

Comparison of Injuries between Two Reservations with Differing Alcohol Availability.

Kelly M. Taylor, Class of 1991.

Between 1981 and 1987, an average of 3% of the population of Pine Ridge and 4% of the population of Rosebud were hospitalized each year due to injuries. Annually, an average of 28 lives on Pine Ridge and 22 lives on Rosebud are lost due to injuries. Because alcohol is a risk factor for many injuries, this study compared injury and death rates between a reservation that allows the sale of alcohol (Rosebud) and one that prohibits it (Pine Ridge).

METHODS

Injury hospitalizations for the years 1981-1987 for Pine Ridge and Rosebud Reservations were obtained from the IHS Patient Care Information System tapes, which contain data on all inpatient stays for direct and contract health hospitalizations. Mortality data was obtained from information provided to IHS by the National Center for Health Statistics. ICD-9 E-Codes were selected for five injury categories most often associated with alcohol: motor vehicle, unintentional firearm, natural and environmental factors, assault, and suicide. Medical misadventure was chosen as a control category of injury because it is not thought to be associated with alcohol.

Because of the small number of inpatient injuries and deaths due to injuries for each year in each age group, the cases were combined over a 7-year period. In the case of injury deaths, sex-specific rates only were evaluated because of the extremely small number of cases in each age group. Pine Ridge and Rosebud Reservations were chosen primarily because they are similar in many respects, including geography, per capita income, age and sex distribution, and culture. They are both in the Aberdeen Indian Health Service administrative area and are located adjacent to each other in the south west and south central portion of South Dakota. The estimated 1992 service population for Pine Ridge is 19,158 and 10,497 for Rosebud.

RESULTS

Statistically-significant differences in injury hospitalization rates between the two reservations are summarized in Table 1. The hospitalization rates were higher in Rosebud ("wet") than Pine Ridge ("dry") for medical misadventures (males), assaults and firearms injuries (females), and suicide attempts (both sexes). Suicide fatality rates were also significantly greater in Rosebud (29.9 per 100,000 per year) than Pine Ridge (14.9 per 100,000 per year). The mortality rates are, however, based on small numbers (20 fatalities on Pine Ridge, 22 on Rosebud). None of the injury categories had mortality rates that were statistically significant between the reservations.

Table 1. Age-adjusted Inpatient Injury Rates per 100,000: Rosebud vs. Pine Ridge.

Males:

INJURY CATEGORY	ROSEBUD RATE	PINE RIDGE RATE	Z STATISTIC	P-VALUE
Motor Vehicle	3490	3777	-.77	NS
Misadventure	803	388	2.64	<.01
Environmental	1426	839	2.75	NS
Suicide	2409	1000	5.10	<.0001
Assault	5864	4988	1.88	NS
Firearm	395	504	-.84	NS

Females:

INJURY CATEGORY	ROSEBUD RATE	PINE RIDGE RATE	Z STATISTIC	P-VALUE
Motor Vehicle	2114	2471	-1.19	NS
Misadventure	834	1014	.96	NS
Environmental	753	595	.97	NS
Suicide	4007	2606	3.85	<.0001
Assault	3537	2103	4.04	<.0001
Firearm	0	104	-2.60	<.01

75% of all injury victims on both the Pine Ridge and Rosebud Reservations were 15-44 years of age. Men are disproportionately represented in all injury categories except medical misadventure, adverse effects of surgical Procedure, and suicide. The greatest percentage of years of potential life lost (YPPL) before the age of 65 for Pine Ridge was due to motor vehicle (46%), homicide (14%), and suicide (11%) injuries. On Rosebud, the greatest percentage of YPLL was due to motor vehicle (36%), suicide (18%), and homicide (16%) injuries.

From 1981-1987, there were 1581 people on the Pine Ridge Reservation and 1027 people on the Rosebud Reservation hospitalized due to the six selected injury categories.

Motor vehicle injuries

61% of motor vehicle injuries requiring hospitalization were in the 15-34 year age group on both reservations. The average age at death from motor vehicle injuries was 29 years on Pine Ridge and 32 years on Rosebud. 19% of the motor vehicle deaths on Pine Ridge involved pedestrians vs. 36% on Rosebud. The average length of hospital stay was longer on Pine Ridge (5 days) than Rosebud (3 days).

Suicides and suicide attempts

59% of suicide attempts requiring hospitalization were in the 15-34 year age group on both reservations. The leading method was poisoning by solid or liquid substances. The use of analgesics, antipyretics, or rheumatics was the second most prevalent method. Half of the suicide deaths on Rosebud were due to hanging, strangulation, or suffocation, while the next most common method was by unspecified firearms (32% of all suicide deaths). Males represented 89% of these deaths. 55% of all suicide deaths on Pine Ridge used unspecified firearms, while 30% used hanging, strangulation, or suffocation. 92% of the suicide deaths on Pine Ridge were males.

Homicide/Assault injuries

80% of assaults on both reservations were in the 15-44 year age group. The average age at death for assault (homicide) victims was 30 years on Pine Ridge and 32 years on Rosebud. 47% of assaults on Pine Ridge were unarmed fights or brawls vs. 54% on Rosebud. 64% of these victims on Pine Ridge were males and 56% on Rosebud were males. Assault by cutting or piercing instruments accounted for 24% of the assaults on Pine Ridge and 14% on Rosebud. Males accounted for more than 80% of these injuries on both reservations. The majority of homicides on both reservations were the result of cutting or piercing instruments and firearms. More than 60% of all homicides were males (61% for Pine Ridge and 68% for Rosebud).

Inpatient injury rates were highest for the 15-34 year age group on both reservations.

Natural and environmental injuries

56% of the inpatient injuries on Pine Ridge and 44% on Rosebud were the result of venomous animal and plant or other animal injuries. 43% of the inpatient injuries on Rosebud and 37% on Pine Ridge were due to excessive cold, hunger, thirst, exposure, or neglect. Six out of the seven natural and environmental deaths on Rosebud (86%) were due to excessive cold, while on Pine Ridge nine out of 12 environmental deaths (75%) were cold-related.

Unintentional firearm/explosive injuries

The majority of the firearm/explosive hospitalized injuries were caused by unspecified firearm missiles on both reservations (38% on Pine Ridge and 60% on Rosebud). Over 80% of the firearm/explosive injuries were to males. 3 people on Pine Ridge and 2 on Rosebud died from this category of injury.

Medical misadventure injuries

94% of the injuries on both reservations were a result of an abnormal reaction of the patient, or complications due to surgical and medical procedures "with no mention of misadventure during the procedure". The remaining six percent were misadventures to patients during surgical and medical care.

DISCUSSION

Motor vehicle injuries

While motor vehicle injury rates were higher on Pine Ridge than Rosebud, death rates were higher for Rosebud than Pine Ridge, though neither difference was statistically significant. Of the motor vehicle deaths, those on Rosebud were 2.4 times as likely to involve pedestrians than those on Pine Ridge.

If off-reservation drinking contributes to higher motor vehicle injuries and deaths, one would expect Pine Ridge to have significantly higher rates than Rosebud, which was not the case. Though rural life and distance to medical care also play a role in motor vehicle injury and death rates, both reservations are similar in those respects. An important factor in alcohol-related motor vehicle injuries is distance to the source. On a reservation that allows the legal sale of alcohol, one would expect the distance to the source to be less than for a reservation that prohibits it. However, nearly a quarter of the residents on both reservations live only two miles from legal alcohol sources. If prohibition

contributes to higher motor vehicle injury and death rates, an association could have been obscured in this study due to confounding. Distance to alcohol source is a factor that should be controlled for in future studies.

Suicide attempts and fatalities

Females had higher hospitalization rates for suicide attempts than males; however, similar to the general US population, males had much higher suicide mortality rates than females. The majority of the suicide attempts requiring hospitalization on both reservations were poisoning by solid or liquid substances.

While the cause of suicide death was different between the two reservations, the relationship to alcohol is unknown. The two most common methods used on both reservations that resulted in death (firearm and hanging, strangulation or suffocation) were the same for the general U.S. population. The number-one method used on Pine Ridge was unspecified firearms, while on Rosebud, the most likely method was death by hanging, strangulation or suffocation. Possibly firearms are more available on Pine Ridge than Rosebud. Since suicides are strongly associated with alcohol use, it is not surprising to find the suicide injury and death rates higher on the reservation with legal alcohol sales. This is not to imply that alcohol availability alone is responsible for the increased injury and death rates. Other factors should be explored to aid in explaining this difference. The mortality rates were based on small numbers which could cause them to be volatile (Pine Ridge n=20; Rosebud n=22).

Homicide/assault injuries

The most common method of assault requiring hospitalization on both reservations was unarmed fight or brawl, with Rosebud having significantly higher rates than Pine Ridge. The most common method of homicide on both reservations was assault by cutting or piercing instruments, followed closely by assault with unspecified firearms. Rosebud had significantly higher mortality rates than did Pine Ridge; however, the rates were based on small numbers which could cause them to be volatile (Pine Ridge n=28; Rosebud n=25).

While males accounted for the majority of hospitalizations, a greater percentage of females were hospitalized on Rosebud (39%) than were hospitalized on Pine Ridge (30%). Since many assaults occur at the place of drinking, it would be helpful to fully explore the place of occurrence. Since 88% of the assault injury records on Pine Ridge and 84% on Rosebud did not specify where the injury occurred, this was not possible. When place of injury was listed, females represented the majority of the victims. This may indicate that domestic violence against women was more likely to be documented than other forms of assaults. None of the homicide records listed place of occurrence.

Natural and environmental injuries

More hospitalizations caused by exposure or excessive cold due to weather conditions occurred on Rosebud than on Pine Ridge. However, a greater percentage of hospitalizations due to neglect of children or helpless individuals occurred on Pine Ridge. The majority of deaths on both reservations were found to be caused by excessive cold (no source specified) or exposure due to weather conditions. Because of the small number of deaths from all categories of natural and environmental injuries (12 on Pine Ridge and seven on Rosebud), comparison is unreliable. Small numbers of hospitalized injury cases (n=114 Pine Ridge; n=90 Rosebud) make comparisons between specific environmental injury categories unreliable.

Although age adjusted injury rates were significantly higher for Rosebud than for Pine Ridge, the broad category of natural and environmental injuries may be misleading. This category includes injuries due to venomous and non-venomous plant and animals, and man-made and unspecified temperature extremes. These are not necessarily related to alcohol use.

Unintentional firearm/explosive injuries

Unintentional firearm or explosive injuries are not necessarily related to alcohol use. The presence of firearms in the house may, however, be a risk factor for suicide deaths. One might expect a correlation between unintentional injuries due to firearms and firearm-related suicides if this were the case, indicating increased availability of firearms. Because the difference in rates for unintentional firearm injuries was not significant between the two reservations and because there were so few firearm suicide deaths, a relationship was not evident. The small number of firearm injuries (n=47 Pine Ridge; n=15 Rosebud) precludes detailed analyses.

Medical misadventure injuries

This category of injury was originally included as a control because it normally should have no association with alcohol. This category includes both misadventure to the patient during a medical procedure and adverse reactions by the patient to a medical procedure. By far, the most common injury on both reservations was adverse reaction to a medical procedure.

Since patients were hospitalized prior to the injury in this case, day of hospital admission was not examined. Length of stay is not a meaningful analysis either, because it would rely on the type of procedure being performed. The injury and death rates were calculated based on total population data rather than total number of medical

procedures performed. While it allows for crude comparison between the two reservations, the rate is not a true measure of the risk of misadventure to patients.

Limitations

Epidemiologic studies cannot in themselves prove a causal association between exposure and outcome. Although ecologic studies have limitations, they are useful tools in generating hypotheses and describing populations.

Blood alcohol concentrations (BACs) are not routinely obtained for people with severe injuries on either Rosebud or Pine Ridge Reservations. Severe injury patients entering emergency rooms with an odor of alcohol, loss of motor control, mental confusion, or a history of alcohol abuse are most often tested for BAC. Often, patients exhibiting these symptoms are presumed to be alcohol-impaired with no further testing. The injuries most likely to receive BACs are motor vehicle fatalities or suicide attempts. In the case of Rosebud, a court order is required before a BAC is performed for motor vehicle-related injuries. This lack of quantitative data prevents accurate documentation of alcohol-related injuries.

I discovered late in the study that alcohol sales were made illegal on Rosebud for approximately 2 years during the study period. This misclassification error would bias the results toward no association if there is a relationship between alcohol availability and risk of severe injury or death. This would explain why there was no difference in motor vehicle morbidity and mortality rates between the two reservations. If alcohol availability were associated with the higher rates for suicides, environmental, and assault injuries on Rosebud, then the misclassification error would tend to decrease the difference in the rates. While this misclassification error is serious, it is still noteworthy that significant differences in environmental, suicide, and assault injuries were found. Even if alcohol availability contributed to this difference, it could not be held solely responsible.

This study did not take into consideration the illegal sale of alcohol on Pine Ridge. "Bootlegging" is known to occur and, in fact, the police are aware of many of those involved. Alcohol is not legally available on Pine Ridge. However, for those living in Pine Ridge Village (nearly 25% of the reservation population), a 2-mile drive off the reservation is all that is required to obtain alcohol legally. While Rosebud allows the legal sale of alcohol and Pine Ridge does not, the availability appears to be essentially the same on the two reservations.

Although 7 years of injury and death data were collected, the numbers involved were small. This is a common problem in studies concerning American Indian and Alaska Native populations. Collapsing related E-codes into broad categories helps in reaching statistically significant numbers, but in some instances (natural and environmental) can be misleading. Not all environmental injuries have been associated with alcohol.

Conclusions

Although the two reservations were chosen because of their similarities, it turned out they were too similar with respect to alcohol availability. Reservations with significantly different alcohol policies would be more appropriate to analyze. In this study, Pine Ridge may technically be a "dry" reservation, but the availability is similar to a reservation that allows alcohol.

With more control over confounding factors, as would be possible with an in-depth, case control study, a more definitive conclusion might be reached. Written alcohol testing policies and quantifiable blood alcohol measurements are essential in determining the extent of alcohol-related injuries. Complete external cause of injury codes should be included for all patient records involving injuries, thus allowing for risk factors to be identified and interventions to be implemented.