The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991-1992 and 2001-2002. *Drug Alcohol Depend.* 2004;74(3):223-234. doi:10.1016/j.drugalcdep.2004.02.004.
15. Williams EC, Gupta S, Rubinsky AD, et al. Racial/Ethnic Differences in the Prevalence of Clinically Recognized Alcohol Use Disorders Among Patients from the U.S. Veterans Health Administration. *Alcohol Clin Exp Res.* 2016;40(2):359-366. doi:10.1111/acer.12950.
16. Mulia N, Ye Y, Greenfield TK, Zemore SE. Disparities in alcohol-related problems among white, black, and Hispanic Americans. *Alcohol Clin Exp Res.* 2009;33(4):654-662. doi:10.1111/j.1530-0277.2008.00880.x.
17. Witbrodt J, Mulia N, Zemore SE, Kerr WC. Racial/Ethnic Disparities in Alcohol-Related Problems: Differences by Gender and Level of Heavy Drinking. *Alcohol Clin Exp Res.* 2014;38(6):1662-1670. doi:10.1111/acer.12398.
18. Williams EC, Bradley KA, Gupta S, Harris AHS. Association between alcohol screening scores and mortality in black, Hispanic, and white male veterans. *Alcohol Clin Exp Res.* 2012;36(12):2132-2140. doi:10.1111/j.1530-0277.2012.01842.x.
19. Dobscha SK, Soleck GD, Dickinson KC, et al. Associations between race and ethnicity and treatment for chronic pain in the VA. *J Pain Off J Am Pain Soc.* 2009;10(10):1078-1087. doi:10.1016/j.jpain.2009.04.018.
20. Williams EC, Lapham GT, Hawkins EJ, et al. Variation in Documented Care for Unhealthy Alcohol Consumption Across Race/Ethnicity in the Department of Veterans Affairs Healthcare System. *Alcohol Clin Exp Res.* 2012;36(9):1614-1622. doi:10.1111/j.1530-0277.2012.01761.x.
21. Bensley KM, Harris AHS, Gupta S, et al. Racial/ethnic Differences in Initiation of and Engagement with Addictions Treatment among Patients with Alcohol Use Disorders in the Veterans Health Administration. *J Subst Abuse Treat.* August 2016. doi:10.1016/j.jsat.2016.08.009.
22. Williams EC, Gupta S, Rubinsky AD, et al. Variation in receipt of pharmacotherapy for alcohol use disorders across racial/ethnic groups: A national study in the U.S. Veterans Health Administration. *Drug Alcohol Depend.* July 2017. doi:10.1016/j.drugalcdep.2017.06.011.

23. Zapolski TCB, Pedersen SL, McCarthy DM, Smith GT. Less drinking, yet more problems: Understanding African American drinking and related problems. *Psychol Bull.* 2014;140(1):188-223. doi:10.1037/a0032113.
24. White K, Haas JS, Williams DR. Elucidating the Role of Place in Health Care Disparities: The Example of Racial/Ethnic Residential Segregation. *Health Serv Res.* 2012;47(3pt2):1278-1299. doi:10.1111/j.1475-6773.2012.01410.x.
25. Karriker-Jaffe KJ, Zemore SE, Mulia N, Jones-Webb R, Bond J, Greenfield TK. Neighborhood disadvantage and adult alcohol outcomes: differential risk by race and gender. *J Stud Alcohol Drugs.* 2012;73(6):865-873.
26. Jones-Webb R, Snowden L, Herd D, Short B, Hannan P. Alcohol-related problems among black, Hispanic and white men: the contribution of neighborhood poverty. *J Stud Alcohol.* 1997;58(5):539-545.
27. Burgess D, van Ryn M, Dovidio J, Saha S. Reducing Racial Bias Among Health Care Providers: Lessons from Social-Cognitive Psychology. *J Gen Intern Med.* 2007;22(6):882-887. doi:10.1007/s11606-007-0160-1.
28. DeCoux Hampton M. The role of treatment setting and high acuity in the overdiagnosis of schizophrenia in African Americans. *Arch Psychiatr Nurs.* 2007;21(6):327-335. doi:10.1016/j.apnu.2007.04.006.
29. Fultz SL, Skanderson M, Mole LA, et al. Development and Verification of a "Virtual" Cohort Using the National VA Health Information System. *Med Care.* 2006;44(8):S25-S30.
30. Williams EC, Johnson ML, Lapham GT, et al. Strategies to implement alcohol screening and brief intervention in primary care settings: A structured literature review. *Psychol Addict Behav.* 2011;25(2):206-214. doi:10.1037/a0022102.
31. Moyer A, Finney JW. MEETING THE CHALLENGES FOR RESEARCH AND PRACTICE FOR BRIEF ALCOHOL INTERVENTION: Commentaries. *Addiction.* 2010;105(6):963-964. doi:10.1111/j.1360-0443.2010.02907.x.
32. Morrill R, Cromartie J, Hart G. METROPOLITAN, URBAN, AND RURAL COMMUTING AREAS: TOWARD A BETTER DEPICTION OF THE UNITED STATES SETTLEMENT SYSTEM. *Urban Geogr.* 1999;20(8):727-748. doi:10.2747/0272-3638.20.8.727.
33. Cromartie J, Hart G. Rural-Urban Commuting Area Codes. Center for Rural Health. <http://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes.aspx#.U20K1F50H0A>. Published June 2, 2014. Accessed October 4, 2016.
34. Lapham GT, Achtmeyer CE, Williams EC, Hawkins EJ, Kivlahan DR, Bradley KA. Increased Documented Brief Alcohol Interventions With a Performance Measure and Electronic Decision Support: *Med Care.* 2012;50(2):179-187. doi:10.1097/MLR.0b013e3181e35743.

35. Alvanzo AAH, Storr CL, Mojtabai R, et al. Gender and race/ethnicity differences for initiation of alcohol-related service use among persons with alcohol dependence. *Drug Alcohol Depend.* 2014;140. doi:10.1016/j.drugalcdep.2014.03.010.
36. Zemore SE, Murphy RD, Mulia N, et al. A Moderating Role for Gender in Racial/Ethnic Disparities in Alcohol Services Utilization: Results from the 2000 to 2010 National Alcohol Surveys. *Alcohol Clin Exp Res.* 2014;38(8):2286-2296. doi:10.1111/acer.12500.
37. Office of Budget and Management. *Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity.* Office of Budget and Management; 1997.
38. Mays VM, Ponce NA, Washington DL, Cochran SD. Classification of Race and Ethnicity: Implications for Public Health*. *Annu Rev Public Health.* 2003;24(1):83-110. doi:10.1146/annurev.publhealth.24.100901.140927.
39. Williams EC, Rubinsky AD, Chavez LJ, et al. An early evaluation of implementation of brief intervention for unhealthy alcohol use in the US Veterans Health Administration: Early evaluation of VA's brief intervention. *Addiction.* 2014;109(9):1472-1481. doi:10.1111/add.12600.
40. Williams EC, Lapham GT, Shortreed SM, et al. Among patients with unhealthy alcohol use, those with HIV are less likely than those without to receive evidence-based alcohol-related care: A national VA study. *Drug Alcohol Depend.* 2017;174:113-120. doi:10.1016/j.drugalcdep.2017.01.018.
41. *VA/DoD Clinical Guideline for the Management of Substance Use Disorders.* Washington, D.C.: The Management of Substance Use Disorders Work Group; 2015. <https://www.healthquality.va.gov/guidelines/MH/sud/VADoDSUDCPGRevised22216.pdf>.
42. Jonas DE, Amick HR, Feltner C, et al. Pharmacotherapy for Adults With Alcohol Use Disorders in Outpatient Settings: A Systematic Review and Meta-analysis. *JAMA.* 2014;311(18):1889. doi:10.1001/jama.2014.3628.
43. Fergusson DM, Boden JM, Horwood LJ. Tests of Causal Links Between Alcohol Abuse or Dependence and Major Depression. *Arch Gen Psychiatry.* 2009;66(3):260. doi:10.1001/archgenpsychiatry.2008.543.
44. Centers for Disease Control and Prevention (CDC). Revised surveillance case definition for HIV infection--United States, 2014. *MMWR Recomm Rep Morb Mortal Wkly Rep Recomm Rep.* 2014;63(RR-03):1-10.
45. McGinnis KA, Brandt CA, Skanderson M, et al. Validating Smoking Data From the Veteran's Affairs Health Factors Dataset, an Electronic Data Source. *Nicotine Tob Res.* 2011;13(12):1233-1239. doi:10.1093/ntr/ntr206.
46. Williams R. Using the margins command to estimate and interpret adjusted predictions and marginal effects. *Stata J.* 2012;12(2):308.

47. Zou G. A Modified Poisson Regression Approach to Prospective Studies with Binary Data. *Am J Epidemiol*. 2004;159(7):702-706. doi:10.1093/aje/kwh090.
48. Miglioretti DL, Heagerty PJ. Marginal Modeling of Nonnested Multilevel Data using Standard Software. *Am J Epidemiol*. 2006;165(4):453-463. doi:10.1093/aje/kwk020.
49. Alegria M, Chatterji P, Wells K, et al. Disparity in Depression Treatment Among Racial and Ethnic Minority Populations in the United States. *Psychiatr Serv*. 2008;59(11):1264-1272. doi:10.1176/appi.ps.59.11.1264.
50. Hatzenbuehler ML, Keyes KM, Narrow WE, Grant BF, Hasin DS. Racial/ethnic disparities in service utilization for individuals with co-occurring mental health and substance use disorders in the general population. *J Clin Psychiatry*. 2008;69(7):1112-1121.
51. Abbott LS, Williams CL. Influences of Social Determinants of Health on African Americans Living With HIV in the Rural Southeast: A Qualitative Meta-synthesis. *J Assoc Nurses AIDS Care*. 2015;26(4):340-356. doi:10.1016/j.jana.2015.03.004.
52. Glass JE, Perron BE, Ilgen MA, Chermack ST, Ratliff S, Zivin K. Prevalence and correlates of specialty substance use disorder treatment for Department of Veterans Affairs Healthcare System patients with high alcohol consumption. *Drug Alcohol Depend*. 2010;112(1-2):150-155. doi:10.1016/j.drugalcdep.2010.06.003.
53. Zemore SE, Ye Y, Mulia N, Martinez P, Jones-Webb R, Karriker-Jaffe K. Poor, persecuted, young, and alone: Toward explaining the elevated risk of alcohol problems among Black and Latino men who drink. *Drug Alcohol Depend*. March 2016. doi:10.1016/j.drugalcdep.2016.03.008.
54. Lê Cook B, Alegría M. Racial-Ethnic Disparities in Substance Abuse Treatment: The Role of Criminal History and Socioeconomic Status. *Psychiatr Serv*. 2011;62(11). doi:10.1176/appi.ps.62.11.1273.
55. Booth BM, Curran GM, Han X, Edlund MJ. Criminal justice and alcohol treatment: Results from a national sample. *J Subst Abuse Treat*. 2013;44(3):249-255. doi:10.1016/j.jsat.2012.07.008.
56. Bush K. The AUDIT Alcohol Consumption Questions (AUDIT-C): An Effective Brief Screening Test for Problem Drinking. *Arch Intern Med*. 1998;158(16):1789. doi:10.1001/archinte.158.16.1789.
57. Bradley KA, DeBenedetti AF, Volk RJ, Williams EC, Frank D, Kivlahan DR. AUDIT-C as a Brief Screen for Alcohol Misuse in Primary Care. *Alcohol Clin Exp Res*. 2007;31(7):1208-1217. doi:10.1111/j.1530-0277.2007.00403.x.
58. Bradley KA, Bush KR, Epler AJ, et al. Two brief alcohol-screening tests From the Alcohol Use Disorders Identification Test (AUDIT): validation in a female Veterans Affairs patient population. *Arch Intern Med*. 2003;163(7):821-829. doi:10.1001/archinte.163.7.821.

59. Williams EC, Achtmeyer CE, Thomas RM, et al. Factors Underlying Quality Problems with Alcohol Screening Prompted by a Clinical Reminder in Primary Care: A Multi-site Qualitative Study. *J Gen Intern Med.* 2015;30(8):1125-1132. doi:10.1007/s11606-015-3248-z.
60. Lapham GT, Rubinsky AD, Shortreed SM, et al. Comparison of provider-documented and patient-reported brief intervention for unhealthy alcohol use in VA outpatients. *Drug Alcohol Depend.* 2015;153:159-166. doi:10.1016/j.drugalcdep.2015.05.027.
61. Bradley KA, Lapham GT, Hawkins EJ, et al. Quality concerns with routine alcohol screening in VA clinical settings. *J Gen Intern Med.* 2011;26(3). doi:10.1007/s11606-010-1509-4.
62. Pellowski JA, Kalichman SC, Matthews KA, Adler N. A pandemic of the poor: social disadvantage and the U.S. HIV epidemic. *Am Psychol.* 2013;68(4):197-209. doi:10.1037/a0032694.

Chapter 6. CONCLUSION

6.1 SUMMARY OF FINDINGS

In this dissertation, we explored ways in which alcohol use, care, and related outcomes differ across rurality and race/ethnicity among VA patients living with HIV (PLWH). Across racial/ethnic groups, we examined differences in the association between levels of alcohol use and one outcome, mortality, as well as differences in receipt of alcohol-related care. Across rurality, we examined differences in patterns of alcohol use, as well as differences in alcohol-related care. These four papers were presented in Chapters 2-5. This dissertation has important implications for patient care among people living with HIV, and identifies several additional questions that should be addressed through further research.

6.1.1 *Racial/Ethnic Differences in Alcohol-related Outcomes and Receipt of Care*

In Chapter 2, we studied whether the association between alcohol use and mortality varied across race/ethnicity among PLWH and found that while there was increased mortality risk among high-risk relative to lower-risk drinkers across all racial/ethnic groups, there were differences in mortality risk between racial/ethnic groups among moderate-risk relative to lower-risk drinkers and within levels of drinking. In Chapter 5, we examined receipt of alcohol-related care among PLWH with unhealthy alcohol use and within a subsample of patients with documented alcohol use disorders and found racial/ethnic differences in receipt of specialty addictions treatment, such that black patients were more likely to specialty addictions treatment.

The implications of these findings in conjunction is significant. Across all racial/ethnic groups, we found increased mortality risk associated with higher-risk levels of drinking, and across all racial/ethnic groups we found suboptimal receipt of alcohol-related care. However, we

did find some small effects of racial/ethnic differences that appear to influence multiple domains of alcohol-related risk. In Chapter 2, we found that black patients had higher mortality risk at lower levels of drinking. This difference is perhaps due to competing health risks. Comparing prevalence of drug use disorders across racial ethnic groups we found differences, such that black patients appeared to have higher drug use among any drinkers (Chapter 2), and among those with unhealthy alcohol use (Chapter 5). Having additional substance use problems in addition to unhealthy alcohol use may increase likelihood of receipt of specialty addiction treatment among black patients observed in Chapter 5. However, while differences were not significant, point estimates suggest that this difference in receipt of care is not consistent across multiple domains of care. This difference itself is problematic because comorbid alcohol and drug use are bidirectionally related among PLWH,^{1,2} and should be addressed concurrently, thus showing similar trends across care domains. Both of these findings may also be due to larger societal trends of stigma and discrimination leading to both increase mortality risk at lower levels of drinking,³ and increased receipt of care (through increased criminalization of drinking leading to more court-mandated care).⁴ While future study is needed to understand the impact of competing risk factors such as drug use disorders, and explore additional factors that may be causing observed differences in receipt of alcohol-related care, these studies also suggest that physicians may need increased support to implement brief interventions among people with competing substance use disorders among PLWH.

6.1.2 *Differences Across Rurality in Patterns of Alcohol Use and Receipt of Alcohol-Related Care*

In Chapter 3, we studied whether patterns of alcohol use varied by rurality among PLWH. In this study, we found that patterns of alcohol use vary among PLWH, such that those

in small rural communities are less likely to report drinking any alcohol. Among those who do drink, more rural PLWH drink at similar or higher levels than urban PLWH. The association between rurality and patterns of alcohol use varies across region, neighborhood poverty level, and depression status. In sum, these exploratory analyses identify key populations that may have increased risk of dangerous alcohol use patterns. In Chapter 4, we studied receipt of alcohol-related care across rurality. We found that while PLWH in large rural communities have increased receipt of brief interventions relative to urban PLWH, PLWH in both large and small rural communities have lower receipt of specialty addictions treatment than those in urban communities, trends that also appear in a subsample of those with AUD.

In conjunction, these studies provide an important basis for future studies examining differences in alcohol use among PLWH across rurality. We found that across all communities, alcohol use among PLWH (and prevalence of unhealthy alcohol use) was common. We also found that across all communities, there is suboptimal receipt of alcohol related care. However, we found small differences across rurality that may increase alcohol-related risk experienced by more rural PLWH. In Chapter 3, we found that while more rural PLWH are less likely to drink than urban PLWH, those that do drink may be engaging in high-risk drinking at similar or higher levels of alcohol use, indicating an important need for alcohol-related care in rural communities. This care may not be available, however, as in Chapter 4, we also found that PLWH in both large and small rural communities are less likely to receive specialty addictions treatment. Thus, rural PLWH who may be more likely to drink at high-risk levels may also have decreased access to specialty addictions treatment in their communities. Interestingly, we also found that regional trends in receipt of care across rurality found in Chapter 4 are reversed in prevalence of any alcohol use trends across rurality found in Chapter 3, such that in regions

where more rural PLWH drink, there appears to be lower prevalence of receipt of brief interventions among those with unhealthy alcohol use in more rural communities.

6.2 CONCLUDING REMARKS

In this dissertation, we examined alcohol use, care, and outcomes in vulnerable subpopulations of PLWH. We found several concerning trends in alcohol related risk among all PLWH, as well as several differences in alcohol use, care, and outcomes among particularly vulnerable subpopulations of PLWH such as racial/ethnic minorities and those in more rural communities. These differences highlight the importance of considering contextual factors when designing interventions to prevent or reduce alcohol use among PLWH. In most ways, differences in alcohol use, care, and outcomes experienced by PLWH across race/ethnicity and rurality mirror population patterns regardless of race/ethnicity and rurality, as well as the minor differences previously observed across these subgroups. Though small, differences identified in this dissertation may have implications for care.

We found that while black PLWH had increased mortality risk at lower-risk levels of drinking, they also may have decreased receipt of brief interventions. These trends may be due to contextual factors driving racial/ethnic differences in alcohol-related risk, and decreased prioritization of brief interventions among patients with competing health factors such as substance use. As concurrent substance use and alcohol use is particularly harmful among PLWH and is associated with both increased transmission of HIV¹ and poorer health outcomes among PLWH,⁵ interventions to encourage providers to increase use of brief interventions with these patients should be prioritized.

While we found that urban PLWH are more likely to drink than more rural PLWH, rural PLWH have similar or greater prevalence of high-risk alcohol use. However, more rural PLWH

also have lower receipt of specialty addictions treatment than urban PLWH and very low receipt of AUD medications. We also found that these differences appeared to depend on additional aspects of the lived experience such as region, poverty level, and depression status. This disparity in need and receipt of treatment may be particularly problematic for rural PLWH, as more rural PLWH may be particularly vulnerable to adverse effects due to alcohol use such as decreased access to HIV-related care,^{6,7} and may have smaller social networks leading to increased HIV transmission risk associated with alcohol.⁸ Future research is needed to examine why these differences across race/ethnicity and rurality exist and what implications this has for alcohol-related outcomes.

In sum, this dissertation provides an important initial study of the ways in which alcohol use, care, and outcomes vary across vulnerable subpopulations of PLWH. Across all PLWH, alcohol use was common, high-risk alcohol use was strongly associated with mortality, and receipt of alcohol-related care, particularly AUD medications, was low. Therefore, approaches to decrease alcohol use and alcohol-related risk among all PLWH are needed. However, this study identifies important differences in both patterns of alcohol use (across rurality) and experience of alcohol-related outcomes (across race/ethnicity), that unique risks of particularly vulnerable PLWH. Thus, approaches that consider both the full population of those with HIV, as well as subgroups that may be particularly vulnerable, are needed.⁹ To prevent further alcohol-related disparities, the influence of the lived experience on alcohol use, care, and outcomes must be addressed both in PLWH and beyond.

6.3 NOTES FOR CHAPTER 6

1. Stein MD, Hanna L, Natarajan R, et al. Alcohol use patterns predict high-risk HIV behaviors among active injection drug users☆☆Presented at the 20th Annual Meeting of the Society of General Internal Medicine, Chicago, IL, USA, April 1998. *J Subst Abuse Treat.* 2000;18(4):359-363. doi:10.1016/S0740-5472(99)00070-7.
2. Korthuis PT, Fiellin DA, McGinnis KA, et al. Unhealthy alcohol and illicit drug use are associated with decreased quality of HIV care. *J Acquir Immune Defic Syndr* 1999. 2012;61(2):171-178. doi:10.1097/QAI.0b013e31826741aa.
3. Zemore SE, Ye Y, Mulia N, Martinez P, Jones-Webb R, Karriker-Jaffe K. Poor, persecuted, young, and alone: Toward explaining the elevated risk of alcohol problems among Black and Latino men who drink. *Drug Alcohol Depend.* March 2016. doi:10.1016/j.drugalcdep.2016.03.008.
4. Lê Cook B, Alegría M. Racial-Ethnic Disparities in Substance Abuse Treatment: The Role of Criminal History and Socioeconomic Status. *Psychiatr Serv.* 2011;62(11). doi:10.1176/appi.ps.62.11.1273.
5. Williams EC, Hahn JA, Saitz R, Bryant K, Lira MC, Samet JH. Alcohol Use and Human Immunodeficiency Virus (HIV) Infection: Current Knowledge, Implications, and Future Directions. *Alcohol Clin Exp Res.* September 2016. doi:10.1111/acer.13204.
6. Ohl ME, Perencevich E. Frequency of human immunodeficiency virus (HIV) testing in urban vs. rural areas of the United States: Results from a nationally-representative sample. *BMC Public Health.* 2011;11(1):681. doi:10.1186/1471-2458-11-681.
7. Ohl M, Tate J, Duggal M, et al. Rural residence is associated with delayed care entry and increased mortality among veterans with human immunodeficiency virus infection. *Med Care.* 2010;48(12):1064-1070. doi:10.1097/MLR.0b013e3181ef60c2.
8. Havens JR, Oser CB, Leukefeld CG. Injection risk behaviors among rural drug users: implications for HIV prevention. *AIDS Care.* 2011;23(5):638-645. doi:10.1080/09540121.2010.516346.
9. Frohlich KL, Potvin L. Transcending the Known in Public Health Practice: The Inequality Paradox: The Population Approach and Vulnerable Populations. *Am J Public Health.* 2008;98(2):216-221. doi:10.2105/AJPH.2007.114777.

BIBLIOGRAPHY

- Abbott, L. S., & Williams, C. L. (2015). Influences of Social Determinants of Health on African Americans Living With HIV in the Rural Southeast: A Qualitative Meta-synthesis. *Journal of the Association of Nurses in AIDS Care*, 26(4), 340–356. <https://doi.org/10.1016/j.jana.2015.03.004>
- Achtmeyer, C. E., & Bradley, K. A. (2011). *Using AUDIT-C Alcohol Screening Data in VA Research: Interpretation, Strengths, Limitations, and Sources*. Northwest HSR&D Center of Excellence, VA Puget Sound.
- Alegria, M., Chatterji, P., Wells, K., Cao, Z., Chen, C. -n., Takeuchi, D., ... Meng, X.-L. (2008). Disparity in Depression Treatment Among Racial and Ethnic Minority Populations in the United States. *Psychiatric Services*, 59(11), 1264–1272. <https://doi.org/10.1176/appi.ps.59.11.1264>
- Altice, F. L., Kamarulzaman, A., Soriano, V. V., Schechter, M., & Friedland, G. H. (2010). Treatment of medical, psychiatric, and substance-use comorbidities in people infected with HIV who use drugs. *The Lancet*, 376(9738), 367–387. [https://doi.org/10.1016/S0140-6736\(10\)60829-X](https://doi.org/10.1016/S0140-6736(10)60829-X)
- Alvanzo, A. A. H., Storr, C. L., Mojtabai, R., Green, K. M., Pacek, L. R., La Flair, L. N., ... Crum, R. M. (2014). Gender and race/ethnicity differences for initiation of alcohol-related service use among persons with alcohol dependence. *Drug and Alcohol Dependence*, 140. <https://doi.org/10.1016/j.drugalcdep.2014.03.010>
- American Psychiatric Association, & American Psychiatric Association (Eds.). (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed). Washington, D.C: American Psychiatric Association.
- Anton, R. F., O'Malley, S. S., Ciraulo, D. A., Cisler, R. A., Couper, D., Donovan, D. M., ... COMBINE Study Research Group, for the. (2006). Combined Pharmacotherapies and Behavioral Interventions for Alcohol Dependence: The COMBINE Study: A Randomized Controlled Trial. *JAMA*, 295(17), 2003. <https://doi.org/10.1001/jama.295.17.2003>
- Arcury, T. A., Gesler, W. M., Preisser, J. S., Sherman, J., Spencer, J., & Perin, J. (2005). The Effects of Geography and Spatial Behavior on Health Care Utilization among the Residents of a Rural Region. *Health Services Research*, 40(1), 135–156. <https://doi.org/10.1111/j.1475-6773.2005.00346.x>
- Arcury, T. A., Preisser, J. S., Gesler, W. M., & Powers, J. M. (2005). Access to transportation and health care utilization in a rural region. *The Journal of Rural Health: Official Journal of the American Rural Health Association and the National Rural Health Care Association*, 21(1), 31–38.

- Arndt, S., Acion, L., & White, K. (2013). How the states stack up: disparities in substance abuse outpatient treatment completion rates for minorities. *Drug and Alcohol Dependence*, *132*(3), 547–554. <https://doi.org/10.1016/j.drugalcdep.2013.03.015>
- Azar, M. M., Springer, S. A., Meyer, J. P., & Altice, F. L. (2010). A systematic review of the impact of alcohol use disorders on HIV treatment outcomes, adherence to antiretroviral therapy and health care utilization. *Drug and Alcohol Dependence*, *112*(3), 178–193. <https://doi.org/10.1016/j.drugalcdep.2010.06.014>
- Azuero, A. (2016). A note on the magnitude of hazard ratios: Correspondence. *Cancer*, *122*(8), 1298–1299. <https://doi.org/10.1002/cncr.29924>
- Baca, C. T., Alverson, D. C., Manuel, J. K., & Blackwell, G. L. (2007). Telecounseling in Rural Areas for Alcohol Problems. *Alcoholism Treatment Quarterly*, *25*(4), 31–45. https://doi.org/10.1300/J020v25n04_03
- Bensley, K. M., Harris, A. H. S., Gupta, S., Rubinsky, A. D., Jones-Webb, R., Glass, J. E., & Williams, E. C. (2016). Racial/ethnic Differences in Initiation of and Engagement with Addictions Treatment among Patients with Alcohol Use Disorders in the Veterans Health Administration. *Journal of Substance Abuse Treatment*. <https://doi.org/10.1016/j.jsat.2016.08.009>
- Bernstein, K. T., Galea, S., Ahern, J., Tracy, M., & Vlahov, D. (2007). The built environment and alcohol consumption in urban neighborhoods. *Drug and Alcohol Dependence*, *91*(2–3), 244–252. <https://doi.org/10.1016/j.drugalcdep.2007.06.006>
- Blazer, D. G., Landerman, L. R., Fillenbaum, G., & Horner, R. (1995). Health services access and use among older adults in North Carolina: urban vs rural residents. *American Journal of Public Health*, *85*(10), 1384–1390.
- Booth, B. M., Kirchner, J., Fortney, J., Ross, R., & Rost, K. (2000). Rural at-risk drinkers: correlates and one-year use of alcoholism treatment services. *Journal of Studies on Alcohol*, *61*(2), 267–277.
- Booth, B. M., Curran, G. M., Han, X., & Edlund, M. J. (2013). Criminal justice and alcohol treatment: Results from a national sample. *Journal of Substance Abuse Treatment*, *44*(3), 249–255. <https://doi.org/10.1016/j.jsat.2012.07.008>
- Borders, T. F., & Booth, B. M. (2007). Rural, suburban, and urban variations in alcohol consumption in the United States: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Rural Health: Official Journal of the American Rural Health Association and the National Rural Health Care Association*, *23*(4), 314–321. <https://doi.org/10.1111/j.1748-0361.2007.00109.x>
- Borders, T. F., Curran, G. M., Mattox, R., & Booth, B. M. (2010). Religiousness among at-risk drinkers: is it prospectively associated with the development or maintenance of an alcohol-use disorder? *Journal of Studies on Alcohol and Drugs*, *71*(1), 136–142.

- Boso, L. A. (2012). Urban bias, rural sexual minorities, and the courts. *UCLA L. Rev.*, *60*, 562.
- Bouffard, L. A., & Muftic, L. R. (2006). The “Rural Mystique”: Social Disorganization and Violence beyond Urban Communities. *Western Criminology Review*, *7*(3), 56–66.
- Bradley, K. A., Bush, K. R., Epler, A. J., Dobie, D. J., Davis, T. M., Sporleder, J. L., ... Kivlahan, D. R. (2003). Two brief alcohol-screening tests From the Alcohol Use Disorders Identification Test (AUDIT): validation in a female Veterans Affairs patient population. *Archives of Internal Medicine*, *163*(7), 821–829. <https://doi.org/10.1001/archinte.163.7.821>
- Bradley, K. A., DeBenedetti, A. F., Volk, R. J., Williams, E. C., Frank, D., & Kivlahan, D. R. (2007). AUDIT-C as a Brief Screen for Alcohol Misuse in Primary Care. *Alcoholism: Clinical and Experimental Research*, *31*(7), 1208–1217. <https://doi.org/10.1111/j.1530-0277.2007.00403.x>
- Bradley, K. A., Kivlahan, D. R., Zhou, X.-H., Sporleder, J. L., Epler, A. J., McCormick, K. A., ... Fihn, S. D. (2004). Using Alcohol Screening Results and Treatment History to Assess the Severity of At-Risk Drinking in Veterans Affairs Primary Care Patients: *Alcoholism: Clinical & Experimental Research*, *28*(3), 448–455. <https://doi.org/10.1097/01.ALC.0000117836.38108.38>
- Bradley, K. A., Lapham, G. T., Hawkins, E. J., Achtmeyer, C. E., Williams, E. C., Thomas, R. M., & Kivlahan, D. R. (2011). Quality concerns with routine alcohol screening in VA clinical settings. *Journal of General Internal Medicine*, *26*(3). <https://doi.org/10.1007/s11606-010-1509-4>
- Bradley, K. A., Williams, E. C., Achtmeyer, C. E., Hawkins, E. J., Harris, A. H. S., Frey, M. S., ... Kivlahan, D. R. (2007). Measuring Performance of Brief Alcohol Counseling in Medical Settings: A Review of the Options and Lessons from the Veterans Affairs (VA) Health Care System. *Substance Abuse*, *28*(4), 133–149. https://doi.org/10.1300/J465v28n04_05
- Braithwaite, R. S., Conigliaro, J., Roberts, M. S., Shechter, S., Schaefer, A., McGinnis, K., ... Justice, A. C. (2007). Estimating the impact of alcohol consumption on survival for HIV+ individuals. *AIDS Care*, *19*(4), 459–466. <https://doi.org/10.1080/09540120601095734>
- Braithwaite, R. Scott, & Bryant, K. J. (2010). Influence of alcohol consumption on adherence to and toxicity of antiretroviral therapy and survival. *Alcohol Research & Health: The Journal of the National Institute on Alcohol Abuse and Alcoholism*, *33*(3), 280–287.
- Braithwaite, R. Scott, McGinnis, K. A., Conigliaro, J., Maisto, S. A., Crystal, S., Day, N., ... Justice, A. C. (2005). A Temporal and Dose-Response Association Between Alcohol Consumption and Medication Adherence Among Veterans in Care: *Alcoholism: Clinical & Experimental Research*, *29*(7), 1190–1197. <https://doi.org/10.1097/01.ALC.0000171937.87731.28>
- Breslow, N. E. (1975). Analysis of Survival Data under the Proportional Hazards Model. *International Statistical Review / Revue Internationale de Statistique*, *43*(1), 45. <https://doi.org/10.2307/1402659>

- Browne, T., Priester, M. A., Clone, S., Iachini, A., DeHart, D., & Hock, R. (2016). Barriers and Facilitators to Substance Use Treatment in the Rural South: A Qualitative Study: Substance Use Treatment Barriers and Facilitators. *The Journal of Rural Health, 32*(1), 92–101. <https://doi.org/10.1111/jrh.12129>
- Bryant, K. J., Nelson, S., Braithwaite, R. S., & Roach, D. (2010). Integrating HIV/AIDS and alcohol research. *Alcohol Research & Health: The Journal of the National Institute on Alcohol Abuse and Alcoholism, 33*(3), 167–178.
- Bryson, C. L. (2008). Alcohol Screening Scores and Medication Nonadherence. *Annals of Internal Medicine, 149*(11), 795. <https://doi.org/10.7326/0003-4819-149-11-200812020-00004>
- Burgess, D., van Ryn, M., Dovidio, J., & Saha, S. (2007). Reducing Racial Bias Among Health Care Providers: Lessons from Social-Cognitive Psychology. *Journal of General Internal Medicine, 22*(6), 882–887. <https://doi.org/10.1007/s11606-007-0160-1>
- Burnam, M. A., Bing, E. G., Morton, S. C., Sherbourne, C., Fleishman, J. A., London, A. S., ... Shapiro, M. F. (2001). Use of Mental Health and Substance Abuse Treatment Services Among Adults With HIV in the United States. *Archives of General Psychiatry, 58*(8), 729. <https://doi.org/10.1001/archpsyc.58.8.729>
- Bush, K. (1998). The AUDIT Alcohol Consumption Questions (AUDIT-C): An Effective Brief Screening Test for Problem Drinking. *Archives of Internal Medicine, 158*(16), 1789. <https://doi.org/10.1001/archinte.158.16.1789>
- Centers for Disease Control and Prevention. (2015). *HIV Surveillance Report, 2014* (No. 26). Retrieved from <http://www.cdc.gov/hiv/library/reports/surveillance>
- Centers for Disease Control and Prevention (CDC). (2014). Revised surveillance case definition for HIV infection--United States, 2014. *MMWR. Recommendations and Reports: Morbidity and Mortality Weekly Report. Recommendations and Reports, 63*(RR-03), 1–10.
- Cerda, M., Diez-Roux, A. V., Tchetgen Tchetgen, E., Gordon-Larsen, P., & Kiefe, C. (2010). The Relationship Between Neighborhood Poverty and Alcohol Use: Estimation by Marginal Structural Models: *Epidemiology, 21*(4), 482–489. <https://doi.org/10.1097/EDE.0b013e3181e13539>
- Chan, Y.-F., Lu, S.-E., Howe, B., Tieben, H., Hoeft, T., & Unützer, J. (2016). Screening and Follow-Up Monitoring for Substance Use in Primary Care: An Exploration of Rural–Urban Variations. *Journal of General Internal Medicine, 31*(2), 215–222. <https://doi.org/10.1007/s11606-015-3488-y>
- Chander, G., Lau, B., & Moore, R. D. (2006). Hazardous alcohol use: a risk factor for non-adherence and lack of suppression in HIV infection. *Journal of Acquired Immune Deficiency Syndromes (1999), 43*(4), 411–417. <https://doi.org/10.1097/01.qai.0000243121.44659.a4>

- Chander, G., Monroe, A. K., Crane, H. M., Hutton, H. E., Saag, M. S., Cropsey, K., ... McCaul, M. E. (2016). HIV primary care providers—Screening, knowledge, attitudes and behaviors related to alcohol interventions. *Drug and Alcohol Dependence*.
<https://doi.org/10.1016/j.drugalcdep.2016.01.015>
- Chartier, K. G., Hesselbrock, M. N., & Hesselbrock, V. M. (2013). Ethnicity and gender comparisons of health consequences in adults with alcohol dependence. *Substance Use & Misuse*, 48(3), 200–210. <https://doi.org/10.3109/10826084.2013.747743>
- Chavez, L. J., Williams, E. C., Lapham, G., & Bradley, K. A. (2012). Association between alcohol screening scores and alcohol-related risks among female veterans affairs patients. *Journal of Studies on Alcohol and Drugs*, 73(3).
- Chokron Garneau, H., Venegas, A., Rawson, R., Ray, L. A., & Glasner, S. (2017). Barriers to initiation of extended release naltrexone among HIV-infected adults with alcohol use disorders. *Journal of Substance Abuse Treatment*. <https://doi.org/10.1016/j.jsat.2017.05.004>
- Cohen, E., Feinn, R., Arias, A., & Kranzler, H. R. (2007). Alcohol treatment utilization: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug and Alcohol Dependence*, 86(2–3), 214–221. <https://doi.org/10.1016/j.drugalcdep.2006.06.008>
- Cooper, H., Friedman, S. R., Tempalski, B., Friedman, R., & Keem, M. (2005). Racial/Ethnic Disparities in Injection Drug Use in Large US Metropolitan Areas. *Annals of Epidemiology*, 15(5), 326–334. <https://doi.org/10.1016/j.annepidem.2004.10.008>
- Coward, R. T., & Krout, J. A. (Eds.). (1998). *Aging in rural settings: life circumstances and distinctive features*. New York: Springer Pub. Co.
- Cromartie, J., & Hart, G. (2014, June 2). Rural-Urban Commuting Area Codes. Retrieved October 4, 2016, from <http://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes.aspx#.U20K1F50H0A>
- Dawson, D. A., Grant, B. F., Stinson, F. S., & Chou, P. S. (2006). Estimating the effect of help-seeking on achieving recovery from alcohol dependence. *Addiction*, 101(6), 824–834. <https://doi.org/10.1111/j.1360-0443.2006.01433.x>
- Dawson, D. A., Grant, B. F., Stinson, F. S., & Zhou, Y. (2005). Effectiveness of the Derived Alcohol Use Disorders Identification Test (AUDIT-C) in Screening for Alcohol Use Disorders and Risk Drinking in the US General Population: *Alcoholism: Clinical & Experimental Research*, 29(5), 844–854. <https://doi.org/10.1097/01.ALC.0000164374.32229.A2>
- DeCoux Hampton, M. (2007). The role of treatment setting and high acuity in the overdiagnosis of schizophrenia in African Americans. *Archives of Psychiatric Nursing*, 21(6), 327–335. <https://doi.org/10.1016/j.apnu.2007.04.006>

- Dixon, M. A., & Chartier, K. G. (2016). Alcohol Use Patterns Among Urban and Rural Residents: Demographic and Social Influences. *Alcohol Research : Current Reviews*, 38(1), 69–77.
- Dobscha, S. K., Soleck, G. D., Dickinson, K. C., Burgess, D. J., Lasarev, M. R., Lee, E. S., & McFarland, B. H. (2009). Associations between race and ethnicity and treatment for chronic pain in the VA. *The Journal of Pain : Official Journal of the American Pain Society*, 10(10), 1078–1087. <https://doi.org/10.1016/j.jpain.2009.04.018>
- Durvasula, R., & Miller, T. R. (2014). Substance Abuse Treatment in Persons with HIV/AIDS: Challenges in Managing Triple Diagnosis. *Behavioral Medicine*, 40(2), 43–52. <https://doi.org/10.1080/08964289.2013.866540>
- Elliott, J. C., Aharonovich, E., O’Leary, A., Wainberg, M., & Hasin, D. S. (2014). Drinking motives as prospective predictors of outcome in an intervention trial with heavily drinking HIV patients. *Drug and Alcohol Dependence*, 134, 290–295. <https://doi.org/10.1016/j.drugalcdep.2013.10.026>
- Farrigan, T. (2015, December 17). Rural Poverty & Well-being. Retrieved June 5, 2016, from <http://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/poverty-overview.aspx>
- Farrigan, T. (2017, March 1). Geography of Poverty. Retrieved June 26, 2017, from <https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/geography-of-poverty/>
- Fergusson, D. M., Boden, J. M., & Horwood, L. J. (2009). Tests of Causal Links Between Alcohol Abuse or Dependence and Major Depression. *Archives of General Psychiatry*, 66(3), 260. <https://doi.org/10.1001/archgenpsychiatry.2008.543>
- Fischer, M. J., Wyatt, C. M., Gordon, K., Gibert, C. L., Brown, S. T., Rimland, D., ... VACS Project Team. (2010). Hepatitis C and the risk of kidney disease and mortality in veterans with HIV. *Journal of Acquired Immune Deficiency Syndromes (1999)*, 53(2), 222–226. <https://doi.org/10.1097/QAI.0b013e3181b980d4>
- Florom-Smith, A. L., & De Santis, J. P. (2012). Exploring the Concept of HIV-Related Stigma: HIV-Related Stigma. *Nursing Forum*, 47(3), 153–165. <https://doi.org/10.1111/j.1744-6198.2011.00235.x>
- Fortney, J., & Booth, B. M. (2002). Access to Substance Abuse Services in Rural Areas. In *Alcoholism* (pp. 177–197). Boston, MA: Springer US. Retrieved from http://link.springer.com/10.1007/978-0-306-47193-3_10
- Fortney, J., Mukherjee, S., Curran, G., Fortney, S., Han, X., & Booth, B. M. (2004). Factors associated with perceived stigma for alcohol use and treatment among at-risk drinkers. *The Journal of Behavioral Health Services & Research*, 31(4), 418–429.

- Frank, D., DeBenedetti, A. F., Volk, R. J., Williams, E. C., Kivlahan, D. R., & Bradley, K. A. (2008). Effectiveness of the AUDIT-C as a screening test for alcohol misuse in three race/ethnic groups. *Journal of General Internal Medicine*, 23(6), 781–787. <https://doi.org/10.1007/s11606-008-0594-0>
- Freiberg, M. S., Chang, C.-C. H., Kuller, L. H., Skanderson, M., Lowy, E., Kraemer, K. L., ... Justice, A. C. (2013). HIV Infection and the Risk of Acute Myocardial Infarction. *JAMA Internal Medicine*, 173(8), 614. <https://doi.org/10.1001/jamainternmed.2013.3728>
- Freiberg, M. S., McGinnis, K. A., Kraemer, K., Samet, J. H., Conigliaro, J., Curtis Ellison, R., ... Justice, A. C. (2010). The Association Between Alcohol Consumption and Prevalent Cardiovascular Diseases Among HIV-Infected and HIV-Uninfected Men: *JAIDS Journal of Acquired Immune Deficiency Syndromes*, 53(2), 247–253. <https://doi.org/10.1097/QAI.0b013e3181c6c4b7>
- Frohlich, K. L., & Potvin, L. (2008). Transcending the Known in Public Health Practice: The Inequality Paradox: The Population Approach and Vulnerable Populations. *American Journal of Public Health*, 98(2), 216–221. <https://doi.org/10.2105/AJPH.2007.114777>
- Fultz, S. L., Skanderson, M., Mole, L. A., Gandhi, N., Bryant, K., Crystal, S., & Justice, A. C. (2006). Development and Verification of a “Virtual” Cohort Using the National VA Health Information System. *Medical Care*, 44(8), S25–S30.
- Galvan, F. H., Bing, E. G., Fleishman, J. A., London, A. S., Caetano, R., Burnam, M. A., ... Shapiro, M. (2002). The prevalence of alcohol consumption and heavy drinking among people with HIV in the United States: results from the HIV Cost and Services Utilization Study. *Journal of Studies on Alcohol*, 63(2), 179–186. <https://doi.org/10.15288/jsa.2002.63.179>
- Giordano, T. P., Morgan, R. O., Kramer, J. R., Hartman, C., Richardson, P., White, C. A., ... El-Serag, H. B. (2006). Is there a race-based disparity in the survival of veterans with HIV? *Journal of General Internal Medicine*, 21(6), 613–617. <https://doi.org/10.1111/j.1525-1497.2006.00452.x>
- Glass, J. E., Perron, B. E., Ilgen, M. A., Chermack, S. T., Ratliff, S., & Zivin, K. (2010). Prevalence and correlates of specialty substance use disorder treatment for Department of Veterans Affairs Healthcare System patients with high alcohol consumption. *Drug and Alcohol Dependence*, 112(1–2), 150–155. <https://doi.org/10.1016/j.drugalcdep.2010.06.003>
- Gonzalez, J. S., Batchelder, A. W., Psaros, C., & Safren, S. A. (2011). Depression and HIV/AIDS treatment nonadherence: a review and meta-analysis. *Journal of Acquired Immune Deficiency Syndromes (1999)*, 58(2), 181–187. <https://doi.org/10.1097/QAI.0b013e31822d490a>
- Goulet, J. L., Fultz, S. L., Rimland, D., Butt, A., Gibert, C., Rodriguez-Barradas, M., ... Justice, A. C. (2007). Do Patterns of Comorbidity Vary by HIV Status, Age, and HIV Severity? *Clinical Infectious Diseases*, 45(12), 1593–1601. <https://doi.org/10.1086/523577>

- Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, S. P., Dufour, M. C., & Pickering, R. P. (2004). The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991-1992 and 2001-2002. *Drug and Alcohol Dependence*, *74*(3), 223–234. <https://doi.org/10.1016/j.drugalcdep.2004.02.004>
- Gross, R., Zhang, Y., & Grossberg, R. (2005). Medication refill logistics and refill adherence in HIV. *Pharmacoepidemiology and Drug Safety*, *14*(11), 789–793. <https://doi.org/10.1002/pds.1109>
- Hahn, J. A., & Samet, J. H. (2010). Alcohol and HIV Disease Progression: Weighing the Evidence. *Current HIV/AIDS Reports*, *7*(4), 226–233. <https://doi.org/10.1007/s11904-010-0060-6>
- Hajjar, I. (2003). Trends in Prevalence, Awareness, Treatment, and Control of Hypertension in the United States, 1988-2000. *JAMA*, *290*(2), 199. <https://doi.org/10.1001/jama.290.2.199>
- Hall, H. I., Li, J., & McKenna, M. T. (2005). HIV in predominantly rural areas of the United States. *The Journal of Rural Health: Official Journal of the American Rural Health Association and the National Rural Health Care Association*, *21*(3), 245–253.
- Harris, A. H. S., Bryson, C. L., Sun, H., Blough, D., & Bradley, K. A. (2009). Alcohol Screening Scores Predict Risk of Subsequent Fractures. *Substance Use & Misuse*, *44*(8), 1055–1069. <https://doi.org/10.1080/10826080802485972>
- Harris, A. H. S., Humphreys, K., & Finney, J. W. (2007). Veterans Affairs facility performance on Washington Circle indicators and casemix-adjusted effectiveness. *Journal of Substance Abuse Treatment*, *33*(4), 333–339. <https://doi.org/10.1016/j.jsat.2006.12.015>
- Harris, A. H. S., Kivlahan, D. R., Bowe, T., & Humphreys, K. N. (2010). Pharmacotherapy of alcohol use disorders in the Veterans Health Administration. *Psychiatric Services (Washington, D.C.)*, *61*(4), 392–398. <https://doi.org/10.1176/appi.ps.61.4.392>
- Hartley, D. (2004). Rural Health Disparities, Population Health, and Rural Culture. *American Journal of Public Health*, *94*(10), 1675–1678.
- Hatzenbuehler, M. L. (2009). How does sexual minority stigma “get under the skin”? A psychological mediation framework. *Psychological Bulletin*, *135*(5), 707–730. <https://doi.org/10.1037/a0016441>
- Hatzenbuehler, M. L., Keyes, K. M., Narrow, W. E., Grant, B. F., & Hasin, D. S. (2008). Racial/ethnic disparities in service utilization for individuals with co-occurring mental health and substance use disorders in the general population. *The Journal of Clinical Psychiatry*, *69*(7), 1112–1121.
- Havens, J. R., Oser, C. B., & Leukefeld, C. G. (2011). Injection risk behaviors among rural drug users: implications for HIV prevention. *AIDS Care*, *23*(5), 638–645. <https://doi.org/10.1080/09540121.2010.516346>

- Hendershot, C. S., Stoner, S. A., Pantalone, D. W., & Simoni, J. M. (2009). Alcohol use and antiretroviral adherence: review and meta-analysis. *Journal of Acquired Immune Deficiency Syndromes (1999)*, *52*(2), 180–202. <https://doi.org/10.1097/QAI.0b013e3181b18b6e>
- Jonas, D. E., Amick, H. R., Feltner, C., Bobashev, G., Thomas, K., Wines, R., ... Garbutt, J. C. (2014). Pharmacotherapy for Adults With Alcohol Use Disorders in Outpatient Settings: A Systematic Review and Meta-analysis. *JAMA*, *311*(18), 1889. <https://doi.org/10.1001/jama.2014.3628>
- Jonas, D. E., Garbutt, J. C., Amick, H. R., Brown, J. M., Brownley, K. A., Council, C. L., ... Harris, R. P. (2012). Behavioral Counseling After Screening for Alcohol Misuse in Primary Care: A Systematic Review and Meta-analysis for the U.S. Preventive Services Task Force. *Annals of Internal Medicine*, *157*(9), 645. <https://doi.org/10.7326/0003-4819-157-9-201211060-00544>
- Jones, C. Y., Hogan, J. W., Snyder, B., Klein, R. S., Rompalo, A., Schuman, P., ... HIV Epidemiology Research Study Group. (2003). Overweight and human immunodeficiency virus (HIV) progression in women: associations HIV disease progression and changes in body mass index in women in the HIV epidemiology research study cohort. *Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America*, *37* Suppl 2, S69-80. <https://doi.org/10.1086/375889>
- Jones-Webb, R., Snowden, L., Herd, D., Short, B., & Hannan, P. (1997). Alcohol-related problems among black, Hispanic and white men: the contribution of neighborhood poverty. *Journal of Studies on Alcohol*, *58*(5), 539–545.
- Justice, A. C., Dombrowski, E., Conigliaro, J., Fultz, S. L., Gibson, D., Madenwald, T., ... Bryant, K. (2006). Veterans Aging Cohort Study (VACS): Overview and description. *Medical Care*, *44*(8 Suppl 2), S13-24. <https://doi.org/10.1097/01.mlr.0000223741.02074.66>
- Justice, A. C., McGinnis, K. A., Tate, J. P., Braithwaite, R. S., Bryant, K. J., Cook, R. L., ... Fiellin, D. A. (2016). Risk of mortality and physiologic injury evident with lower alcohol exposure among HIV infected compared with uninfected men. *Drug and Alcohol Dependence*, *161*, 95–103. <https://doi.org/10.1016/j.drugalcdep.2016.01.017>
- Kahler, C. W., Strong, D. R., Papandonatos, G. D., Colby, S. M., Clark, M. A., Boergers, J., ... Buka, S. L. (2008). Cigarette smoking and the lifetime alcohol involvement continuum. *Drug and Alcohol Dependence*, *93*(1–2), 111–120. <https://doi.org/10.1016/j.drugalcdep.2007.09.004>
- Kalichman, S. C., Amaral, C. M., White, D., Swetsze, C., Kalichman, M. O., Cherry, C., & Eaton, L. (2012). Alcohol and Adherence to Antiretroviral Medications: Interactive Toxicity Beliefs Among People Living With HIV. *Journal of the Association of Nurses in AIDS Care*, *23*(6), 511–520. <https://doi.org/10.1016/j.jana.2011.11.005>
- Kalichman, S. C., Grebler, T., Amaral, C. M., McNerey, M., White, D., Kalichman, M. O., ... Eaton, L. (2013). Intentional Non-Adherence to Medications among HIV Positive Alcohol

- Drinkers: Prospective Study of Interactive Toxicity Beliefs. *Journal of General Internal Medicine*, 28(3), 399–405. <https://doi.org/10.1007/s11606-012-2231-1>
- Karriker-Jaffe, K. J., & Zemore, S. E. (2009). Associations between acculturation and alcohol consumption of Latino men in the United States. *Journal of Studies on Alcohol and Drugs*, 70(1), 27–31.
- Karriker-Jaffe, K. J., Zemore, S. E., Mulia, N., Jones-Webb, R., Bond, J., & Greenfield, T. K. (2012). Neighborhood disadvantage and adult alcohol outcomes: differential risk by race and gender. *Journal of Studies on Alcohol and Drugs*, 73(6), 865–873.
- Kerr, W. C., Greenfield, T. K., Bond, J., Ye, Y., & Rehm, J. (2011). Racial and Ethnic Differences in All-Cause Mortality Risk According to Alcohol Consumption Patterns in the National Alcohol Surveys. *American Journal of Epidemiology*, 174(7), 769–778. <https://doi.org/10.1093/aje/kwr147>
- Kerr, William C., Patterson, D., & Greenfield, T. K. (2009). Differences in the measured alcohol content of drinks between black, white and Hispanic men and women in a US national sample. *Addiction*, 104(9), 1503–1511. <https://doi.org/10.1111/j.1360-0443.2009.02579.x>
- Keyes, K. M., Hatzenbuehler, M. L., McLaughlin, K. A., Link, B., Olfson, M., Grant, B. F., & Hasin, D. (2010). Stigma and Treatment for Alcohol Disorders in the United States. *American Journal of Epidemiology*, 172(12), 1364–1372. <https://doi.org/10.1093/aje/kwq304>
- Kinder, L. S., Bryson, C. L., Sun, H., Williams, E. C., & Bradley, K. A. (2009). Alcohol screening scores and all-cause mortality in male Veterans Affairs patients. *Journal of Studies on Alcohol and Drugs*, 70(2), 253–260.
- Kong, M. C., Nahata, M. C., Lacombe, V. A., Seiber, E. E., & Balkrishnan, R. (2012). Association between race, depression, and antiretroviral therapy adherence in a low-income population with HIV infection. *Journal of General Internal Medicine*, 27(9), 1159–1164. <https://doi.org/10.1007/s11606-012-2043-3>
- Korthuis, P. T., Fiellin, D. A., McGinnis, K. A., Skanderson, M., Justice, A. C., Gordon, A. J., ... Kraemer, K. L. (2012). Unhealthy alcohol and illicit drug use are associated with decreased quality of HIV care. *Journal of Acquired Immune Deficiency Syndromes (1999)*, 61(2), 171–178. <https://doi.org/10.1097/QAI.0b013e31826741aa>
- Krumme, A. A., Kaigamba, F., Binagwaho, A., Murray, M. B., Rich, M. L., & Franke, M. F. (2015). Depression, adherence and attrition from care in HIV-infected adults receiving antiretroviral therapy. *Journal of Epidemiology and Community Health*, 69(3), 284–289. <https://doi.org/10.1136/jech-2014-204494>
- Lapham, G. T., Achtmeyer, C. E., Williams, E. C., Hawkins, E. J., Kivlahan, D. R., & Bradley, K. A. (2012). Increased Documented Brief Alcohol Interventions With a Performance Measure and Electronic Decision Support. *Medical Care*, 50(2), 179–187. <https://doi.org/10.1097/MLR.0b013e3181e35743>

- Lapham, G. T., Rubinsky, A. D., Shortreed, S. M., Hawkins, E. J., Richards, J., Williams, E. C., ... Bradley, K. A. (2015). Comparison of provider-documented and patient-reported brief intervention for unhealthy alcohol use in VA outpatients. *Drug and Alcohol Dependence*, *153*, 159–166. <https://doi.org/10.1016/j.drugalcdep.2015.05.027>
- Lê Cook, B., & Alegría, M. (2011). Racial-Ethnic Disparities in Substance Abuse Treatment: The Role of Criminal History and Socioeconomic Status. *Psychiatric Services*, *62*(11). <https://doi.org/10.1176/appi.ps.62.11.1273>
- Levi-Minzi, M. A., & Surratt, H. L. (2014). HIV Stigma Among Substance Abusing People Living with HIV/AIDS: Implications for HIV Treatment. *AIDS Patient Care and STDs*, *28*(8), 442–451. <https://doi.org/10.1089/apc.2014.0076>
- Lieber, C. S. (2001). Alcohol and Hepatitis C. *National Institute on Alcohol Abuse and Alcoholism*.
- Link, B. G., & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior, Spec No*, 80–94.
- Mark, T. L., Kassed, C. A., Vandivort-Warren, R., Levit, K. R., & Kranzler, H. R. (2009). Alcohol and opioid dependence medications: Prescription trends, overall and by physician specialty. *Drug and Alcohol Dependence*, *99*(1–3), 345–349. <https://doi.org/10.1016/j.drugalcdep.2008.07.018>
- Martin, J. K., Tuch, S. A., & Roman, P. M. (2003). Problem Drinking Patterns among African Americans: The Impacts of Reports of Discrimination, Perceptions of Prejudice, and “Risky” Coping Strategies. *Journal of Health and Social Behavior*, *44*(3), 408–425.
- Mays, V. M., Ponce, N. A., Washington, D. L., & Cochran, S. D. (2003). Classification of Race and Ethnicity: Implications for Public Health*. *Annual Review of Public Health*, *24*(1), 83–110. <https://doi.org/10.1146/annurev.publhealth.24.100901.140927>
- McGinnis, K. A., Brandt, C. A., Skanderson, M., Justice, A. C., Shahrir, S., Butt, A. A., ... Crothers, K. (2011). Validating Smoking Data From the Veteran’s Affairs Health Factors Dataset, an Electronic Data Source. *Nicotine & Tobacco Research*, *13*(12), 1233–1239. <https://doi.org/10.1093/ntr/ntr206>
- McGinnis, Kathleen A., Tate, J. P., Williams, E. C., Skanderson, M., Bryant, K. J., Gordon, A. J., ... Justice, A. C. (2016). Comparison of AUDIT-C collected via electronic medical record and self-administered research survey in HIV infected and uninfected patients. *Drug and Alcohol Dependence*, *168*, 196–202. <https://doi.org/10.1016/j.drugalcdep.2016.09.015>
- McKinney, C. M., Chartier, K. G., Caetano, R., & Harris, T. R. (2012). Alcohol Availability and Neighborhood Poverty and Their Relationship to Binge Drinking and Related Problems Among Drinkers in Committed Relationships. *Journal of Interpersonal Violence*, *27*(13), 2703–2727. <https://doi.org/10.1177/0886260512436396>

- Miglioretti, D. L., & Heagerty, P. J. (2006). Marginal Modeling of Nonnested Multilevel Data using Standard Software. *American Journal of Epidemiology*, *165*(4), 453–463. <https://doi.org/10.1093/aje/kwk020>
- Miller, P. M., Book, S. W., & Stewart, S. H. (2011). Medical Treatment of Alcohol Dependence: A Systematic Review. *The International Journal of Psychiatry in Medicine*, *42*(3), 227–266. <https://doi.org/10.2190/PM.42.3.b>
- Montague, B. T., Kahler, C. W., Colby, S. M., McHugh, R. K., Squires, D., Fitzgerald, B., ... Mayer, K. H. (2015). Attitudes and Training Needs of New England HIV Care and Addiction Treatment Providers: Opportunities for Better Integration of HIV and Alcohol Treatment Services. *Addictive Disorders & Their Treatment*, *14*(1), 16–28. <https://doi.org/10.1097/ADT.0000000000000040>
- Moolchan, E. T., Fagan, P., Fernander, A. F., Velicer, W. F., Hayward, M. D., King, G., & Clayton, R. R. (2007). Addressing tobacco-related health disparities. *Addiction*, *102*, 30–42. <https://doi.org/10.1111/j.1360-0443.2007.01953.x>
- Morrill, R., Cromartie, J., & Hart, G. (1999). METROPOLITAN, URBAN, AND RURAL COMMUTING AREAS: TOWARD A BETTER DEPICTION OF THE UNITED STATES SETTLEMENT SYSTEM. *Urban Geography*, *20*(8), 727–748. <https://doi.org/10.2747/0272-3638.20.8.727>
- Moskal, A., Norat, T., Ferrari, P., & Riboli, E. (2007). Alcohol intake and colorectal cancer risk: A dose–response meta-analysis of published cohort studies. *International Journal of Cancer*, *120*(3), 664–671. <https://doi.org/10.1002/ijc.22299>
- Mott, J. M., Grubbs, K. M., Sansgiry, S., Fortney, J. C., & Cully, J. A. (2015). Psychotherapy Utilization Among Rural and Urban Veterans From 2007 to 2010: Psychotherapy Use Among Rural Veterans. *The Journal of Rural Health*, *31*(3), 235–243. <https://doi.org/10.1111/jrh.12099>
- Moyer, A., & Finney, J. W. (2010). MEETING THE CHALLENGES FOR RESEARCH AND PRACTICE FOR BRIEF ALCOHOL INTERVENTION: Commentaries. *Addiction*, *105*(6), 963–964. <https://doi.org/10.1111/j.1360-0443.2010.02907.x>
- Mulia, N., Ye, Y., Greenfield, T. K., & Zemore, S. E. (2009). Disparities in alcohol-related problems among white, black, and Hispanic Americans. *Alcoholism, Clinical and Experimental Research*, *33*(4), 654–662. <https://doi.org/10.1111/j.1530-0277.2008.00880.x>
- Murphy, D. A., Greenwell, L., & Hoffman, D. (2002). Factors associated with antiretroviral adherence among HIV-infected women with children. *Women & Health*, *36*(1), 97–111.
- National Institute of Alcohol Abuse and Alcoholism. (n.d.). Alcohol Use Disorder. Retrieved April 8, 2015, from <http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-use-disorders>

- Nelson, R. E., Hicken, B., West, A., & Rupper, R. (2012). The Effect of Increased Travel Reimbursement Rates on Health Care Utilization in the VA: Effect of Increased Travel Reimbursement Rates on Health Care Utilization. *The Journal of Rural Health, 28*(2), 192–201. <https://doi.org/10.1111/j.1748-0361.2011.00387.x>
- Office of Budget and Management. (1997). *Revisions to the standards for the classification of federal data on race and ethnicity*. Office of Budget and Management.
- Ohl, M. E., & Perencevich, E. (2011). Frequency of human immunodeficiency virus (HIV) testing in urban vs. rural areas of the United States: Results from a nationally-representative sample. *BMC Public Health, 11*(1), 681. <https://doi.org/10.1186/1471-2458-11-681>
- Ohl, M. E., Perencevich, E., McInnes, D. K., Kim, N., Rimland, D., Akgun, K., ... Justice, A. (2013). Antiretroviral Adherence Among Rural Compared to Urban Veterans with HIV Infection in the United States. *AIDS and Behavior, 17*(1), 174–180. <https://doi.org/10.1007/s10461-012-0325-8>
- Ohl, M., Tate, J., Duggal, M., Skanderson, M., Scotch, M., Kaboli, P., ... Justice, A. (2010). Rural residence is associated with delayed care entry and increased mortality among veterans with human immunodeficiency virus infection. *Medical Care, 48*(12), 1064–1070. <https://doi.org/10.1097/MLR.0b013e3181ef60c2>
- Pellowski, J. A., Kalichman, S. C., Matthews, K. A., & Adler, N. (2013). A pandemic of the poor: social disadvantage and the U.S. HIV epidemic. *The American Psychologist, 68*(4), 197–209. <https://doi.org/10.1037/a0032694>
- Pereira, G., Wood, L., Foster, S., & Haggar, F. (2013). Access to Alcohol Outlets, Alcohol Consumption and Mental Health. *PLoS ONE, 8*(1), e53461. <https://doi.org/10.1371/journal.pone.0053461>
- Peterson, K., McCleery, E., & Waldrip, K. (2011). Evidence Brief: Update on Prevalence of and Interventions to Reduce Racial and Ethnic Disparities within the VA. In *VA Evidence-based Synthesis Program Evidence Briefs*. Washington (DC): Department of Veterans Affairs (US). Retrieved from <http://www.ncbi.nlm.nih.gov/books/NBK384611/>
- Power, R., Koopman, C., Volk, J., Israelski, D. M., Stone, L., Chesney, M. A., & Spiegel, D. (2003). Social Support, Substance Use, and Denial in Relationship to Antiretroviral Treatment Adherence among HIV-Infected Persons. *AIDS Patient Care and STDs, 17*(5), 245–252. <https://doi.org/10.1089/108729103321655890>
- Probst, J. C., Laditka, S. B., Moore, C. G., Harun, N., Powell, M. P., & Baxley, E. G. (2006). Rural-urban differences in depression prevalence: implications for family medicine. *Family Medicine, 38*(9), 653–660.
- Pullen, E., & Oser, C. (2014). Barriers to Substance Abuse Treatment in Rural and Urban Communities: Counselor Perspectives. *Substance Use & Misuse, 49*(7), 891–901. <https://doi.org/10.3109/10826084.2014.891615>

- Rehm, J., Probst, C., Shield, K. D., & Shuper, P. A. (2017). Does alcohol use have a causal effect on HIV incidence and disease progression? A review of the literature and a modeling strategy for quantifying the effect. *Population Health Metrics*, 15(1).
<https://doi.org/10.1186/s12963-017-0121-9>
- Reif, S., Golin, C. E., & Smith, S. R. (2005). Barriers to accessing HIV/AIDS care in North Carolina: rural and urban differences. *AIDS Care*, 17(5), 558–565.
<https://doi.org/10.1080/09540120412331319750>
- Reif, Susan, Pence, B. W., Hall, I., Hu, X., Whetten, K., & Wilson, E. (2015). HIV Diagnoses, Prevalence and Outcomes in Nine Southern States. *Journal of Community Health*, 40(4), 642–651. <https://doi.org/10.1007/s10900-014-9979-7>
- Robert, S. A. (1999). SOCIOECONOMIC POSITION AND HEALTH: The Independent Contribution of Community Socioeconomic Context. *Annual Review of Sociology*, 25(1), 489–516. <https://doi.org/10.1146/annurev.soc.25.1.489>
- Roerecke, M., & Rehm, J. (2013). Alcohol use disorders and mortality: a systematic review and meta-analysis. *Addiction (Abingdon, England)*, 108(9), 1562–1578.
<https://doi.org/10.1111/add.12231>
- Room, R., Babor, T., & Rehm, J. (2005). Alcohol and public health. *Lancet*, 365(9458), 519–530. [https://doi.org/10.1016/S0140-6736\(05\)17870-2](https://doi.org/10.1016/S0140-6736(05)17870-2)
- Rubinsky, A. D., Dawson, D. A., Williams, E. C., Kivlahan, D. R., & Bradley, K. A. (2013). AUDIT-C scores as a scaled marker of mean daily drinking, alcohol use disorder severity, and probability of alcohol dependence in a U.S. general population sample of drinkers. *Alcoholism, Clinical and Experimental Research*, 37(8), 1380–1390.
<https://doi.org/10.1111/acer.12092>
- Saitz, R. (2005). Unhealthy Alcohol Use. *New England Journal of Medicine*, 352(6), 596–607.
<https://doi.org/10.1056/NEJMcp042262>
- Samet, J. H., Horton, N. J., Meli, S., Freedberg, K. A., & Palepu, A. (2004). Alcohol Consumption and Antiretroviral Adherence Among HIV-Infected Persons With Alcohol Problems: *Alcoholism: Clinical & Experimental Research*, 28(4), 572–577.
<https://doi.org/10.1097/01.ALC.0000122103.74491.78>
- Samet, J. H., Phillips, S. J., Horton, N. J., Traphagen, E. T., & Freedberg, K. A. (2004). Detecting alcohol problems in HIV-infected patients: use of the CAGE questionnaire. *AIDS Research and Human Retroviruses*, 20(2), 151–155.
<https://doi.org/10.1089/088922204773004860>
- Schneider, M., Chersich, M., Neuman, M., & Parry, C. (2012). Alcohol consumption and HIV/AIDS: the neglected interface. *Addiction (Abingdon, England)*, 107(8), 1369–1371.
<https://doi.org/10.1111/j.1360-0443.2012.03824.x>

- Sheth, S. H., Jensen, P. T., & Lahey, T. (2009). Living in rural New England amplifies the risk of depression in patients with HIV. *BMC Infectious Diseases*, 9(1). <https://doi.org/10.1186/1471-2334-9-25>
- Shield, K. D., Parry, C., & Rehm, J. (2014). Chronic Diseases and Conditions Related to Alcohol Use. *Alcohol Research : Current Reviews*, 35(2), 155–171.
- Shuper, P. A., Neuman, M., Kanteres, F., Baliunas, D., Joharchi, N., & Rehm, J. (2010). Causal Considerations on Alcohol and HIV/AIDS -- A Systematic Review. *Alcohol and Alcoholism*, 45(2), 159–166. <https://doi.org/10.1093/alcalc/agp091>
- Singh, N., Berman, S. M., Swindells, S., Justis, J. C., Mohr, J. A., Squier, C., & Wagener, M. M. (1999). Adherence of Human Immunodeficiency Virus–Infected Patients to Antiretroviral Therapy. *Clinical Infectious Diseases*, 29(4), 824–830. <https://doi.org/10.1086/520443>
- Slifkin, R., Goldsmith, L., & Ricketts, T. (2000). Race and Place: Urban-Rural Differences in Health for Racial and Ethnic Minorities, (66). Retrieved from http://www.shepscenter.unc.edu/rural/pubs/finding_brief/fb61.pdf
- Smith, P. C., Schmidt, S. M., Allensworth-Davies, D., & Saitz, R. (2009). Primary Care Validation of a Single-Question Alcohol Screening Test. *Journal of General Internal Medicine*, 24(7), 783–788. <https://doi.org/10.1007/s11606-009-0928-6>
- Sohn, M.-W., Arnold, N., Maynard, C., & Hynes, D. M. (2006). Accuracy and completeness of mortality data in the Department of Veterans Affairs. *Population Health Metrics*, 4(1). <https://doi.org/10.1186/1478-7954-4-2>
- Spence, R. T., & Wallisch, L. S. (2007). Alcohol and Drug Use in Rural Colonias and Adjacent Urban Areas of the Texas Border. *The Journal of Rural Health*, 23(s1), 55–60. <https://doi.org/10.1111/j.1748-0361.2007.00124.x>
- Spithoff, S., & Kahan, M. (2015). Primary care management of alcohol use disorder and at-risk drinking: Part 2: counsel, prescribe, connect. *Canadian Family Physician*, 61(6), 515–521.
- StataCorp. (2013). *Stata Statistical Software: Release 13*. College Station, TX: StataCorp LP.
- Staton-Tindall, M., Wahler, E., Webster, J. M., Godlaski, T., Freeman, R., & Leukefeld, C. (2012). Telemedicine-based alcohol services for rural offenders. *Psychological Services*, 9(3), 298–309. <https://doi.org/10.1037/a0026772>
- Stein, M. D., Hanna, L., Natarajan, R., Clarke, J., Marisi, M., Sobota, M., & Rich, J. (2000). Alcohol use patterns predict high-risk HIV behaviors among active injection drug users☆☆Presented at the 20th Annual Meeting of the Society of General Internal Medicine, Chicago, IL, USA, April 1998. *Journal of Substance Abuse Treatment*, 18(4), 359–363. [https://doi.org/10.1016/S0740-5472\(99\)00070-7](https://doi.org/10.1016/S0740-5472(99)00070-7)

- Sullivan, L. E., Fiellin, D. A., & O'Connor, P. G. (2005). The prevalence and impact of alcohol problems in major depression: a systematic review. *The American Journal of Medicine*, *118*(4), 330–341. <https://doi.org/10.1016/j.amjmed.2005.01.007>
- Sullivan, L. E., Goulet, J. L., Justice, A. C., & Fiellin, D. A. (2011). Alcohol consumption and depressive symptoms over time: a longitudinal study of patients with and without HIV infection. *Drug and Alcohol Dependence*, *117*(2–3), 158–163. <https://doi.org/10.1016/j.drugalcdep.2011.01.014>
- Taylor, B., Irving, H. M., Baliunas, D., Roerecke, M., Patra, J., Mohapatra, S., & Rehm, J. (2009). Alcohol and hypertension: gender differences in dose-response relationships determined through systematic review and meta-analysis: Alcohol and hypertension: a meta-analysis. *Addiction*, *104*(12), 1981–1990. <https://doi.org/10.1111/j.1360-0443.2009.02694.x>
- The Management of Substance Use Disorders Work Group. (2015). *VA/DoD Clinical Guideline for the Management of Substance Use Disorders*. Washington, D.C. Retrieved from <https://www.healthquality.va.gov/guidelines/MH/sud/VADoDSUDCPGRevised22216.pdf>
- The Veterans Aging Cohort Study, McGinnis, K. A., Fiellin, D. A., Tate, J. P., Cook, R. L., Braithwaite, R. S., ... Justice, A. C. (2016). Number of Drinks to ?Feel a Buzz? by HIV Status and Viral Load in Men. *AIDS and Behavior*, *20*(3), 504–511. <https://doi.org/10.1007/s10461-015-1053-7>
- Vaeth, P. A. C., Wang-Schweig, M., & Caetano, R. (2016). Drinking, Alcohol Use Disorder, and Treatment Access and Utilization Among U.S. Racial/Ethnic Groups. *Alcoholism: Clinical and Experimental Research*. <https://doi.org/10.1111/acer.13285>
- Vanable, P. A., Carey, M. P., Blair, D. C., & Littlewood, R. A. (2006). Impact of HIV-Related Stigma on Health Behaviors and Psychological Adjustment Among HIV-Positive Men and Women. *AIDS and Behavior*, *10*(5), 473–482. <https://doi.org/10.1007/s10461-006-9099-1>
- Vander Weg, M. W., & Cai, X. (2012). Variability in Veterans' Alcohol Use by Place of Residence: Alcohol Use in Veterans. *The American Journal on Addictions*, *21*(1), 31–37. <https://doi.org/10.1111/j.1521-0391.2011.00191.x>
- Vyavaharkar, M., Glover, S., Leonhirth, D., & Probst, J. (2013). *HIV/AIDS in Rural America: Prevalence and Service Availability*. South Carolina Rural Health Research Center.
- Wandeler, G., Kraus, D., Fehr, J., Conen, A., Calmy, A., Orasch, C., ... Swiss HIV Cohort Study. (2015). The J-curve in HIV: low and moderate alcohol intake predicts mortality but not the occurrence of major cardiovascular events. *Journal of Acquired Immune Deficiency Syndromes (1999)*. <https://doi.org/10.1097/QAI.0000000000000864>
- Websdale, N., & Johnson, B. (1998). An Ethnostatistical Comparison of the Forms and Levels of Woman Battering in Urban and Rural Areas of Kentucky. *Criminal Justice Review*, *23*(2), 161–196. <https://doi.org/10.1177/073401689802300203>

- Weisner, C., Matzger, H., & Kaskutas, L. A. (2003). How important is treatment? One-year outcomes of treated and untreated alcohol-dependent individuals. *Addiction (Abingdon, England)*, *98*(7), 901–911.
- Wheeler, D. A., Gibert, C. L., Launer, C. A., Muurahainen, N., Elion, R. A., Abrams, D. I., & Bartsch, G. E. (1998). Weight loss as a predictor of survival and disease progression in HIV infection. Terry Bein Community Programs for Clinical Research on AIDS. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology: Official Publication of the International Retrovirology Association*, *18*(1), 80–85.
- White, K., Haas, J. S., & Williams, D. R. (2012). Elucidating the Role of Place in Health Care Disparities: The Example of Racial/Ethnic Residential Segregation. *Health Services Research*, *47*(3pt2), 1278–1299. <https://doi.org/10.1111/j.1475-6773.2012.01410.x>
- Willing, C. E., Salvador, M., & Kano, M. (2006). Brief Reports: Unequal Treatment: Mental Health Care for Sexual and Gender Minority Groups in a Rural State. *Psychiatric Services*, *57*(6), 867–870. <https://doi.org/10.1176/appi.ps.57.6.867>
- Williams, D. R., & Jackson, P. B. (2005). Social Sources Of Racial Disparities In Health. *Health Affairs*, *24*(2), 325–334. <https://doi.org/10.1377/hlthaff.24.2.325>
- Williams, D. R., Mohammed, S. A., Leavell, J., & Collins, C. (2010). Race, socioeconomic status, and health: Complexities, ongoing challenges, and research opportunities: Race, SES, and health. *Annals of the New York Academy of Sciences*, *1186*(1), 69–101. <https://doi.org/10.1111/j.1749-6632.2009.05339.x>
- Williams, E. C., Achtmeyer, C. E., Thomas, R. M., Grossbard, J. R., Lapham, G. T., Chavez, L. J., ... Bradley, K. A. (2015). Factors Underlying Quality Problems with Alcohol Screening Prompted by a Clinical Reminder in Primary Care: A Multi-site Qualitative Study. *Journal of General Internal Medicine*, *30*(8), 1125–1132. <https://doi.org/10.1007/s11606-015-3248-z>
- Williams, E. C., Bradley, K. A., Gupta, S., & Harris, A. H. S. (2012). Association Between Alcohol Screening Scores and Mortality in Black, Hispanic, and White Male Veterans. *Alcoholism: Clinical and Experimental Research*, *36*(12), 2132–2140. <https://doi.org/10.1111/j.1530-0277.2012.01842.x>
- Williams, E. C., Gupta, S., Rubinsky, A. D., Glass, J. E., Jones-Webb, R., Bensley, K. M., & Harris, A. H. S. (2017). Variation in receipt of pharmacotherapy for alcohol use disorders across racial/ethnic groups: A national study in the U.S. Veterans Health Administration. *Drug and Alcohol Dependence*. <https://doi.org/10.1016/j.drugalcdep.2017.06.011>
- Williams, E. C., Gupta, S., Rubinsky, A. D., Jones-Webb, R., Bensley, K. M., Young, J. P., ... Harris, A. H. S. (2016). Racial/Ethnic Differences in the Prevalence of Clinically Recognized Alcohol Use Disorders Among Patients from the U.S. Veterans Health Administration. *Alcoholism: Clinical and Experimental Research*, *40*(2), 359–366. <https://doi.org/10.1111/acer.12950>

- Williams, E. C., Hahn, J. A., Saitz, R., Bryant, K., Lira, M. C., & Samet, J. H. (2016). Alcohol Use and Human Immunodeficiency Virus (HIV) Infection: Current Knowledge, Implications, and Future Directions. *Alcoholism: Clinical and Experimental Research*. <https://doi.org/10.1111/acer.13204>
- Williams, E. C., Johnson, M. L., Lapham, G. T., Caldeiro, R. M., Chew, L., Fletcher, G. S., ... Bradley, K. A. (2011). Strategies to implement alcohol screening and brief intervention in primary care settings: A structured literature review. *Psychology of Addictive Behaviors*, 25(2), 206–214. <https://doi.org/10.1037/a0022102>
- Williams, E. C., Joo, Y. S., Lipira, L., & Glass, J. E. (2016). Psychosocial stressors and alcohol use, severity, and treatment receipt across human immunodeficiency virus (HIV) status in a nationally representative sample of US residents. *Substance Abuse*, 1–9. <https://doi.org/10.1080/08897077.2016.1268238>
- Williams, E. C., Lapham, G. T., Hawkins, E. J., Rubinsky, A. D., Morales, L. S., Young, B. A., & Bradley, K. A. (2012). Variation in Documented Care for Unhealthy Alcohol Consumption Across Race/Ethnicity in the Department of Veterans Affairs Healthcare System. *Alcoholism: Clinical and Experimental Research*, 36(9), 1614–1622. <https://doi.org/10.1111/j.1530-0277.2012.01761.x>
- Williams, E. C., Lapham, G. T., Shortreed, S. M., Rubinsky, A. D., Bobb, J. F., Bensley, K. M., ... Bradley, K. A. (2017). Among patients with unhealthy alcohol use, those with HIV are less likely than those without to receive evidence-based alcohol-related care: A national VA study. *Drug and Alcohol Dependence*, 174, 113–120. <https://doi.org/10.1016/j.drugalcdep.2017.01.018>
- Williams, E. C., McFarland, L. V., & Nelson, K. M. (2012). Alcohol consumption among urban, suburban, and rural Veterans Affairs outpatients. *The Journal of Rural Health : Official Journal of the American Rural Health Association and the National Rural Health Care Association*, 28(2), 202–210. <https://doi.org/10.1111/j.1748-0361.2011.00389.x>
- Williams, E. C., Rubinsky, A. D., Chavez, L. J., Lapham, G. T., Rittmueller, S. E., Achtmeyer, C. E., & Bradley, K. A. (2014). An early evaluation of implementation of brief intervention for unhealthy alcohol use in the US Veterans Health Administration: Early evaluation of VA's brief intervention. *Addiction*, 109(9), 1472–1481. <https://doi.org/10.1111/add.12600>
- Williams, R. (2012). Using the margins command to estimate and interpret adjusted predictions and marginal effects. *Stata Journal*, 12(2), 308.
- Witbrodt, J., Mulia, N., Zemore, S. E., & Kerr, W. C. (2014). Racial/Ethnic Disparities in Alcohol-Related Problems: Differences by Gender and Level of Heavy Drinking. *Alcoholism: Clinical and Experimental Research*, 38(6), 1662–1670. <https://doi.org/10.1111/acer.12398>
- Woolf, S. E., & Maisto, S. A. (2009). Alcohol Use and Risk of HIV infection among Men Who Have Sex with Men. *AIDS and Behavior*, 13(4), 757–782. <https://doi.org/10.1007/s10461-007-9354-0>

- Wroth, T. H., & Pathman, D. E. (2006). Primary medication adherence in a rural population: the role of the patient-physician relationship and satisfaction with care. *Journal of the American Board of Family Medicine: JABFM*, 19(5), 478–486.
- WWAMI Rural Health Research Center. (n.d.). Rural Urban Commuting Area Codes Data. Retrieved April 18, 2016, from <http://depts.washington.edu/uwruca/ruca-uses.php>
- Yang, C., & M Crane, H. (2016). Implementation of Computer-delivered Brief Alcohol Intervention in HIV Clinical Settings: Who Agrees to Participate? *Journal of Addiction Research & Therapy*, 07(02). <https://doi.org/10.4172/2155-6105.1000276>
- Zapolski, T. C. B., Pedersen, S. L., McCarthy, D. M., & Smith, G. T. (2014). Less drinking, yet more problems: Understanding African American drinking and related problems. *Psychological Bulletin*, 140(1), 188–223. <https://doi.org/10.1037/a0032113>
- Zemore, S. E. (2007). Acculturation and alcohol among Latino adults in the United States: a comprehensive review. *Alcoholism, Clinical and Experimental Research*, 31(12), 1968–1990. <https://doi.org/10.1111/j.1530-0277.2007.00532.x>
- Zemore, S. E., Murphy, R. D., Mulia, N., Gilbert, P. A., Martinez, P., Bond, J., & Polcin, D. L. (2014). A Moderating Role for Gender in Racial/Ethnic Disparities in Alcohol Services Utilization: Results from the 2000 to 2010 National Alcohol Surveys. *Alcoholism: Clinical and Experimental Research*, 38(8), 2286–2296. <https://doi.org/10.1111/acer.12500>
- Zemore, S. E., Ye, Y., Mulia, N., Martinez, P., Jones-Webb, R., & Karriker-Jaffe, K. (2016). Poor, persecuted, young, and alone: Toward explaining the elevated risk of alcohol problems among Black and Latino men who drink. *Drug and Alcohol Dependence*. <https://doi.org/10.1016/j.drugalcdep.2016.03.008>
- Zou, G. (2004). A Modified Poisson Regression Approach to Prospective Studies with Binary Data. *American Journal of Epidemiology*, 159(7), 702–706. <https://doi.org/10.1093/aje/kwh090>
- Zukoski, A. P., & Thorburn, S. (2009). Experiences of stigma and discrimination among adults living with HIV in a low HIV-prevalence context: a qualitative analysis. *AIDS Patient Care and STDs*, 23(4), 267–276. <https://doi.org/10.1089/apc.2008.0168>

VITA

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