Motor Vehicle Crashes and Alcohol Among American Indians and Alaska Natives

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The American Indian population, made up of well over 300 tribes, now numbers more than 1.5 million or over 0.6 percent of the U.S. population. Throughout the recent past, it has been a rapidly growing population that has consistently had a birth rate twice that of the rest of the U.S. population (IHS 1988; May 1988; Broudy and May 1983). Because of this high fertility, the median age of the Indian population was 22.9 in 1980, compared to 30.3 for the overall U.S. population. The median age of the population living on reservation was 19 years in 1980 (U.S. Congress 1986). The young age composition has definite implications for the study of both motor vehicle injuries and alcohol.

Some other general considerations of the U.S. Indian population are also vital here. While Indians and Alaska Natives live in every State of the Union, most live in 32 "reservation States" (see exhibit 1), the vast majority (over 1 million) in Western States (IHS 1988). Many Indians live in rural areas (46 percent) or other urbanized settings such as small towns (32 percent), while 22 percent live in central cities. In 1980, 37 percent lived on reservations or in Indian communities. Many who live in cities or off reservations are characterized as highly mobile (U.S. Congress 1986). Average economic indicators for Indians as a group remain poor. The 1980 Census indicated unemployment rates twice the national average, and the median family income for Indians was about half the average for the entire U.S. population (U.S. Congress 1986; U.S. Bureau of Census 1984*a*, *b*). Finally, educational attainment of many Indians remains lower than the national averages (Brod and McQuiston 1983).

Overview of Accident Statistics

When reviewing accident data for Indians, one must first consider accidents as they affect the overall Indian population and then move to specific considerations of gender, age, and local and regional data. Only recently have accidents fallen to second place among causes of mortality. Accidents were the leading cause of death throughout the 1950s, 1960s, and 1970s for Indians and Alaska Natives in the 32 reservation States (IHS 1988). In 1983-85, accidents caused 3,218 deaths or 16 percent of all mortality (see table 1). Of these deaths, 1,753 or 54.5 percent were caused by motor vehicles. When measured by crude rates, accidents are the fourth leading cause of death among other U.S. residents. Motor vehicle accidents take a higher toll among Indian males than females, and this is even more true of other accidents.

Table 2 presents age-adjusted death rates that allow comparisons between Indians and other groups in the United States. When age-adjusted rates are considered, accident

Exhibit 1

Indian Health Service (IHS) reservation States numbered 24 from 1969 to 1974. Prior to that, IHS calculated rates on 50-percent samples of U.S. records. Since 1974, eight more States have been added. The current 32 states listed by administrative area and the year added for the most recent additions are:

Nashville Area:	Alabama (added in 1984), Connecticut (added in 1983), Florida, Louisiana, Maine (added in 1979), Mississippi, New York (added in 1979), North Carolina, Pennsylvania (added in 1979), Rhode Island (added in 1983).
Bemidji Area:	Michigan, Minnesota, Wisconsin
Oklahoma Area:	Oklahoma, Texas (added in 1983), Kansas
Aberdeen Area:	Iowa, Nebraska, North Dakota, South Dakota.
Billings Area:	Montana, Wyoming
Albuquerque Area:	Colorado, New Mexico
Navajo Area:	Main Navajo reservation (parts of Arizona,New Mexico and Utah)
Phoenix Area:	Arizona (most), Nevada, Utah
Tucson Area:	Southern Arizona (Papago reservation)
Portland Area:	Idaho, Oregon, Washington
Alaska Area:	Alaska

mortality becomes the third leading cause of death for all Indians and Alaska Natives. The rate of 42.2 per 100,000 for motor vehicle accidents is 2.3 times the rate for all races combined. Other accidents, which in the distant and relatively recent past have played a major role in mortality among Indians (Kunitz 1983) and particularly Alaska Natives (Boyd et al. 1968), are 2.2 times higher than U.S. averages.

The trend in accident mortality rates for Indians and Alaska Natives has been down over the years that accurate, Indian-specific rates have been kept, but the exact magnitude of this drop is difficult to determine . Many procedural changes have affected the calculation of Indian mortality rates, confusing the interpretation of trends. Some of these changes include: alterations in census enumeration methodologies for American Indians and Alaska Natives; changes in methodologies for estimating the Indian population (which was necessary to correct suspected undercounts;); debate over whether tribal enrollment or resident population figures were the most appropriate for use as denominators; and, most importantly, the addition of Indians from States such as Pennsylvania, Rhode Island, and Connecticut to Indian Health Service "reservation States" (see U.S. Congress 1986, pp. 59-82; IHS 1988; Passell 1976; Passell and Berman 1986; May 1988).

Taken at face value the Indian Health Service (IHS) rates indicate that accident mortality has fallen dramatically. The age-adjusted rate of motor vehicle accident mortality declined from a high of 106.2 in 1956 to 42.6 in 1985 (IHS 1988), a drop of 59.8 percent. However, a more realistic trend figure might be obtained by using 20-year figures from 1956 through 1976, when the major reshaping of the IHS denominator began. From 1956 to 1976, the Indian rate of motor vehicle accident death dropped from 106.2 to 74.5 or 29.8 percent. This is quite comparable to the overall U.S. drop of 14.7 percent from 1956 to 1976 or 34.0 percent from 1956 to 1985. Therefore, it is safe to conclude that the American Indian rates have dropped, probably in a magnitude similar to or slightly greater than the drop for the overall U.S. population. [1] One positive reason for this drop could certainly be the upgrading of emergency medical services begun in the middle 1970s on many reservations.

1 Indian vital statistics in many areas tend to parallel U.S. statistics, although some rates usually remain higher. For example, most tribes experienced a baby boom similar to the total U.S. population, only the birth rates were substantially higher and the peak was several years later (see Broudy and May 1983). Also, motor vehicle accident rates were reduced in 1974 on the Navajo reservation when the oil embargo forced the lowering of the national speed limit (Katz and May 1979).

Table I. Leading causes of death for American Indian and Alaska Natives by frequency, gender, and rates per 100,000, 1983-85

Males			Females		
Causes of death	Number	Mortality rate	Causes of death	Number	Mortality rate
All causes	11,894	568.4	All causes	8,216	382.2
Diseases of the heart	2,727	130.3	Diseases of the heart	1,958	91.1
Accidents	2,385	114.0	Malignant neoplasms	1,301	60.5
Motor vehicle	1,263	60.4	Accidents	833	38.7
Other accidents	1,122	53.6	Motor vehicle	490	22.8
Malignant neoplasms	1,424	68.0	Other accidents	343	16.0
Chronic liver disease and cirrhosis	520	24.8	Cerebrovascular diseases	513	23.9
Suicide	485	23.2	Chronic liver disease and cirrhosis	404	18.8
Cerebrovascular diseases	456	21.8	Diabetes mellitus	392	18.2
Homicide	453	21.6	Pneumonia and influenza	295	13.7
Pneumonia and influenza	387	18.5	Certain conditions originating in the perinatal period	171	8.0
Diabetes mellitus	284	13.6	Nephritis, nephrotic, and nephrosis	151	7.0
Chronic obstructive pulmonary diseases and allied conditions	254	12.1	Homicide	144	6.7
Certain conditions originating in the perinatal period	216	10.3	All other causes	2,054	
All other causes	2,303				

Source: Indian Health Service, *Chart Book Series*, 1988.

The greater magnitude of the rate of motor vehicle accident death warrants further discussion here. The overall aggregated data for 1983-85 indicate that Indians and Alaska Natives die twice (2.3 times) as frequently from motor vehicle crashes. But since these are overall figures that include both males and females, eastern and western Indians, Alaska Natives and Indians, rural and urban Indians, and a great diversity of tribes with differing social and cultural traditions, it is imperative to examine data that are more specific to local, tribal, and gender variations.

Table 3 gives age- and gender-specific data for U.S. Indians and Alaska Natives. Indian males' rates of motor vehicle accident mortality are substantially higher than Indian females, in each age category. Further, Indian males age 15 to 85 years and older die three times more frequently than Indian females in motor vehicle crashes. Both Indian males and Indian females have higher rates of death at virtually every age category than all races combined, the exception being Indian women 75 and over.

This higher rate of accidental death for Indian males, when expressed in years of potential life lost or life expectancy, is dramatic. Among the Navajo in 1972-74, motor vehicle deaths reduced the male life expectancy at birth by 5.2 years, and other accidents reduced male longevity by another 3.1 years (Carr and Lee 1978). For Navajo females, the respective figures were 2.7 years and less than 1 year (Carr and Lee 1978). The comparable figures for the U.S. population at this time were reductions of less than 1 year for motor vehicle and other accidents for both males and females (Tsai et al. 1978).

An examination of geographical and cultural variations in unintentional injury death rates (table 4) reveals three items that need to be emphasized. First, the highest rates of

Table 2. Age-adjusted mortality rates (per 100,000 population) for American Indians and Alaska Natives in reservation States, 1983-1985, and U.S. populations, 1985

	Indians and Alaska Natives	United States			Ratio of Indians to all US races
		All races	White	All other	
All causes	542.7	546.1	523.1	697.8	1.0
Major cardiovascular disease	174.6	224.0	216.9	273.4	0.8
Diseases of heart	141.6	180.5	176.1	210.4	0.8
Cerebrovascular diseases	26.8	32.3	30.1	49.4	0.8
Atherosclerosis	2.5	4.0	4.0	3.9	0.6
Hypertension	1.0	1.8	1.4	4.7	0.6
Malignant neoplasms	84.9	133.6	130.7	155.7	0.6
Accidents	77.7	34.7	34.1	39.7	2.2
Motor vehicle	42.6	18.8	19.1	17.4	2.3
All other	35.1	16.0	15.0	22.3	2.2
Chronic liver disease and cirrhosis	29.2	9.6	8.9	14.4	3.0
Diabetes mellitus	22.9	9.6	8.6	17.7	2.4
Pneumonia and influenza	17.9	13.4	12.8	16.8	1.3
Homicide	14.3	8.3	5.4	24.4	1.7
Suicide	14.1	11.5	12.3	6.7	1.2
Chronic obstructive pulmonary diseases and allied conditions	11.5	18.7	19.2	13.8	0.6
Tuberculosis, all forms	1.6	0.5	0.3	1.8	3.2

Source: Indian Health Service, *Chart Book Series*, 1988.

motor vehicle accident deaths occur in the West (Rocky Mountain, Plains, and Upper Midwest). Indians in the Billings, Aberdeen, Tucson, and Navajo areas have the highest rates, which are 6.7, 5.4, 4.9, and 4.6 times, respectively, that of the general U.S. population. Alaska has the lowest rate.

Second, Alaska Natives, while they have lower rates of motor vehicle mortality, have much higher rates of other accident mortality such as from water transport, firearm incidents, and air transport. Third, females, particularly those living in Alaska and the West, are at increased risk for motor vehicle and other injury-related death. In summary, even though the overall age-adjusted death rates for accidents among Indians seem to have improved dramatically over the years and are now only 2.2 to 2.3 times the national averages, many tribes, cultures, and subcultures, particularly in the West, still have dramatically higher accident mortality rates. The reasons for this are sociocultural (May 1982) as well as geographical and environmental.

Local Mortality Data From the West

Isolated State data confirm, in another way, the extremely high accident mortality rates for western Indians. From 1982 through 1986 in Montana, the Indian crude rate of death from motor vehicle accidents was 79.7 per 100,000, while the non-Indian rate was

Table 3. Age-and gender-specific motor vehicle accident death rates (per 100,000 population) for American Indians and Alaska Natives in reservation States, 1983-85, and U.S. all races, 1984

	MALE			FEMALE		
	American Indian and Alaska Native (1983–1985)	U.S. all races (1984)	Ratio Indian to U.S. all races	American Indian and Alaska Native (1983–1985)	U.S. all races (1984)	Ratio Indian to U.S. all races
Under 1 year	19.5	4.3	4.5	12.0	4.6	2.6
1 to 4 years	23.8	8.0	3.0	18.8	5.7	3.3
5 to 14 years	9.9	8.3	1.2	7.9	4.9	1.6
15 to 24 years	87.7	54.9	1.6	31.9	18.3	1.7
25 to 34 years	99.1	37.0	2.7	30.7	10.7	2.9
35 to 44 years	78.4	25.2	3.1	29.4	9.2	3.2
45 to 54 years	71.0	22.4	3.2	25.7	8.8	2.9
55 to 64 years	59.0	21.9	2.7	22.1	10.1	2.2
65 to 74 years	57.0	24.9	2.3	15.2	12.7	1.2
75 to 84 years	89.4	42.0	2.1	14.4	20.0	0.7
Over 84 years	71.9	53.3	1.3	9.5	13.5	0.7

Source: Indian Health Service, *Chart Book Series*, 1988.

26.5 (calculated from data in the State of Montana, 1983-88). Even though these were not age-adjusted, one can conclude that the Indian rate was approximately 2.5 to 3 [2] times the non-Indian rate in the same State. In New Mexico, similar trends are found. In both 1976-78 and 1984-86, the age-adjusted motor vehicle accident death rates for Indians were considerably higher than for the other three major ethnic groups (see table 5). Indian rates in both periods were 2.5 to 5.2 times higher than the other groups, even though the rates for all groups decreased with time. The rate of decrease was 35.5 percent for Indians, which was a more substantial reduction than among Hispanics and blacks, but not as desirable as the decline among non-Hispanic whites. Among Indian and non-Indian populations in the same State, Indians have higher rates of motor vehicle accident death.

Even in the same county, Indians and non-Indians have differential rates of motor vehicle accident death. For example, in Montana in 1974, a colleague of mine and I calculated crude accidental death rates for both Indians and non-Indians on a county-by-county basis. This was facilitated by the fact that reservation boundaries cross several counties, and each county therefore has a substantial number of both Indian and non-Indian residents living in a similar natural ecology. Of the 17 counties characterized by this situation, Indians had higher rates of accidental death (motor vehicle and other) in 11. The overall mortality rate for Indians in these counties was 253 per 100,000 compared to 70 per 100,000 for non-Indians (May and Morigeau 1976).

Morbidity Statistics

Accidents among Indians put a great burden on the health care system as measured by hospital discharge data. In fiscal year 1987, injuries and poisonings was the leading diagnostic category for Indian and Alaska Native males at IHS and contract hospitals,

2 Actually 3.6 times, but since the rates are not age-adjusted, too specific a comparison is not appropriate.

Table 4. Age-adjusted death rates (per 100,000 population) by type of injury, sex, and area for Indians and Alaska Natives, 1980-82

Type of injury	EASTERN		WESTERN							FAR WEST	
	Nashville	Oklahoma	Aberdeen	Bemidji	Billings	Albuquerque	Navajo	Phoenix	Tucson	Portland	Alaska
Male											
Motor vehicle traffic	74.4	64.5	160.4	109.9	204.7	104.3	156.8	120.7	162.8	99.5	42.5
Ratio to U.S. all races	2.3	2.0	4.9	3.4	6.3	3.2	4.8	3.7	5.0	3.0	1.3
Other unintentional injury	84.5	36.7	103.0	79.7	149.8	85.6	114.3	106.5	59.7	76.6	277.1
Ratio to U.S. all races	3.1	1.3	3.7	2.9	5.4	3.1	4.2	3.9	2.2	2.8	10.1
Female											
Motor vehicle traffic	22.2	27.8	77.2	46.6	87.2	48.0	51.2	54.1	55.0	49.0	86.7
Ratio to U.S. all races	2.0	2.5	6.8	4.1	7.7	4.3	4.5	4.8	4.9	4.3	9.5
Other unintentional injury	4.2	6.7	30.8	28.3	35.2	17.6	20.1	24.8	19.2	27.1	11.0
Ratio to U.S. all races	0.5	0.7	3.4	3.1	3.9	1.9	2.2	2.7	2.1	3.0	1.0
Total (both sexes)											
Motor vehicle traffic	48.2	45.8	116.8	77.6	145.0	74.8	101.3	85.9	106.2	74.0	27.0
Ratio to U.S. all races	2.2	2.1	5.4	3.6	6.7	3.4	4.6	3.9	4.9	3.4	1.2
Other unintentional injury	42.7	21.1	65.5	53.1	91.1	49.6	64.4	63.9	37.5	51.6	183.5
Ratio to U.S. all races	2.4	1.2	2.3	3.0	5.1	2.8	3.6	3.6	2.1	2.9	10.2

Source: U.S. Congress, *Indian Health Care*, 1986.

Table 5. Age-adjusted and crude mortality motor vehicle accident rates (per 100,000 population) for New Mexico ethnic groups 1976-78 and 1984-86

	Crude rate	Age-adjusted rates				Percent change 1976-86
		Total	Ratio Ind/Other	Male	Female	
1976 through 1978						
Indian	125.5	150.4	—	243.5	67.9	—
Hispanic	44.6	51.2	2.9	85.7	22.8	—
White non-Hispanic	39.1	42.6	3.5	61.4	26.2	—
Black	23.5	29.2	5.2	39.7	19.4	—
1984 through 1986						
Indian	85.9	97.0	—	148.3	52.0	-35.5
Hispanic	36.3	38.8	2.5	58.6	19.8	-24.2
White non-Hispanic	24.9	25.2	3.8	35.6	14.9	-40.8
Black	23.7	27.7	3.5	43.7	10.3	- 5.1

Source: *New Mexico Selected Health Statistics*, 1978 and 1986.

accounting for 18.7 percent of all inpatient stays. Among females, the same category was the fourth most frequent inpatient diagnosis, accounting for 6.8 percent of all stays. Within these statistics, motor vehicle-related injuries are the largest category in most areas of the country, rivaled and/or surpassed only in certain age groups by falls (IHS 1988; unpublished IHS program statistics.).

Available Literature and Explanatory Themes

All the above material raises some interesting questions about why Indians and Alaska Natives are plagued by high rates of accidental death and injury. Realizing that the word "accident" is both unpopular and also inaccurate because vehicle crashes have objective, recognizable, and predictable precursors, it is now expedient to examine the research literature.

Few major studies are available on motor vehicle accidents among Indians or Alaska Natives. However, some studies have examined all types of accidents combined and also violent death. Most of these articles include motor vehicle accidents as one of a number of variables. Schmitt et al. (1966) studied accidental deaths among Indians in British Columbia (Canada) . In this study, motor vehicle deaths accounted for 24 percent of all Indian accident deaths as opposed to 35 percent for non-Indians. Drownings and burns were the most common causes of death.

Boyd et al. (1968) studied accident mortality in Alaska in 1958-62 and found drowning (water transport) as the leading cause of death (62.7 per 100,000) and motor vehicle accidents as the third leading cause, behind fires. Brown et al. (1970) also studied all types of accidents, but used clinic records to examine both morbidity and mortality among the Navajo. Motor vehicle accident deaths accounted for 48 percent of Navajo accident mortality in the late 1960s and 19.3 percent of the injuries. Factors related to motor vehicle crashes were unlicensed drivers, alcohol use, lack of driver education, lax enforcement of laws, and poor roads.

Omran and Laughlin (1972) also studied injury morbidity and mortality among the

Navajo, but focused only on clinic records from an earlier period (1950s and early 1960s) from a remote, central portion of the reservation. All the studies cited above are rather descriptive and in many ways serve to place the motor vehicle accident experience in a historical context (e.g., in relation to horse and wagon-induced injuries) and in the broader context of all injuries (cuts, falls, etc.).

A more recent study of all types of injury was undertaken by Leon Robertson for the Indian Health Service (1985). Using national IHS clinic data and existing literature, Robertson reviewed the nature of injury morbidity and mortality as they related to magnitude in all areas served by IHS. Also, there was an attempt to identify individual risk factors that relate to injury. Such high-risk diagnoses are venereal diseases, diabetes, etc. While this was an interesting attempt to identify a general population at risk, the epidemiological and public health implications of this study were limited by a lack of focus on local and specific conditions and socio-cultural variables.

Four major articles/works have been published about the Papago of Southern Arizona. Each work examined the total range of injuries from clinic records in various modern and traditional communities. Hackenberg and Gallagher (1972) found that injury rates were twice as high in the more modern villages and explained this as a function of social change correlating with wage labor, Protestant religion, and higher education. Change produced stress that, coupled with alcohol use, produced more injury.

Stull (1972, 1973) also studied Papago clinic records and found that the highest injury rates were typical of modern individuals in progressive communities, but that rates of accident and injury were lower for traditional individuals in progressive communities and lowest for traditional people in traditional communities. In a later article, Stull (1977) modified this argument to say that injuries were more prevalent in modern settings "simply because the environment and associated lifestyle place individuals at a greater risk for injury." Alcohol was also mentioned as a contributing factor to injury.

One other article that explored the theme of modernization and social stress was written by James Wills (1969), who worked among the Oglala Sioux of Pine Ridge, South Dakota. Wills states that a comprehensive, baseline self-report survey showed that accident and injury were higher among fullblood Indians. Further, one half of those individuals involved in vehicular accidents had been arrested at least once for drinking and were also prone to other social and legal problems. The bulk of this study, however, was concerned with brief psychological autopsies of three male Sioux drivers killed in motor vehicle crashes. These drivers were characterized as having problems of adjustment, low self-esteem, failure to achieve, and feelings of a lack of control over their own lives.

Another study among the Navajo focused solely on motor vehicle accidents. Using police data from three States and from tribal police, this project produced three documents – one monograph (Katz and May 1979) and two article/pamphlets (May and Katz 1979*a*, *b*) – that described and analyzed the multivariate nature and epidemiologic features of both Indian and non-Indian fatal (n = 500) and nonfatal crashes (n = 2,347). Data were collected on both the Navajo reservation and roads leading to it in 1973-75. Some of the key findings regarding fatal crashes in this study include:

- Mortality rates per 100 million miles traveled (which control for driving exposure) were higher for Navajos (12.6 per 100 million) than for the State of Arizona (5.0), New Mexico (6.1), or the U.S. population (3.8).
- Of all the fatal Indian crashes, 51 percent were single vehicle, 29 percent were multiple vehicle, and 20 percent were pedestrian.
- In fatal single vehicle crashes, Navajos were significantly more likely than non-Indians to be driving a pickup truck, have an invalid license, be younger, and have been drinking.

- When comparing Navajo fatal single versus multiple vehicle crashes, single vehicle drivers were significantly more likely to have been drinking (41 percent versus 28 percent), less likely to have a valid license, were younger, and single vehicle fatalities were more likely to happen at any time of day and in the daylight.
- Regarding multiple vehicle crashes, the only significant difference between Navajo and non-Indian experience was that Navajos were more likely to be driving a pickup.

No differences were found between fatal Indian and non-Indian crashes regarding number of persons in the vehicle, condition of vehicle, or environmental conditions (weather, light, hour of day, weekend, or season).

In nonfatal crashes, weather, road, and environment were more important. Therefore, this study pointed heavily, but not exclusively, to the individual characteristics (e.g., youth, alcohol, license) of the Indian driver. Local belief at the time of the study maintained that the roads, environmental conditions, vehicles in poor condition, and driving greater distances were the major determinants of serious crashes. In the study, however, the rates per hundred million miles traveled and other comparisons did not support these beliefs, but rather showed that most fatal crashes were related to driver characteristics.

In addition to the specific findings of the Katz and May (1979) Navajo studies, general conclusions were reached as to why Indians have a higher rate of motor vehicle death than others in the United States or surrounding areas.

> First of all rurality is a key factor. As Waller (1967) and Waller et al. (1964) have shown, accidents in rural areas produce four times the amount of death than urban accidents of similar severity. Since the Navajo reservation is possibly the most remote area in the U.S. with a very sparse population (150,000 to an area the size of West Virginia), high rates of death are to be expected. The U.S. in general is about 70 percent urban and had a rate of death of 4.20 per 100 million miles traveled in 1973. One would, then, expect the total rate for the Navajo reservation (approximately 10-20 percent urban) to be approximately 12 per 100 million overall and 16 or higher on many roads. Thus lack of access to medical care due to remoteness and time and distance to medical care influence the fatalities greatly. . . .
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> A second major factor in the high rates is the age of the population. Young persons in the U.S. are frequently involved in and killed in accidents. To a similar extent Navajo under 30 years of age are also highly involved in accidents, particularly, single car accidents. The difference, which has the effect of raising Navajo rates, is the sheer number of people who are under 30 years old. While only 50 percent of the U.S. population is under 30, 70 percent of the Navajo population is under 30. Thus, unless age specific rates are calculated, crude rates and rates per 100 million miles will be higher for the Navajo population. The preponderance of young Navajo results in a high risk population.
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> A third factor in the high rates is alcohol and the drinking patterns. Younger persons are more likely to be experimenters with alcohol in the U.S. in general and this is also true with the Navajo. Most Navajo who drink are under 45 years of age (Levy and Kunitz 1974) and the modal drinking style of those who do is sporadic, binge drinking (Ferguson 1968). This style of drinking, coupled with prohibition, is a factor in high accident rates. Under prohibition, with most cultural and ethnic groups, drinking styles emphasize hurried drinking and intoxication (see May 1976). The Navajo are no exception and drinking in border areas such as Gallup, Farmington, Flagstaff, etc.,

takes this form. After drinking, however, a long drive or walk home of 10 to over 100 miles becomes a more difficult task, especially on two-lane roads. Thus, the higher rates of motor vehicle and pedestrian accidents and alcohol relatedness among the Navajo are influenced by alcohol and particularly the laws of prohibition on the reservation.

A final variable in explaining high accident rates is culture. As many authors have pointed out, cultural variables are important in many areas of deviance or "social pathology" (Levy and Kunitz 1974), and for accidents this is true (Hackenberg and Gallagher 1972; Selzer and Vinokur 1974). Nevertheless the nature of Navajo acculturation and assimilation should not be ignored. Acculturation and assimilation of cultural items are slow processes and are never uniform. Presently in Navajo society, acculturation has occurred in that the motor vehicle (particularly the pickup truck) has been adopted and is used with great vigor. Assimilation, on the other hand, the internalizing of values from another culture, is a much slower process and has not occurred among many Navajo with regard to motor vehicle use. The Navajo use pickups in a fashion which is strongly based in traditional values. One very prominent value surrounding accidents is fatalism. . . . Related to this is a lack of adoption of safe or defensive driving, many people disregard licensing procedures and laws, and seat belts are rarely used. This is not to deny that overall U.S. and European populations could be accused of these behaviors, but the degree is different. Due to differences in culture and world view, fewer Navajo have adopted safe practices for motor vehicles than some other groups in the U.S. population. (Katz and May 1979)

Alcohol Involvement

Because of drunk-Indian stereotypes and other folk beliefs about the West, a strong relationship between alcohol and motor vehicle accidents among Indians has been assumed by many (see May and Smith 1988; May 1982). The fact is, however, that there is little concrete evidence in print to document the true extent of alcohol involvement in motor vehicle accidents involving Indians and Alaska Natives. There is, however, enough evidence to generalize here.

First of all, a little known fact is that Indian drinking behavior is highly variable from one tribe to the next. In some tribes, more youth and adults drink than the general population but in others, fewer individuals drink. For example, among the Navajo in 1970 only 31 percent of adults drank at all, and many individuals in the over-40 age categories were abstainers (Levy and Kunitz 1974). By 1985, some increase had been registered in Navajo drinking prevalence, which was then believed to be as high as 52 percent, but the prevalence was still lower than the 67 percent reported in the overall U.S. population (May and Smith 1988). The point here is that Indian drinking patterns are highly variable from one tribe to the next, and drinking styles are also unique and may not always conform to popular notions put forth by mainstream stereotypes. Particular drinking styles, however, are important to consider when studying and intervening with the unintentional injury complex.

Going back to earlier accident studies, Schmitt et al. (1966) in British Columbia used hospital insurance data to find that 28 percent of the 300 accidental (of all types) native deaths in their study were alcohol-related. Further, they found that among those over 20 years of age, 39 percent of the male accident deaths and 49 percent of the female deaths were alcohol-related. Alcohol intoxication, they concluded, was an important factor in native driving and transport accidents.

Other studies dealing with all types of accidents have found and/or speculated upon a native alcohol and injury relationship. Boyd et al. (1968) found that 12 percent of all motor vehicle accidents and drownings in Alaska were alcohol-related. Wills (1969) found a significant correlation between Sioux accident victims and alcohol arrest. Brown et al. (1970) listed alcohol as the most influential factor in Navajo motor vehicle accidents, but provided no data. Omran and Laughlin (1972) reported that of 10 motor vehicle accident deaths studied among the Navajo, 5 were alcohol-related. Among the Papago, both Hackenberg and Gallagher (1972) and Stull (1973, 1977) related alcohol consumption to modernization and acculturation stress, and these in turn combined to increase injury rates. Katz and May (1979) found that police records linked alcohol to 41 percent of the Indian drivers in single vehicle crashes, 46 percent [3] of multiple vehicle crashes, and driver or pedestrians in 44 percent [4] of pedestrian fatalities.

With all of these studies, however, the role of alcohol was, no doubt, underestimated, for police reports in the 1970s, hospital and clinic records, and death records seldom reported the true magnitude of the problem (Zylman and Bacon 1968). Further, police data might be biased in that Indians might be tested more frequently than others as Westermeyer and Brantner (1972) found, or recording of alcohol involvement on Indians may be more common or acceptable in terms of societal norms. For example, in the Navajo studies (Katz and May 1979), the Indian alcohol involvement was 2.8 times higher in single vehicle crashes, 1.7 times higher in multiple vehicle crashes, and 1.3 times higher in pedestrian fatalities than non-Indian events. Maybe this was the actual magnitude, but underreporting and selective reporting of all alcohol involvement must be considered as a possibility with all these studies.

Some investigators used more accurate or valid data sources. In an intensive autopsy study of sudden death in British Columbia, 43 of the subjects were Native (Cutler and Morrison 1971). Of the accidents, suicides, and homicides of these Indians, 54.8 percent involved BACs at or above to the legal intoxication limit (0.08) in Canada. The authors concluded that the "high rate of Indian sudden death is primarily the result of occasional, but intense intoxication in high risk situations" (Cutler and Morrison 1971).

In another study of sudden death, the Kenora (Ontario) Planning Council found, through inquiry of knowledgeable parties, that alcohol was a factor in more than 70 percent of the nearly 200 sudden Indian deaths, including even 50 percent of the victims of homicide. This report concluded that the 70 percent may be an underestimate. In Manitoba, Trott et al. (1981) found sudden death to be more common among Native Indians, with 52.5 to 54.3 percent of the accidental deaths alcohol- and/or drug-related. These data, however, included many non-Indians as well as Indians. Jarvis and Boldt (1982) studied the deaths of Alberta Province Indians in a prospective fashion, using interviewers in 35 native communities. Alcohol was involved in 70.6 percent of all motor vehicle accident deaths as reported by informants immediately following a death. The four Canadian studies have increased our knowledge considerably, but the question remains, what about Indians in the United States?

In New Mexico, the medical investigator system and the State laboratories are centralized in both authority and in operation. Blood and breath testing are strictly overseen by these centralized bureaus, so the quality of information is good. Since more than 8 percent of the State is populated by American Indians, and several counties are heavily Indian, one might closely examine the alcohol and accident situation among Indians using routine data. Realizing the real risk of committing the ecological correlation fallacy in examining county data without linking it to individuals (Robinson 1950),

3 Includes data on all drivers of both vehicles, so that if one or the other or both were cited as intoxicated, it was counted as an alcohol-related crash.

4 The pedestrian involvement included 22 percent of the drivers (excluding the 25.5-percent hit-and-run who may well have been intoxicated) and 22 percent of the pedestrians.

Table 6. Motor vehicle accidents and alcohol in three selected counties in New Mexico, 1982-84

County	Percent Indian (major tribe)	Alcohol involvement (percent)	
		Fatal accidents	Severe accidents*
A	66 (Navajo)	78.0	33.1
B	33 (Navajo)	78.0	28.8
C	27 (Pueblo)	73.7	24.2
Entire State	8	63.7	21.2

*Severe accidents are those that involve injury or death.
Source: New Mexico Traffic Safety Bureau 1984 and *New Mexico Vital Statistics, 1984.*

table 6 shows that serious accidents are slightly more alcohol-related in those counties with a substantial Indian population. County A, which is 66 percent Indian, is probably the best comparison. In the 3 years covered, 1982 through 1984, 78 percent of all fatal accidents and 33 percent of all serious accidents were alcohol-involved as measured by blood or breath alcohol.

One final statistic from New Mexico is also available. Several studies, particularly in Canada, referred to one particular Indian pattern or style of drinking—binge drinking—that is characterized by rapid consumption and leads to high blood alcohol levels. Autopsy data examining alcohol levels in blood and vitreous fluid samples from 253 accidental deaths in New Mexico indicated that Indian crash victims had high blood-alcohol levels. The 68 Indian crash victims autopsied in 1986 who were positive for alcohol had a mean blood alcohol level of 0.201, compared to 0.183 for Hispanic positives and 0.126 for comparable non-Hispanic whites [5](Guerin, in process).

Solutions and Partial Solutions

Given all the data that indicate that alcohol and driving are tragically linked in American Indian populations, with more severe consequences than among other groups in the United States, a comprehensive, multivariate prevention strategy must be planned and launched. Because the available information is not as complete as public health professionals might desire, more research to further specify the relationship between alcohol, injury, and Indians is needed in the future. However, current knowledge is clearly adequate for a solid beginning in prevention and intervention.

Below, general trends and/or ideas in prevention are highlighted, using as a guide the usual scheme of primary, secondary, and tertiary levels of prevention. Primary prevention attacks root causes of a problem in its basic environmental, social, cultural, and political structure. Secondary prevention is directed at eliminating the onset of a problem and/or taking action in the early stages of manifestation. Tertiary prevention seeks to provide curative and remedial action to deal with and minimize the illness, injury, and other negative outcomes of a major health problem.

5 The legal intoxication level in New Mexico is 0.10.

Primary Prevention

The social, economic, and educational status of many American Indians can undoubtedly be improved to the overall benefit of many tribes and individuals alike (Dozier 1966). As several authors have pointed out, many Indian groups are undergoing epidemiologic transition (Omran 1971; Kunitz 1983; Broudy and May 1983), and this movement from traditional to modern is related to the high accident rates now prevalent, particularly on Western reservations (Hackenberg and Gallagher 1972; Stull 1972, 1977, 1973; Omran and Laughlin 1972). As Omran and Laughlin (1972) pointed out, people in transition "exhibit many insecurities and inabilities to cope with their changing way of life," and this results in the accident and violence complex among particular segments of Indian societies. Therefore, assisting Indian groups and individuals in their efforts at economic, social and educational enhancement will ultimately benefit many areas, including alcohol abuse and accident and violence rates.

In the Native American Adolescent Injury Prevention Program (unpublished data) run in the rural areas of New Mexico, rural Indian youth were found to have the lowest scores on social psychological scales, such as locus of control and self-esteem, that are predictive of accident susceptibility. However, these scores are highly influenced by the educational level of the parents of the Indian children (see also Liban and Smart 1982). Indian children from families of high educational attainment not only score better on social psychological scales, but they also report less substance abuse and risk-taking behavior common to accidents. Therefore, broad social enhancement, such as education, which may strengthen the family, also enhances the individual in ways that should reduce the accident rate over an extended period (Mail 1985; Dozier 1966).

Other primary prevention is being, and can be further, pursued. The IHS, Office of Environmental Health, is now working at national, State, and local levels to improve roads, encourage seatbelt use, and promote injury control and state-of-the-art highway safety all over the Indian lands of the Nation. It appears likely that some of this road improvement has already begun to reduce the accident fatality rates in some reservation areas. [6]

A final area of primary prevention concerns tribal and community law and policy. Tribes have great legal power to control alcohol policy, taxation, and enforcement on their reservations and communities. More than 60 percent have retained prohibition but are reluctant to enforce strong penalties to support it (May 1975, 1976, 1977; May and Smith 1988). Tribes need to strictly examine and change alcohol and social policies so that they influence new norms and guidelines of behavior regarding alcohol and substance use, particularly for the minority who abuse alcohol. Whether the policy adopted is a more strict, comprehensive, and effective approach to prohibition, or whether it is legalization that is comprehensive and specific in its prescriptive qualities, a new, more explicit set of policies is needed to guide behavior (see May and Smith 1988; May 1986).

Secondary Prevention

Alcohol and health education with youth must continue and be further expanded. Recent years have seen a great increase in this area, but more has yet to be done. Youth need to be educated, not only about alcohol abuse, but also taught in a social learning mode that emphasizes self-esteem enhancement, values clarification, coping, and problem-solving skills (Bach and Bornstein 1981; Winfree and Griffiths 1983; May 1986).

6 For example, the motor vehicle accident death rate for the Crow and Northern Cheyenne Indians appears to have declined in 1981-85 (IHS unpublished statistics) from what it was in 1959-75 (see May 1976). Some of this reduction may be due to the construction of Interstate Highway 25 from Crow Agency to Billings, Montana, for the old road was a notoriously narrow, hilly, winding, and dangerous stretch of more than 60 miles.

Health education with adult Indians should take a different approach. Most adult Indians are well aware of the health implications of alcohol abuse but could benefit greatly from education and exposure to public health principles and the possibilities of public policy for alcohol abuse and accident prevention (May and Smith 1988).

A continuing and open forum on alcohol policy needs to be pursued, and widespread public education will feed this. Policies, laws, and campaigns that are specific to accident and alcohol abuse hold great promise for a tribe. Positive action in this area is now beginning with safety campaigns, but routinizing the dialog and concern regarding these issues is necessary. Recently, for example, the Navajo Tribe took a major step in this direction by passing a mandatory seatbelt law for their reservation, the largest in the United States (Landon 1988). The enforcement of such laws and the perception of sure and swift penalties must be emphasized as well (Ross 1982).

Safety programs such as infant car-seat purchase and rental have been promoted by the IHS and a number of tribes. Generally, these programs seem to be well received, for most Indians are particularly responsive to child health and welfare issues. The programs, however, need to be expanded to all babies of all tribes. Targeting youth in safety programs may produce a whole new generation of Indian seatbelt users. Currently, surveys of the New Mexico Native American Adolescent Injury Prevention Program (unpublished data) indicate that young Indian males have the lowest seatbelt use of any group in New Mexico. But these data also indicate that increasing seatbelt use is the most common and significant change in behavior of the injury prevention program.

Tertiary Prevention

Until the middle 1970s, few reservations had any emergency medical resources such as ambulances and trained and employed emergency medical technicians. Now, most reservations and many rural Indian communities have some level of emergency medical services, and these small programs may well have had an influence on the drop in Indian motor vehicle crash fatality rates registered since 1976. However, these services greatly need to be continually upgraded, improved, and expanded so that more accident victims can be saved and/or their injuries minimized, and the high disability rate of Indians can be lowered. Further, emergency room capabilities need to be enhanced, so that accident victims receive state-of-the-art trauma care whenever possible. New Mexico has only one level-one trauma center and some western States have none.

The most desirable tertiary prevention would be improved interdiction of drunk drivers before they cause crashes and expanded alcohol treatment capabilities. Tribal, Bureau of Indian Affairs, local sheriff, and police forces in Indian country are notoriously understaffed and in need of further assistance of all kinds. Increasing their training and, particularly, their manpower and resources should be a priority. Further, if the laws and policies regarding alcohol and driving under the influence (primary and secondary prevention) were improved so that the police efforts were facilitated, then enforcement would be greatly aided. For example, on many "dry" reservations, bootlegging is so common and institutionalized that the tribal police can tell you who sells and how much it costs, and can even estimate their income. But to eliminate the practice would require considerably more manpower, time, and new, stronger, and more explicit laws than currently exist on reservations and in most western States.[7]

Alcohol treatment programs in Indian country are characterized by too few resources and capabilities of all kinds (manpower, money, level of training for the counselors, and

7 On the Navajo reservation, for example, the maximum penalty for bootlegging is 6 months in jail and a $500 fine. Police report, however, that to charge a person with bootlegging takes a number of officer manpower days to build a case, search, collect evidence, and bring it to court. Seldom, however, is any major jail time spent by the accused, and the maximum fine for conviction ($500) is little more than an overhead expense in the cost of doing a profitable business.

treatment regimens). A total upgrading and new commitment is needed in this arena, so that all first-time driving-under-the-influence offenders can be screened and placed in an appropriate treatment modality (May 1986).

Conclusion

In summary, then, the problem of alcohol abuse and accidents exists in many Indian communities. It takes a tremendously large toll in terms of injury and lives lost. Since it has multiple causes and related factors, its solution must also be multivariate. Any program designed to reduce alcohol-related motor vehicle accidents among Indians must be comprehensive and must address both general conditions and specific prevention and intervention tasks.

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