IN-HOSPITAL MORTALITY, LENGTH OF STAY, AND DISCHARGE DISPOSITION IN A COHORT OF RURAL AND URBAN AMERICAN INDIANS AND ALASKA NATIVES

John M. Clements, PhD, and Stephanie J. Rhynard, MD

Abstract: This study uses data from the 2012 National Inpatient Sample to determine if mortality, length of stay, and discharge disposition are different between rural and urban American Indians and Alaska Natives (AI/ANs) with alcohol abuse, depression, diabetes, and post-traumatic stress disorder. Results show no difference in mortality between groups. Alcohol abuse, depression, and diabetes are less prevalent in rural AI/ANs, and rural patients have shorter lengths of stay and fewer chronic conditions, diagnoses, and procedures. Finally, urban patients are discharged to short-term hospitals or skilled nursing facilities at higher rates. Rural diabetes patients exhibit increased mortality, but there is little evidence that rurality adversely affects the AI/AN population for the conditions we studied.

INTRODUCTION

The American Indian and Alaska Native (AI/AN) populations in the United States face significant health disparities that impact their life expectancy (Henderson & Carson, 2014; Castor et al., 2006; Nelson, 2013; Rieckmann et al., 2012; Indian Health Service, 2014). The presence of disparities related to alcohol addiction, drug use, and chronic diseases like diabetes is well established, but concrete explanations for the differences remain elusive. One factor in AI/AN health care that is under examined is the role of place (rural versus urban) in health outcomes. Further explanations for the differences in AI/AN health outcomes may come from examining the role of rurality in their morbidity and mortality.

There is very little current research describing health outcomes in rural versus urban AI/AN populations. The gap in all-cause mortality between rural and urban populations increased from 1969-2009 and is largely attributed to greater reduction in mortality in metropolitan areas compared to rural areas (Singh & Siahpush, 2014). Mortality rates increase with increasing levels of rurality for both the population as a whole, and also for non-Hispanic whites, blacks, and AI/AN

racial subgroups (Singh & Siahpush, 2014). However, there is a lack of information that compares outcomes for specific diseases or conditions between rural and urban areas.

Alcoholism, diabetes, and mental health issues particularly affect the AI/AN population as a whole. AI/AN rates of current alcohol use in youths aged 12-17 fell from 20.5 percent in 2006 to 9.3 percent in 2013. Current AI/AN rates of alcohol use in anyone ages 12 and over remained steady at 37.2 percent in 2007 to 37.3 percent in 2013 (Substance Abuse and Mental Health Services Administration [SAMHSA], 2007; 2014). Overall, recent AI/AN alcohol use rates in adults may be trending down, with overall heavy drinking decreasing from 6.9 in 2006 to 6.3 percent in 2013, and binge drinking coming down to 23.5 percent in 2013 from 31.0 percent in 2006 (SAMHSA 2007; 2014). While current data indicates that people in metropolitan areas are more likely to be current users of alcohol, and be binge drinkers, the data does not provide a geographical breakdown of AI/AN rates (SAMHSA, 2014). However, despite these trends, the AI/AN population suffers a rate of alcohol-attributable death 3.3 times higher than whites in the same geographical region (Landen, Roeber, Naimi, Nielsen, & Sewell, 2014).

The prevalence of diagnosed diabetes by race is highest in AI/ANs at 15.9% as compared to 7.6% of non-Hispanic whites (American Diabetes Association, n.d.). Additionally, the AI/AN population suffers from a 2.5 to 3.5 times higher rate of death caused by diabetes (Cho et al., 2014). The all-cause diabetes-related mortality rate in noncore (rural) areas of the United States is approximately 34.2 per 100,000 population and ranges from 20.5 to 30.7 in more urbanized areas (Callaghan, Towne, Bolin, & Ferdinand, 2017). Unfortunately, there is limited data regarding outcomes for AI/AN people with diabetes based on geographic region.

Finally, between 2009-2010, AI/ANs experienced serious psychological distress 1.5 times more than whites (USDHHS, 2012). The AI/AN population also has 1.5 times greater odds of suffering from major depressive disorder when compared to whites, and PTSD has been described as one of the most serious mental health problems faced by the AI/AN population (Basset, Buchwald, & Manson, 2014; Hasin, Goodwin, Stinson, & Grant, 2005). While specific data on mortality related to PTSD in this population is unavailable, Bassett, Buchwald, and Manson (2014) suggest that AI/AN groups experience a greater burden of PTSD and related symptoms than their white counterparts.

The ongoing disparities in health conditions experienced by the AI/AN population warrant further investigation. The specific objective of this study is to examine differences in length of stay (LOS), discharge disposition (e.g., home, short-term care, skilled nursing, etc.), and mortality

related to alcohol abuse, depression, diabetes (both uncomplicated and complicated), and PTSD in the AI/AN population when they receive health care in urban settings compared to rural settings. We first hypothesize that 1) LOS, discharge disposition, and mortality are different between rural and urban AI/AN populations. Second, we further hypothesize that the prevalence of diagnoses included in discharge records for 2a) alcohol abuse, 2b) depression, 2c) uncomplicated diabetes, 2d) complicated diabetes, and 2e) PTSD will differ between rural and urban settings. Finally, we hypothesize that LOS, discharge disposition, and mortality will differ between urban and rural AI/AN populations in subsamples of subjects with diagnoses of 3a) alcohol abuse, 3b) depression, 3c) uncomplicated diabetes, 3d) complicated diabetes, and 3e) PTSD.

METHODS

We use discharge data from the National Inpatient Sample (NIS), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality (2012). The 2012 NIS includes a sample of discharges from HCUP-participating hospitals. As such, the data does not represent individual patients, but instead represents discrete hospital stays. The NIS for each year is comprised of four files: Inpatient Core, Hospital Weights, Disease Severity Measures, and Diagnosis and Procedure Groups. We use the Inpatient Core, Hospital Weights, and Disease Severity Measures files to create our sample.

The Inpatient Core file provides the following variables: age, sex, race (to filter our subsample of Native Americans, which is how they are described and coded in the database), location of patient's residence, length of stay, disposition (where the patient went upon discharge), and death. In the NIS, the location of patient's residence was coded as 1 = "Central" counties of metropolitan areas of > = 1 million population, 2 = "Fringe" counties of metropolitan areas of > = 1 million population, 3 = Counties in metro areas of 250,000-999,999 population, 4 = Counties in metropolitan areas of 50,000-249,999 population, 5 = Micropolitan counties, and 6 = Not metropolitan or micropolitan counties. We recoded this variable reflecting the advice from Ingram and Franco (2012) to reflect urban (codes 1-4) and rural (codes 5-6). A unique identifier (KEY_NIS) provides a link between the Inpatient Core file, the Hospital Weights, and Disease Severity Measures files.

From the Disease Severity Measures we linked information from the Core file to chronic conditions including alcohol abuse, depression, and diabetes (uncomplicated and with chronic

complications). PTSD is not included as a chronic condition in the Disease Severity Measures, but ICD-9 diagnosis codes related to each stay are included in the Core file. Filtering by diagnosis code allowed us to create a subsample of stays with PTSD as a diagnosis code. Finally, the Hospital Weights file provided the location of the hospital (coded as rural, urban teaching, and urban non-teaching). For comparison of groups, we used the hospital location variable and the patient location variable to create two groups: rural patient/rural hospital (hereafter referred to as rural), and urban patient/urban hospital (referred to as urban). Because we are interested in comparing groups of subjects that are representative of rural and urban areas, we only considered subjects who were likely to obtain treatment near where they lived. Thus, we exclude the group of rural patients cared for in urban hospitals, and a much smaller group of urban patients cared for in rural hospitals. However, we do know from the data that people sought care in locations that were not close to their homes, but still matched the rural or urban residence designation (e.g., rural residents who seek care in an urban hospital). Because we were only interested in situations where patient residence matched hospital location, and because we did not want to bias our analyses with patients who were likely sicker than the two original groups, we did not consider cases where rural patients sought care in urban hospitals. For those interested, we include a supplemental table as an online appendix that includes our original two group comparisons with the addition of this rural patient/urban hospital group.

Table 1 describes the variables we include in our study for the entire group of AI/ANs and comparisons of the rural and urban subgroups. Table A1 (see Appendix) includes comparisons of the rural and urban subgroups based on subjects with alcohol abuse, depression, uncomplicated and complicated diabetes, and PTSD diagnoses.

To determine differences between rural and urban groups, we conducted independent group *t*-tests on age at admission, LOS, and numbers of chronic conditions, diagnoses, and procedures on the discharge record. In addition, we conducted a *z*-test of proportions on the female sex, discharge disposition, and death variables. We used an alpha value of 0.05 to test for statistical significance of differences between groups. We conducted statistical analyses using discharge weights and techniques described by HCUP (Houchens, Ross, & Elixhauser, 2015). As such, all samples sizes and results reflect weighting procedures.

RESULTS

Table 1 shows the demographic information for the total sample of AI/ANs (n = 251,130) used in this study. As a reminder, "rural" refers to rural patients in rural hospitals, and "urban" refers to urban patients in urban hospitals. Patients represented by this discharge data are about 42 years old, majority female, and have approximately 3.8 chronic conditions. Length of stay is about 3.8 days in the hospital, and the overwhelming majority (78.4%) are discharged home with no additional care. The prevalence of the five conditions examined in this study range from 1.0% (PTSD) to 17.7% (uncomplicated diabetes).

Table 1
Sample Statistics and Rural/Urban Location Comparisons

	Total Sample	Rural	Urban
Sample size	251,130	50,005	154,035
Patient Demographics			
Age at Admission (SD)	42.2 (26.6)	42.0 (26.4)	42.3 (26.6)*
% Female Sex	59.3	61.6	60.4*
Chronic Conditions, # (SD)	3.8 (3.5)	3.3 (3.3)	3.8 (3.6)*
Diagnoses, # (SD)	8.6 (5.6)	7.7 (5.5)	8.7 (5.9)*
Procedures, # (SD)	1.6 (2.1)	1.0 (1.4)	1.6 (2.1)*
Dependent Variables			
Length of Stay, days (SD)	4.3 (6.8)	3.5 (5.5)	4.3 (6.7)*
Died in Hospital (%)	1.7	1.7	1.7
% Discharged to:			
Home	78.4	78.9	78.4*
Short-term Hospital	2.3	2.1	2.3*
Skilled Nursing/Long-term Care	9.2	9.0	9.2
Home Health	7.3	7.1	7.3
Against Medical Advice	1.1	1.2	1.1
% with Comorbid Conditions			
Alcohol Abuse	8.1	6.1	7.7*
Depression	8.2	7.9	8.3*
Diabetes, Uncomplicated	17.7	17.9	17.0*
Diabetes, chronic complications	5.5	4	5.5*
PTSD	1.0	1.0	1.0

* statistically significant difference between rural and urban group at P<.05

Turning to the results of our statistical tests, we first hypothesized that LOS, discharge disposition, and mortality are different between rural and urban AI/AN populations. The results in Table 1 provide partial support for this hypothesis. First, LOS is significantly lower in rural versus

urban locations (3.5 days vs. 4.3 days). There is no difference in mortality rate between rural and urban locations. Finally, more rural patients go home after discharge (78.9% vs. 78.4%), and fewer rural patients are discharged to short-term hospitals than are urban patients (2.1% vs. 2.3%). Other results indicate that rural patients are younger and have fewer chronic conditions, diagnoses, and procedures on their discharge records than do urban patients. Female patients make up a larger proportion of rural patients than urban patients do.

We further hypothesized that the prevalence of 2a) alcohol abuse, 2b) depression, 2c) uncomplicated diabetes, 2d) complicated diabetes, and 2e) PTSD will differ between rural and urban settings. Results in Table 1 provide partial support for this hypothesis. In fact, the rates of alcohol abuse (6.1% vs. 7.7%), depression (7.9% vs. 8.3%), and diabetes with complications (4.4% vs. 5.5%) are significantly lower in rural versus urban subjects, while the rate of uncomplicated diabetes (17.9% vs. 17.0%) is significantly higher in rural versus urban subjects. There is no difference in the rate of PTSD.

Finally, we tested to determine if LOS, discharge disposition, and mortality differ between urban and rural AI/AN populations in subsamples of subjects with diagnoses of 3a) alcohol abuse, 3b) depression, 3c) uncomplicated diabetes, 3d) complicated diabetes, and 3e) PTSD. Table A1 (see Appendix) provides partial support for this hypothesis across all five comorbid conditions of interest.

Regarding alcohol abuse, rural subjects had a shorter LOS than urban subjects (4.1 days vs. 5.2 days). A larger percentage of urban subjects with an alcohol abuse diagnosis left the hospital against medical advice (1.4% vs. 0.5%). There was no difference in mortality rate between rural and urban groups. Finally, fewer rural patients with an alcohol abuse diagnosis were female, and rural subjects had a fewer chronic conditions, diagnoses, and procedures during the hospital stay.

In the subgroup with depression, again, rural patients had a shorter LOS than urban subjects (4.2 days vs. 4.8 days). Fewer depressed rural patients were discharged to short-term hospitals (1.8% vs. 2.6%) than urban patients were. Again, there was no difference in mortality rate between rural and urban depression groups. Rural subjects with a depression diagnosis also had fewer chronic conditions, diagnoses, and procedures during the hospital stay.

There was no difference in LOS for subjects with uncomplicated diabetes based on urban and rural location. However, a larger proportion of rural subjects with uncomplicated diabetes died in the hospital than did urban subjects (2.1% vs. 1.7%). In addition, a smaller proportion of rural patients with uncomplicated diabetes was discharged to skilled nursing facilities than urban

patients (8.7% vs. 9.4%), perhaps indicating that the more complicated cases are discharged from urban hospitals due to the availability of step-down care facilities in these areas. Greater numbers of depressed rural patients were female (59.5% vs. 55.5%). Finally, rural subjects with an uncomplicated diabetes diagnosis had fewer chronic conditions, diagnoses, and procedures during the hospital stay.

Rural subjects with diabetes with complications had a shorter LOS (5.3 days vs. 6.2 days) in the hospital and were more likely to be discharged home (80.2% vs. 76.2%), compared to urban subjects. Rural subjects were less likely to be discharged to short-term hospitals (1.3% vs. 2.9%) or skilled nursing facilities (8.0% vs. 10.1%), compared to urban patients. As observed for uncomplicated diabetes discharges, a larger proportion of rural subjects diagnosed with diabetes with complications died in the hospital than did urban subjects (2.3% vs. 1.6%). Again, it is possible that more complicated cases in urban locations are discharged to other facilities because of the availability of short-term and long-term care in these locations. While there is no difference in the proportion of female patients, rural patients with complicated diabetes were younger and had fewer chronic conditions, diagnoses, and procedures during the hospital stay than urban patients.

Finally, regarding the PTSD subgroup, rural subjects had a shorter LOS (3.4 days vs. 3.8 days) and were less likely to die during hospitalization (0.0% vs. 1.3%). Fewer PTSD rural patients were discharged home (77.7% vs. 82.5%) than urban patients, but a greater number of rural patients were discharged to home health care (professional care in the home; 7.8% vs. 3.5%) and left the hospital against medical advice (4.9% vs. 1.6%). Finally, there was no difference in the proportion of female patients with PTSD in urban and rural locations, but rural patients were older and had fewer chronic conditions, diagnoses, and procedures during the hospital stay than urban patients.

DISCUSSION

The 2012 NIS provided the ability to study a representative subsample of inpatient hospital discharges of an AI/AN population to examine differences in rural and urban prevalence, length of stay, discharge disposition, and mortality. There was no difference in in-hospital mortality for the entire sample between urban and rural AI/AN groups, in contrast to findings from Singh and Siahpush (2014). In addition, from the entire sample, fewer urban patients were discharged home,

while more urban patients were discharged to short-term hospitals. This is likely due to the increased need to free up hospital beds in urban hospitals combined with the fact that there is greater availability of short-term step down units in urban locations that can more readily accept patient transfers. Finally, for the entire sample, rural patients stayed in the hospital almost one day less (0.8 days) than urban patients, possibly because urban patients were sicker upon admission. In fact, urban patients had more chronic conditions documented in the discharge record than rural patients, perhaps because they were sicker, but also perhaps because of differences in social support mechanisms that influence their health.

When specific diagnoses known to disproportionately impact the AI/AN groups are analyzed some interesting trends result. The fact that there is a statistically significant difference in prevalence across four of the five health conditions we studied between rural and urban suggests a role for psychosocial factors in the health of this population. We argue that an urban AI/AN population that has been displaced from its natural psychosocial setting causes undo stress to a population resulting in disparities in prevalence and outcomes of some health conditions.

Alcohol abuse, depression, and complicated diabetes are documented on records of AI/AN urban hospital discharges more often than AI/AN rural hospital discharges. The rural population may have less access to regular health care and screenings, including health care education about diabetes and substance use or abuse. However, it is entirely possible that for these conditions, a rural setting in closer proximity to historical, cultural, and social support systems may advantage rural AI/AN residents in terms of prevalence of these conditions.

Regarding mortality for the five health conditions we studied, rural AI/ANs died in the hospital at greater rates than did urban AI/ANs for both complicated and uncomplicated diabetes. However, urban AI/ANs were discharged to short-term hospitals and skilled nursing facilities at higher rates than rural AI/ANs for both conditions. In the NIS, mortality is only noted if death occurred in the hospital. The observation that urban patients are transferred out of the hospital at higher rates limits our ability to make conclusions about after hospital mortality. In fact, 30-day mortality is a common outcome measure in many studies that include mortality as an outcome. It is possible that if we were able to consider 30-day mortality, we may encounter equal rates or increased rates in the urban population as they have increased number of chronic conditions, diagnoses, and procedures, perhaps indicating a sicker population who might be more prone to 30-day mortality. Finally, PTSD is documented as diagnosis in urban patients and rural patients at the same rate, but urban patients die at greater rates. Perhaps this speaks to a lack of social and cultural

support mechanisms that may be more prevalent in AI/AN rural communities.

One consistent pattern that emerges from our analysis is that for all five conditions, urban patients have a longer LOS and greater numbers of chronic conditions, diagnoses, and procedures on the discharge record when compared to rural patients. It is worth noting these patients live in urban areas and seek care at urban hospitals as opposed to rural patients seeking care in rural hospitals. There is no reason to think that urban patients would be sicker than rural patients, especially given the finding that the mortality gap has increased between these groups, largely because of the declining mortality rate in urban areas (Singh & Siahpush, 2014). However, for our selected diseases, urban patients present with more chronic conditions and tend to stay longer in the hospital.

Limitations

When considering these patterns and findings, it is important to mention some limitations of this study. The major limitation is that when working with such a large sample size, as we were for many of the analyses, it becomes easy to demonstrate statically significant differences when only minute ones exist. An additional assumption of the study is that patients were seeking care in an area that represents the area in which they live (i.e., a patient from an urban area is assumed to be getting health care in an urban environment). We controlled for this by only including discharges where rural and urban patient residence and hospital location matched. It is entirely possible that people sought care in locations that were not close to their homes, but still matched the rural or urban residence designation, but may have removed them from their social and cultural support system. In addition, because we were only interested in situations where patient residence matched hospital location, and because we did not want to bias our analyses with patients who were likely sicker than the two original groups, we did not consider cases where rural patients sought care in urban hospitals. However, we include a supplemental table as an online appendix that include our original two group comparisons with the addition of this rural patient/urban hospital group. We did not include a much smaller group of urban patients seeking care in rural hospitals in our original analyses, nor in our supplemental table, because HCUP data use agreements prevent researchers from reporting analyses where the cells of any table include a count of less than 10, as was the case with many variables for the group of urban patients in rural hospitals.

CONCLUSION

AI/AN populations face many health disparities, and the goal of this study was to determine if rural versus urban settings contribute to these differences. We found that between rural and urban groups as a whole there were no differences in overall mortality in the hospital, but that rural patients had shorter LOS and there were minimal differences in discharge disposition. However, rural patients had lower rates of alcohol abuse, depression, and diabetes with chronic complications. In addition, rural patients with diabetes died in the hospital more often than urban patients, perhaps due to urban patients being discharged at higher rates to step-down facilities in urban areas. However, rural patients with PTSD died at lower rates than urban patients. The findings regarding chronic conditions, diagnoses, procedures, and LOS across all five conditions we studied, along with the observation that many of these conditions are more prevalent in urban areas, suggests that urban living may adversely affect AI/AN populations with these health conditions. This research only focused on five health conditions prevalent in the AI/AN community. Additional research could consider a wider range of conditions that influence rural versus urban health outcomes. These results may provide information to the public health infrastructure to help identify strategies to address different health concerns in urban and rural areas.

REFERENCES

Basset, D., Buchwald, D., & Manson, S. (2014). Posttraumatic stress disorder and symptoms among American Indians and Alaska Natives: A review of the literature. *Social Psychiatry and Psychiatric Epidemiology*, *49*(3), 417-433. http://dx.doi.org/10.1007/s00127-013-0759-y

Callaghan, T. H., Towne, S. D., Bolin, J., & Ferdinand, A. O. (2017). *Diabetes mortality in rural America: 1999-2015.* Policy Brief. Southwest Rural Health Research Center. Retrieved from https://srhrc.tamhsc.edu/docs/srhrc-pb2-callaghan-diabetes.pdf

Castor, M. L., Smyser, M. S., Taualii, M. M., Park, A. N., Lawson, S. A., & Forquera, R. A. (2006). A nationwide population-based study identifying health disparities between American Indians/Alaska Native and the general populations living in select urban counties. *American Journal of Public Health*, *96*(8), 1478-1484. http://dx.doi.org/10.2105/AJPH.2004.053942

Cho, P., Giess, L. S., Burrows, N. R., Roberts, D. L., Bullock, A. K., & Toedt, M. E. (2014). Diabetes-related mortality among American Indians and Alaska Natives, 1990-2009. *American Journal of Public Health*, *104*(Suppl 3), S496-503. http://dx.doi.org/10.2105/AJPH.2014.301968

Hasin, D., Goodwin, R., Stinson, F., & Grant, B. (2005). Epidemiology of major depressive disorder results from the national epidemiologic survey on alcoholism and related conditions. *Archives of General Psychiatry, 62*(10), 1097-1106. http://dx.doi.org/10.1001/archpsyc.62.10.1097

Henderson J. N., & Carson L. D. (2014). American Indian Diabetes Prevention Center: Challenges of a health equity quest. *Care Management Journals, 15*(4), 196-204. http://dx.doi.org/10.1891/1521-0987.15.4.196

Houchens, R., Ross, D., & Elixhauser, A. (2015). *Final Report on Calculating National Inpatient Sample (NIS) Variances for Data Years 2012 and Later* (HCUP Methods Series Report No. 2015-09). Retrieved from http://www.hcup-us.ahrq.gov/reports/methods/methods.jsp

Indian Health Service. (2014). *Trends in Indian health. 2014 ed*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Indian Health Service, Office of Planning, Evaluation and Legislation, Division of Program Statistics. Retrieved from https://www.ihs.gov/dps/includes/themes/newihstheme/display_objects/documents/Trends2014Book508.pdf

Ingram, D. D., & Franco, S. J. (2012). NCHS urban-rural classification scheme for counties. *Vital Health Statistics, 2*(154), 1-72. Retrieved from https://www.cdc.gov/nchs/data/series/sr_02/sr02_154.pdf

Landen, M., Roeber, J., Naimi, T., Nielsen, L., & Sewell, M. (2014). Alcohol-attributable mortality among American Indians and Alaska Natives in the United States 1999-2009. *American Journal of Public Health, 104*(S3), S343-349. http://dx.doi.org/10.2105/AJPH.2013.301648

National Inpatient Sample [NIS]. (2012). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality.

Nelson, M. (2013). Health ownership in American Indigenous communities. *Rural Remote Health, 13*(2), 2302. Retrieved from www.rrh.org.au/journal/article/2302

Rieckmann T., McCarty D., Kovas A., Spicer P., Bray J., Gilbert S., & Mercer J. (2012). American Indians with substance use disorders: Treatment needs and comorbid conditions. *The American Journal of Drug and Alcohol Abuse, 38*(5), 498-504. http://dx.doi.org/10.3109/00952990.2012.694530

Singh, G. K., & Siahpush, M. (2014). Widening rural-urban disparities in all-cause mortality and mortality from major causes of death in the USA, 1969-2009. *Journal Urban Health, 91*(2), 272-292. http://dx.doi.org/10.1007/s11524-013-9847-2

American Diabetes Association. (n.d.). *Statistics about diabetes*. Retrieved from http://www.diabetes.org/diabetes-basics/statistics/

Substance Abuse and Mental Health Services Administration [SAMHSA]. (2007). *Results from the 2006 National Survey on Drug Use and Health: National findings*. Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. Retrieved from https://files.eric.ed.gov/fulltext/ED498206.pdf

Substance Abuse and Mental Health Services Administration [SAMHSA]. (2014). *Results from the 2013 National Survey on Drug Use and Health: National findings*. Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. Retrieved from https://www.samhsa.gov/data/sites/default/files/NSDUHresultsPDFWHTML2013/Web/NSDUHresults2013.pdf

U.S. Department of Health and Human Services [USDHHS]. (2012). *Health, United States, 2011: With Special Feature on Socioeconomic Status and Health*. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, National Center for Health Statistics. Retrieved from http://www.cdc.gov/nchs/data/hus/hus11.pdf

AUTHOR INFORMATION

Dr. John M. Clements is an assistant professor in the College of Medicine at Central Michigan University in Mt. Pleasant, MI.

Dr. Stephanie J. Rhynard conducted this work as a 4th year medical student at the College of Medicine at Central Michigan University and is currently a resident physician in the Department of Physical Medicine and Rehabilitation at Beaumont Hospital in Royal Oak, MI.

Appendix A. Differences in Outcomes Table

Table A1
Rural and Urban Differences in Outcomes for Selected Conditions

	Alcohol Abuse		Depression		Uncomplicated Diabetes		Diabetes w/Complications		PTSD	
	Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**
Sample size	3040	11835	3945	12800	8965	26245	1990	8405	515	1575
Patient Demographics										
Age at Admission (SD)	41.7 (28.0)	40.9 (27.8)	41.7 (27.6)	41.2 (27.5)	42.5 (27.4)	42.4 (26.8)	41.7 (26.1)	43.1 (27.1)*	43.2 (15.9)	40.4 (16.3)*
% Female Sex	35.2	37.1*	65.3	66.9	59.5	55.5*	55.5	53.3	65.0	61.9
Chronic Conditions, # (SD)	5.3 (2.9)	5.8 (3.0)*	6.6 (3.0)	7.0 (3.2)*	6.1 (2.8)	6.8 (2.8)	8.3 (3.3)	9.0 (3.0)*	3.4 (3.4)	4.1 (3.7)*
Diagnoses, # (SD)	10.5 (5.2)	12.1 (5.6)*	12.5 (5.5)	13.1 (5.8)*	11.4 (5.2)	12.5 (5.2)	15.2 (5.9)	16.5 (5.3)*	7.5 (5.7)	8.9 (6.3)*
Procedures, # (SD)	0.92 (1.7)	1.6 (2.2)*	0.91 (1.5)	1.5 (2.0)*	0.94 (1.6)	1.7 (2.3)	1.3 (2.1)	2.1 (2.5)*	0.81 (1.2)	1.5 (2.1)*
Dependent Variables										
Length of Stay, days (SD)	4.1 (5.3)	5.2 (6.5)*	4.2 (4.5)	4.8 (5.8)*	4.1 (5.1)	4.8 (5.4)	5.3 (6.1)	6.2 (6.3)*	3.4 (3.1)	3.8 (3.8)*
% Died In Hospital	2.1	1.8	1.8	1.7	2.1	1.7*	2.3	1.6*	0.0	1.3*
% Discharged to:										
Home	78.5	76.8	78.1	77.2	79.1	78.5	80.2	76.2*	77.7	82.5*
Short-term Hospital	2.5	2.6	1.8	2.6*	2.5	2.1	1.3	2.9*	1.9	1.6
Skilled Nursing/LTC	9.2	9.5	9.6	9.5	8.7	9.4*	8.0	10.1*	7.8	9.5
Home Health	7.2	7.9	7.6	7.9	6.7	6.9	7.3	8.2	7.8	3.5*
Against Medical Advice	0.5	1.4*	1.1	1.1	0.9	1.4*	1.0	1.0	4.9	1.6*

* statistically significant difference between rural patient/rural hospital group and urban patient/urban hospital group at P<.05

Appendix B. Online Appendix Screenshot (downloadable appendix available at http://dx.doi.org/10.5820/aian.2503.2018.78)

Supplemental Table: Rural and Urban Differences in Outcomes for Selected Conditions among three Rural/Urban Patient and Hospital Group:

	Alcohol Abuse			Depression			Uncomplicated Diabetes			Diabetes w/Complications			Post Traumatic Stress Disorder		
	Rural Pt Rural Hosp	Urban Pt Urban Hosp	Rural Pt Urban Hosp	Rural Pt Rural Hosp	Urban Pt Urban Hosp	Rural Pt Urban Hosp	Rural Pt Rural Hosp	Urban Pt Urban Hosp	Rural Pt Urban Hosp	Rural Pt Rural Hosp	Urban Pt Urban Hosp	Rural Pt Urban Hosp	Rural Pt Rural Hosp	Urban Pt Urban Hosp	Rural Pt Urban Hosp
Sample size	3040	11835	5315	3945	12800	3495	8965	26245	8540	1990	8405	3345	515	1575	345
Patient Demographics															
Age at Admission (SD)	41.7 (28.0)	40.9 (27.8)	42.0 (28.2)#	41.7 (27.6)	41.2 (27.5)	39.3 (27.9)#	42.5 (27.4)^	42.4 (26.8)	41.6 (27.1)	41.7 (26.1)~	43.1 (27.1)	44.3 (27.3)	43.2 (15.9)*	40.4 (16.3)	41.2 (15.8)
% Female Sex	35.2	37.1	31.0*	65.3	66.9	63.8*	59.5	55.5	51.8$	55.5	53.3	46.2#	65.0	61.9	60.9
Chronic Conditions, # (SD)	5.3 (2.9)	5.8 (3.0)	5.6 (2.9)$	6.6 (3.0)	7.0 (3.2)	7.3 (3.2)$	6.1 (2.8)	6.8 (2.8)	6.8 (2.8)$	8.3 (3.3)^	9.0 (3.0)	9.0 (2.8)	3.4 (3.4)^	4.1 (3.7)	4.1 (3.2)
Diagnoses on record, # (SD)	10.5 (5.2)^	12.1 (5.6)	11.9 (5.9)	12.5 (5.5)	13.1 (5.8)	13.8 (6.2)$	11.4 (5.2)	12.5 (5.2)	12.8 (5.4)$	15.2 (5.9)^	16.5 (5.3)	16.7 (5.5)	7.5 (5.7)^	8.9 (6.3)	9.0 (6.0)
Procedures on record, # (SD)	0.92 (1.7)	1.6 (2.2)	2.1 (2.8)$	0.91 (1.5)	1.5 (2.0)	2.1 (2.4)$	0.94 (1.6)	1.7 (2.3)	2.5 (2.8)$	1.3 (2.1)	2.1 (2.5)	3.0 (3.0)$	0.81 (1.2)	1.5 (2.1)	2.0 (2.2)$
Dependent Variables															
Length of Stay (SD) days	4.1 (5.3)	5.2 (6.5)	5.7 (7.7)$	4.2 (4.5)	4.8 (5.8)	6.3 (9.6)$	4.1 (5.1)	4.8 (5.4)	5.3 (7.0)$	5.3 (6.1)	6.2 (6.3)	7.2 (7.6)$	3.4 (3.1)	3.8 (3.8)#	4.6 (5.1)
% Died During Hospitalization	2.1	1.8	1.6	1.8	1.7	0.6#	2.1	1.7	1.6	2.3	1.6	1.9	0.0	1.3&	0.0
Disposition - % Discharged to:															
Home	78.5	76.8	74.7#	78.1	77.2	80.0*	79.1	78.5	78.5	80.2^	76.2	75.0	77.7	82.5&	72.5
Short-term Hospital	2.5	2.6	3.9#	1.8	2.6&	1.9	2.5	2.1	2.3	1.3+	2.9	2.1	1.9	1.6	4.3*
Skilled Nursing/Long-term Care	9.2	9.5	10.4	9.6	9.5	10.3	8.7	9.4	9.3	8.0+	10.1	10.6	7.8	9.5	15.9#
Home Health	7.2	7.9	7.7	7.6	7.9	6.7	6.7	6.9	6.8	7.3	8.2	9.1	7.8+	3.5	4.3
Against Medical Advice	0.5^	1.4	1.6	1.1	1.1	0.6#	0.9+	1.4	1.3	1.0	1.0	1.2	4.9+	1.6	2.9

* statistically significant difference between rural patient/urban hospital group and urban patient/urban hospital group at p<0.05
# statistically significant difference between rural patient/urban hospital group and the other two groups at p<0.05
$ statistically significant difference among all three patient and hospital group combinations at p<0.05
^ statistically significant difference between rural patient/rural hospital group and the other two groups at p<0.05
& statistically significant difference between urban patient/urban hospital group and the other two groups at p<0.05
+ statistically significant difference between rural patient/rural hospital group and urban patient/urban hospital group at p<0.05
~ statistically significant difference between rural patient/rural hospital group and rural patient/urban hospital group at p<0.05