Community Injury Control Programs of the Indian Health Service: an Early Assessment

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Synopsis..................................

In response to the high rates of injury morbidity and mortality among Native Americans, the Indian Health Service initiated community injury control programs in 1982 mainly aimed at educating the populations served.

Substantial declines in hospitalization rates per population for falls, motor vehicle injuries, and assaults were observed through 1984. Regression analyses of changes in hospitalization rates for particular types of injury in relation to rates of persons served in 54 service units suggests some favorable effect of certain activities and possible adverse effect of a few. Increased targeting of effort based on detailed surveillance of serious injuries is planned.

FOLLOWING SUBSTANTIAL DECLINES in infectious diseases, injuries became in recent decades the leading cause of deaths among Native Americans (*1*). In 1977-79, deaths from unintentional injury per 100,000 population among Native Americans were about twice as high as among the white or black populations. Suicide rates were about the same as those of the white population, but lower than for the black population, and homicide rates were higher than those in the white population, but lower than those for the black population (*2*). These rates were not age-adjusted, and the Native American population had proportionately more children and young people that have higher rates of most types of injury. Nevertheless, it is clear that injury is the leading health problem of Native Americans.

The Indian Health Service (IHS) is responsible for providing health services to Native Americans. In response to the knowledge of high injury rates among Native Americans, IHS began planning in 1981 for an increase in injury prevention programs. The environmental health program was primarily responsible for this effort. The environmental health officer in each service unit, usually attached to an outpatient clinic or hospital, was asked to form a Community Injury Control (CIC) Committee. Each service unit was supposed to have a committee, but the lack of response to a request for activity reports in two areas suggests the possibility of limited or no activity in those areas. The committees were interdisciplinary, including clinical personnel and representatives of the community. The committee's task was to set priorities and develop programs for injury prevention and severity reduction.

Actual activities and the target injuries toward which those activities were directed have varied widely among service units in each year and from year to year. The initial activities were focused on training persons to avoid hazards or to treat injuries with first aid or to administer cardiopulmonary resuscitation (CPR), using materials developed by organizations such as the Red Cross. More recent activities included sale or rental of child restraints in many service units and, in a few others, distribution of smoke detectors, fire extinguishers, and friction strips for bathtubs. Chimney cleaning equipment is available for loan in one or two service units.

Although it is early to assess the long-range impact of community injury control on the injury rates among the Native American population, after 3 years of widely varied activities it is possible to measure the correlation of numbers of persons trained to avoid or to treat specific injuries and the changes in those specific injury rates among service units. This report presents a preliminary analysis.

Methods

Data on injury incidence, injury control activity, and population size were necessary for the analysis. Mortality data were not yet available from the National Center for Health Statistics for the years

1983-84. Therefore, it was thought that too little information was available to correlate activity to mortality rates. Data on hospitalizations for injury and clinic visits for injury for 1980-84 were provided on computer tapes by IHS. These data included injuries treated in IHS hospitals and those in other facilities under contract to IHS. Although the hospitalizations were coded using the International Classification of Disease E codes (external causes of injury and poisoning) and were considered adequately coded, coding on outpatient visit forms of cause of injury was too often "other" causes. Therefore, the analysis was confined to hospitalizations.

To assess activities, each environmental health officer at the area level was contacted and sent forms requesting detailed activity reports for each service unit. These forms were patterned after the activity reports required of the local environmental health officers in each IHS service unit, with a few additional details. Forms asked for the number of persons trained in particular aspects of injury prevention or emergency first aid and CPR, as well as the number of pieces of safety equipment loaned or distributed. Numbers of persons trained in the prevention of specific injuries, per 100 population, and number of specific units of safety equipment distributed per 100 population were the independent variables.

Population size in each service unit during each year, 1980-84, was estimated by IHS, based on the 1980 census, and adjusted in subsequent years by adding births and subtracting deaths. Hospitalizations per 100 population for each of the major types of injury were calculated for each service unit with a population greater than 2,000 in 1980. Service units serving smaller populations were excluded to avoid excessive variation attributable to small numbers in statistical tests. Seventeen service units serving a total of 17,400 people were excluded on this basis. There were approximately 570,300 people in service units used in the analysis and 349,000 in those units from which data were unavailable.

Despite the limit on population size of the service units included, examination of the year-to-year injury rates indicated some instability in many service units, as would be expected in relatively small populations. To reduce the instability for statistical analysis, the 1980 and 1981 injury rates were combined and the 1983 and 1984 rates were combined. The 1980-81 rate was subtracted from the 1983-84 rate in each service unit to obtain the change that occurred before and after the increase in injury control activities. Because changes in population were minimal, changes in rates are primarily the result of changes in frequency of hospitalization for injury. This procedure reduces differences among service units that might have occurred because of errors in population estimates.

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The change in hospitalization rates per 100 population for each specific type of injury was correlated to the cumulation of relevant persons trained or equipment distributed per 100 population directed at that specific type of injury during 1982-84. Data on activities prior to 1982 were incomplete for most service units and were therefore not included. According to IHS headquarters, injury control activity prior to 1982 was ad hoc and minimal.

For each major injury type, a multiple regression model was used to assess the correlation of each activity, controlling statistically for the others. The regression coefficients provide an estimate of the impact of the number of persons trained or equipment distributed per 100 population on frequency of hospitalizations for a given injury per 100 population.

The general form of the model is:

$$C_j = a_j + b_{1j}A_1 + b_{2j}A_2 + \ldots + e_j$$

where C = change in injury rate j from 1980-81 to 1983-84

A_i = sum of persons trained in course i or equipment distributed per population from 1982-84

b_i = regression coefficient indicating increase (if positive) or decrease (if negative) in percent injured per change in course i

e_j = residual variation.

Table 1. Average persons trained or equipment distributed per 100 population, 1982–84, in 54 service units of the Indian Health Service

Training or activity	*1982*	*1983*	*1984*	*Total*
General safety training	1.1	2.2	2.5	5.8
Motor vehicle safety training (excluding defensive driving)	0.6	2.0	1.1	3.7
Defensive driving	0.2	1.2	0.6	2.0
Recreation safety training	0.6	2.0	3.9	6.5
Occupational safety training	0.2	1.1	0.5	1.8
Poison prevention training	0.3	0.3	0.2	0.7
Water safety training	1.0	1.8	1.2	4.0
Fire safety training	0.6	0.3	0.1	1.0
Gun safety training	2.2	3.9	4.2	10.3
Extreme temperature training	1.0	0.1	0.3	1.4
First-aid training	0.6	0.8	0.3	1.7
Cardiopulmonary resuscitation (CPR) training	1.1	1.0	0.3	2.4
Cultural identity and stress	0.7	0.5	0.7	1.9
Child restraint distribution	0.2	0.4	0.5	1.1
Smoke detector distribution	0.1	0.1	0.8	1.0
Fire extinguisher distribution	0.1	0.1	0.2	0.4

NOTE: a few friction slip kits for bath tubs and chimney cleaning kits were distributed, but to less than 0.1 percent of the population.

Results

Usable data were available from 54 of 124 service units based on the population size criteria and return of activity reports. Two large areas containing several service units each as well as many service units serving small populations did not return reports and were excluded both from summary statistics and regression analyses.

The average activities per 100 population in the injury control program during 1982–84 are indicated in table 1. It is not known to what extent different people were trained in different aspects of safety or the extent to which there is overlap; that is, a few people trained in several courses. Because a small proportion of the total population was trained or had received safety equipment, one would not expect a large effect on injury rates during this startup period.

The average hospitalization rates per 100 population in 54 service units for each year are presented in the figure. Substantial reductions in hospitalizations for falls, motor vehicle injuries, and assault injuries occurred from 1980 to 1984. Only slight decreases were found in the other major causes of injury hospitalizations—suicide attempts, poisoning, cuts or piercing, and fire or smoke.

Table 2 presents the results of the regression analysis of hospitalizations associated with several kinds of injuries, including falls. Several prevention activities were associated with hospitalization resulting from falls but not all favorably. Activities associated with decreased hospitalizations for falls included percent of the population trained in general safety, recreational safety, and first aid during 1982–84. However, the coefficients for occupational safety training and CPR were positive, indicating that hospitalizations for falls increased (or declined less than expected) in service units with greater amounts of such training. The coefficients for the other activities listed—training in cultural identity and stress management and distribution of friction strips—were in the "right" direction, but well within the range of random fluctuations in samples of this size; that is, they were not large enough to be considered statistically reliable. The R^2 of 0.35 indicates that about 35 percent of the variation in changes in fall injury rates can be attributed to factors in the model. Much variation remained unexplained.

Associations of hospitalizations for motor vehicle injuries and possibly relevant CIC activities are also shown in table 2. None of the coefficients was statistically significant, and the variance explained was extremely low, only 7 percent.

Regression results for hospitalizations resulting from assaults are presented in table 2. None of the activities possibly relevant to reduction of the incidence or severity of these injuries was statistically significant by usually accepted standards. The variation explained was again extremely low, only 3 percent.

Changes in diagnosed suicide attempts that resulted in hospitalization are also analyzed in relation to injury control activities (table 2). The only coefficients that were statistically significant were those for training in poison prevention and fire safety. Although a decrease in suicide attempts occurred in areas where fire safety training was more frequent, the direction of the coefficient on poison prevention indicated increased suicide attempts in service units where there was training in poison prevention. About 23 percent of the variance is explained by the model.

Changes in hospitalization rates for poisoning were not significantly related to relevant control activities (see regression analysis in table 2). About 5 percent of the variation was accounted for by the activities in the model.

None of the relevant CIC activities was correlated significantly with changes in the rate of hospitalizations because of wounds from cutting and piercing objects (table 2). About 11 percent of the variation was explained in this model.

The regression analysis of change in hospitalizations related to injuries from fire and smoke is presented in table 2. The model explained only about 6 percent of the variation, and not one program activity was correlated to a statistically significant degree with the change in hospitalization rates.

Discussion

This analysis suggests that some of the reduction in hospitalization rates for injuries that occurred from 1980-81 to 1983-84 in IHS service units can very likely be attributed to specific injury control activities. Reductions in hospitalizations for falls were associated with training in general safety, recreational safety, and first aid. The two other types of injuries with the greatest declines in hospitalizations, those related to motor vehicles and assaults, were not associated with specific activities. Less of a trend was seen in other types of injury, and there were few correlations with injury control activity. Hospitalizations for suicide attempts apparently declined more in service units with greater fire safety training.

The fact that other activities were not significantly associated with injury reduction cannot be taken as conclusive evidence that they are totally ineffective. The analysis is not refined to the extent that it is possible to link persons with particular training or safety equipment with exposure to hazard so it can be said that specific exposures cause less harm when the person is better trained or equipped. Although such an analysis would be more definitive in specifying the effect of training or available equipment on individual risk, it would not account for the possibility of information transfer, that is, persons trained may change the behavior of others by example or social influence. There is evidence from carefully controlled studies that training in motor vehicle safety and defensive driving does not reduce individual risk of injuries (*3*). The lack of correlation with hospitalizations here is, therefore, not unexpected.

Some studies suggest an increase in hazardous activity associated with some types of safety training (*3*). The increase in hospitalizations for suicide attempts associated with training in poison prevention could be causal if persons learned which poisons were more toxic and used that knowledge in suicide attempts. More detailed data on whether poisons were used in the suicide attempts would be needed to draw a stronger conclusion.

Average hospitalizations per 100 population by cause, 1980-84, Indian Health Service

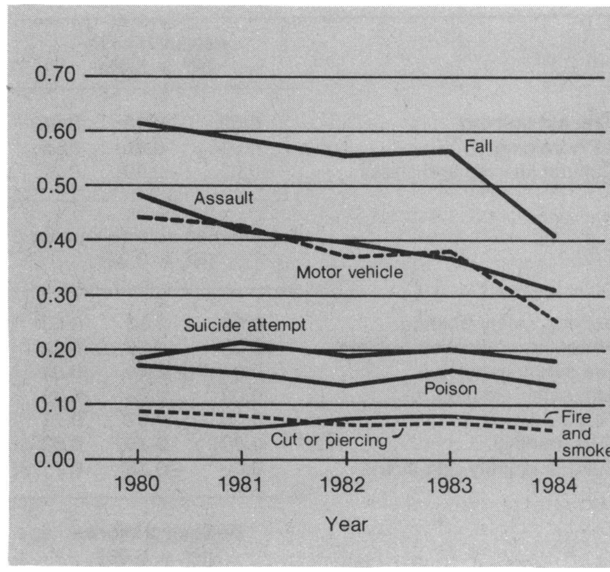

Table 2. Regression analyses of changes in injury-caused hospitalizations from 1980-81 to 1983-84 in association with injury control activities in 54 service units of the Indian Health Service

Activity	*Regression coefficient*	*t*	*P*
	Fall injuries (R^2 = 0.35)		
General safety training	−0.02	−2.29	0.03
Recreation safety training	−0.01	−2.18	0.03
Occupational safety training	0.03	2.34	0.02
First-aid training	−0.04	−2.55	0.01
Cardiopulmonary resuscitation (CPR) training	0.04	3.25	0.01
Cultural identity and stress	−0.03	−1.56	0.13
Friction slips	−0.21	−1.26	0.21
	Motor vehicle injuries (R^2 = 0.07)		
Motor vehicle safety training	−0.02	−1.47	0.15
Defensive driving	−0.01	−0.67	0.51
General safety training	0.00	0.22	0.83
First aid training	0.00	0.22	0.83
CPR training	0.00	0.08	0.94
Culture identity and stress	0.00	−0.14	0.89
Child restraint distribution	0.01	0.20	0.84
	Assault injuries (R^2 = 0.03)		
General safety training	0.00	0.11	0.91
Gun safety training	0.00	0.34	0.74

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Activity	Regression coefficient	t	P
	Assault injuries ($R^2 = 0.03$)		
First aid training	0.00	0.03	0.98
CPR training	0.01	0.46	0.65
Cultural identity and stress	−0.02	−0.90	0.37
	Attempted suicide injuries ($R^2 = 0.23$)		
General safety training	0.00	−0.63	0.53
Poisoning prevention training	0.08	2.66	0.01
Fire safety training	−0.04	−2.41	0.02
Gun safety training	0.00	0.26	0.79
First aid training	0.00	−0.37	0.71
CPR training	0.00	0.48	0.63
Cultural identity and stress	0.00	−0.38	0.71
	Poisoning injuries ($R^2 = 0.05$)		
General safety training	0.00	−0.70	0.48
Poison prevention training	0.02	0.63	0.53
First aid training	0.00	−0.26	0.79
CPR training	0.01	0.59	0.56
Cultural identity and stress	−0.01	−1.15	0.26
	Cutting and piercing object injuries ($R^2 = 0.11$)		
General safety training	0.00	−0.04	0.97
Recreation safety training	0.00	−1.25	0.22
Occupational safety training	0.01	1.40	0.17
First aid training	−0.01	−1.36	0.18
CPR training	0.00	0.53	0.60
Cultural identity and stress	0.00	−0.57	0.57
	Fire and smoke injuries ($R^2 = 0.06$)		
General safety training	0.00	−1.18	0.24
Fire safety training	0.00	0.67	0.50
First aid training	0.00	−0.72	0.47
CPR training	0.00	0.49	0.62
Cultural identity and stress	0.00	−0.39	0.70
Smoke detectors	0.00	0.53	0.60
Fire extinguishers	0.01	0.76	0.45

The association of increased injuries from falls with occupational safety and CPR training is puzzling. It is conceivable that this training would make people overly confident, but no good experimental evidence exists to support such a hypothesis. In a presentation of these results at IHS, a member of the audience suggested that increased hospitalizations associated with CPR might occur because persons who would have died in the absence of CPR were surviving to be hospitalized. Data on mortality rates in relation to CPR training would be necessary to test that hypothesis.

The significant association of fire safety training with reduced suicides is odd. Inclusion of fire safety training in the suicide model is questionable. Because 1 in 20 correlations is significant at the 5 percent level by chance, this association could be meaningless.

Some of the lack of finding of effects could be due to the rarity of the outcome or the activities. For example, use of child restraints is known to reduce injury to children. The hospitalization rate for vehicle occupant injuries to children less than 5 years old was less than 0.1 percent per year, however. Therefore, the effect of child restraints would not be detectable in this analysis.

The reader should not be misled into thinking that all the reduction in hospitalizations shown in the figure resulted from the significantly correlated injury control activities. From 1980 through 1984, averaged per population among the studied service units, hospitalizations for motor vehicle injuries fell 41 percent, and those from assault and falls each fell 35 percent. With only a few percent of the population trained in relevant correlated activities for injury control, and allowing for some effect of information transfer, these activities could account for only a fraction of the observed reductions in hospitalizations.

It is possible that some activities were better conducted than others or were better targeted at the most vulnerable populations in individual service units, but that the effects would not show up in an aggregate analysis. It is likely that other favorable trends have had a substantial effect. For example, motor vehicle safety standards reduce injury (*3*), and preregulation vehicles were being junked at an accelerating rate during the 1980s. Improved housing, changes in use of alcohol, and the like could contribute to the reductions in hospitalizations from falls and assaults. Although these rates declined in the same period, the declines among them are not highly correlated among service units. In other words, a service unit that had a large decline in hospitalizations for falls did not necessarily have a decline in hospitalizations for motor vehicle or assault injuries. This lack of correlation suggests that some unmeasured activity, such as alcohol programs or improved emergency medical services, does not account for a great deal of the seemingly parallel declines in hospitalizations because of falls, motor vehicle injuries, and assaults seen in the averages for all service units.

Injury control activities in specific communities not specifically initiated by the committees may also be a factor. For example, in one service unit visited during this study, a fence to keep animals from wandering onto the road had been constructed by the State after a lawsuit was filed regarding injury to persons in a vehicle that struck a horse in the road. Documentation of all the factors that could have changed the injury rates was beyond the scope of this investigation, if such documentation is possible from existing records.

IHS is examining its CIC programs in an attempt to accelerate improvement in injury rates. Although some success related to specific injury control activities can be inferred from this preliminary evaluation, it is evident that more precise targeting of activities toward specific hazards is needed. At the current rate of training a few percent of the population annually on a wide range of aspects of the injury problem, a new generation will be born and will grow up by the time the present population is trained, assuming that they were all reachable. A comprehensive surveillance program should reveal specific hazards for amelioration. The logic supporting such a program should be obvious. For example, it makes no sense to distribute friction strips for bathtubs if most injuries from falls occur on icy porches.

Detailed protocols for injury surveillance have been developed, and menu-driven computer programs for data gathering and analysis are being distributed to CIC committees. A cooperative agreement with the Centers for Disease Control, Public Health Service, for demonstration programs has been concluded. These activities could prove to be models in community injury control for the nation.

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Urban AHECs: A Comparison With Rural AHECs

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Synopsis

The first generation of projects in the Federal Area Health Education Center (AHEC) Program was funded in 1972. Those AHEC projects, located in predominantly rural areas, focused on problems that resulted from the geographic maldistribution of health professionals, especially primary care physicians. Education programs for health professionals, students, and practitioners were used to influence the geographic distribution of health professionals and to improve access to and quality of health care for underserved populations. In 1976, the Congress redrafted the law authorizing the expenditure of funds for AHECs and emphasized that improving access to health care in urban underserved areas also was to be addressed by the program.

During the early years of urban AHEC development, it was not clear which lessons learned from rural AHEC experiences could be applied to urban communities and what would be the best focus for AHEC activities in the complex urban environment. Some said that urban areas were so different from rural areas—in economic, racial, and cultural terms and in the subtlety of barriers to health care—as to make the rural AHEC experience largely irrelevant. Others maintained that basic AHEC principles could be applied, regardless of setting, with changes only in tactics to address the problems of the urban inner city. Now that 18 of the total 53 AHECs nationally are urban, and a decade of experience in developing them has been