Analysis and Implications of Alabama Hunting Accidents, 1976–1985

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Abstract: Alabama hunting accident data collected from 1976 to 1985 were examined to assess trends and establish causal relationships. Species hunted, geographic area, time of day, type of firearm, age of shooter, and hunter judgement were major factors associated with hunting accidents. Close correlations seemed evident between hunters <18 years old without hunter education training and hunting accidents throughout the study period, while no correlation was evident for hunters <18 years old who had hunter education training. Recommendations were made for future data collection and analysis of hunting accidents occurring in the Southeast. Also, special areas of emphasis were highlighted to be stressed in future hunter education courses based on identified relationships between accidents and analyzed factors.

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Hunter education programs have been established by all states. Over the past 15 years, many states have enacted new laws such as mandatory hunter education, hunter orange dress requirements, and other safety-oriented regulations. While organization and execution of hunter education programs varies considerably between states, a common objective of all programs is to reduce hunting accidents. Most program professionals agree that hunter education has improved safety among hunters to some extent. The principal questions now are "What program changes are needed to further reduce hunting accidents?" and "Is it possible to predict the effects of a given change in laws or policies on accident statistics?"

Evaluating the effectiveness of hunter education programs presents a complex problem for those who seek to improve them (Bromley and Hampton 1981). Evaluation may begin with analysis of hunting accidents. Such analysis in Michigan (Langenau et al. 1985) and Virginia (Kerrick et al. 1978) provides insight into accident

characteristics and trends in those states. Accident data collected by the North American Association of Hunter Safety Coordinators (NAAHSC) provides summary information of accident statistics to program administrators for North America as a whole.

This paper reports trends in Alabama's hunting accident data and suggests improved methods of collection and analysis of such data in all states. Areas are identified where data are currently unavailable for analysis but could be very valuable when analyzed in conjunction with hunting accidents.

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Methods

Data were obtained for this report from 385 National Rifle Association of America Uniform Hunter Casualty Reports completed in Alabama from 1 September 1976 to 31 August 1986 by Alabama law enforcement officers. North American hunting accident data were obtained from NAAHSC Annual Hunting Accident Reports. License sales information was taken from the U.S. Fish and Wildlife Service Annual Statistical Summaries for Fish and Wildlife Restoration. Alabama's annual hunter mail survey provided hunter effort data and numbers of hunter education students were taken from Alabama's Game and Fish Division hunter safety files.

For Alabama, each year was defined in this paper as 1 September to 31 August to include all conventional hunting seasons. Each season was referenced by its beginning year. A hunting accident was defined as injury or death from a firearm or bow and arrow while involved in the activity of hunting. This definition does not include falling from a tree or tree stand where injury from the discharge of a firearm or point of an arror did not occur, as these accidents are not thought to be reported consistently in our data. Causes of Alabama hunting accidents were grouped similar to Langenau et al. (1985) and the Uniform Hunter Casualty Report Form (Table 1).

Results

Accidents

In Alabama, 385 hunting accidents occurred from September 1976 to August 1986. Of these, 95 (24.7%) were fatal and 93 (24.2%) were self-inflicted. Accidents/year increased over the period, however the hunting licenses sold/year declined (Fig. 1). Increase was also evident in accidents/100,000 licenses sold in Alabama, while the same statistic remained fairly stable for North America (Fig. 2). Accidents/million hunter-days were calculated to measure hunting accidents against actual hunter effort in Alabama, and as shown in Figure 3, this statistic also increased over the study period.

Table 1. Classification system we used for causal information on Alabama's hunting accidents.

Intentional discharge	Skill and aptitude	Safety	Mechanical failure	Other or unknown causes
Victim moved in line of fire	Shooter stumbled and fell	Clubbing cover or game	Defective firearm or bow	Other
Victim covered by shooter swinging on game	Trigger caught on object	Removing firearm from or replacing firearm in vehicle	Defective ammunition	Unknown
Victim out of sight of shooter	Loading firearm	Riding with loaded firearm		
Victim mistaken for game	Unloading firearm	Firearm fell from insecure rest		
Other intentional discharge	Other skill and aptitude	Horseplay with loaded firearm		
		Improper crossing of obstacles		
		Other safety		

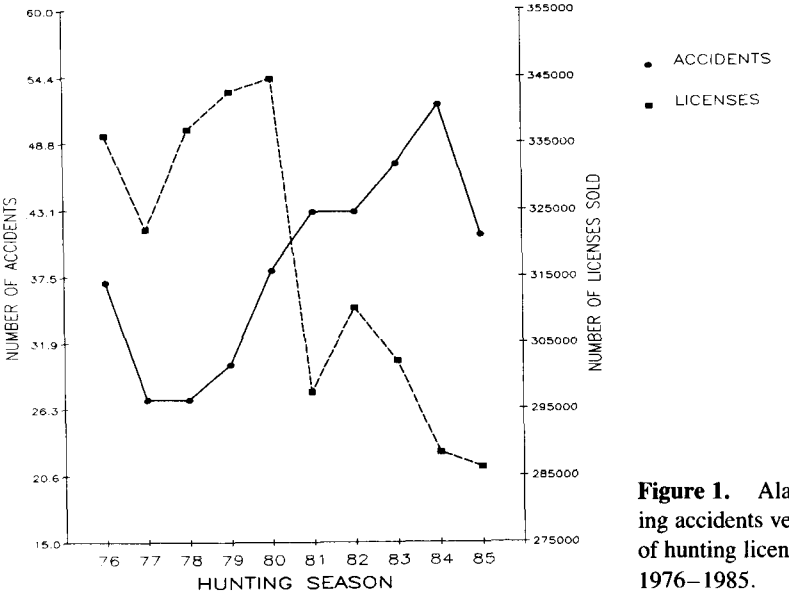

Figure 1. Alabama hunting accidents versus number of hunting licenses sold, 1976–1985.

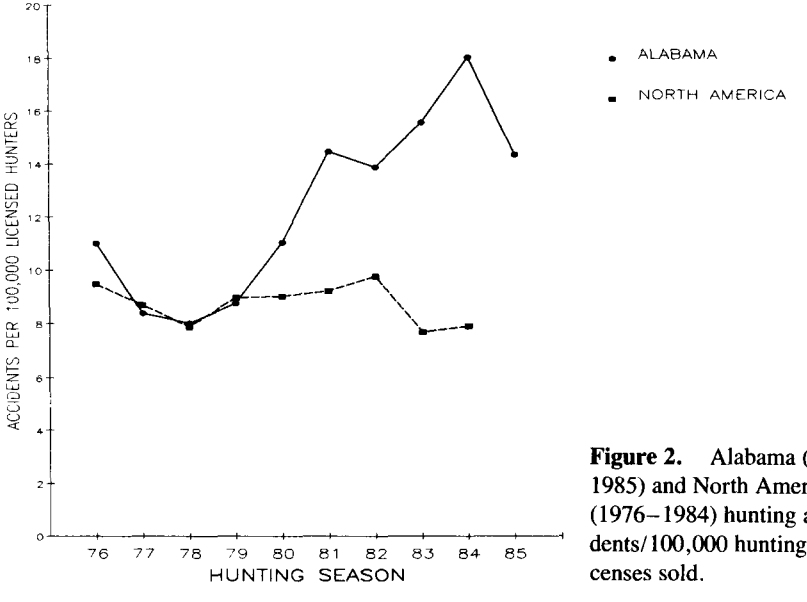

Figure 2. Alabama (1976–1985) and North America (1976–1984) hunting accidents/100,000 hunting licenses sold.

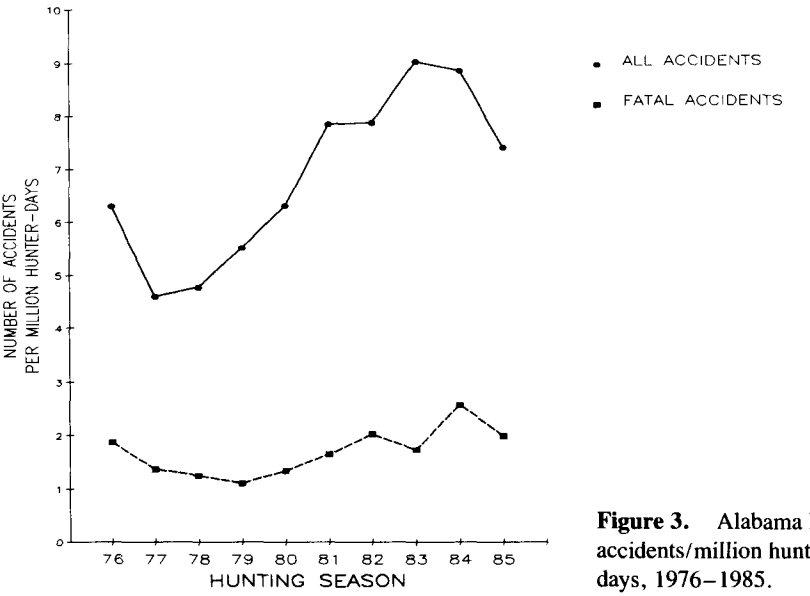

Figure 3. Alabama hunting accidents/million hunter-days, 1976–1985.

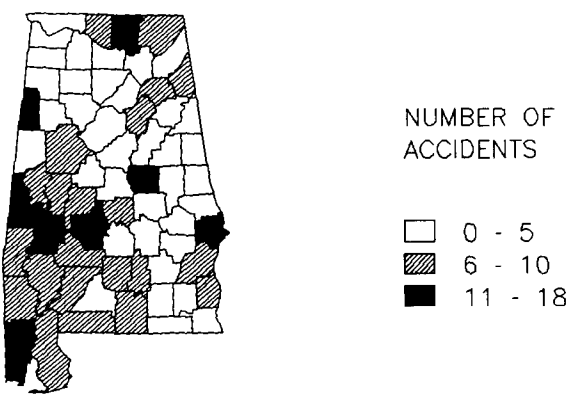

Figure 4. Alabama hunting accidents by county.

Geographic and Temporal Distribution

Clustered patterns are evident in geographic distribution and time of occurrence of accidents. Figure 4 illustrates the non-random geographic distribution. Most accidents occurred during November, December, and January, which coincide closely with most hunting seasons. Time of occurrence was reported for 354 accidents. We expected accidents would peak during dawn and dusk hours, when reduced visibility and perhaps heavy hunting activity occurred. However, hunting accidents in Alabama were concentrated between 0600 hours and 1200 hours and between 1400 hours and 1800 hours with peak hours from 0900 to 1000 hours and

1500 to 1600 hours. Similar data were reported for Virginia hunting accidents (1961–1971) (Kerrick et al. 1978). As in Alabama, a very low percentage of accidents occurred in Virginia during the dawn and dusk hours. Accidents in Virginia were more evenly distributed through the daylight period, showing a smaller drop during mid-day than in Alabama.

Type of Game

Variability also occurred when the data were examined by type of game hunted. This information was reported for 377 of the 385 accidents. Of these, 233 (61.8%) were deer hunting accidents. Turkey hunting in Alabama had the highest accident rate (accidents/million hunter days), followed by deer, squirrel and rabbit, upland game birds, and duck. Turkey hunting also had the highest accident rate in Michigan, followed by upland game birds, rabbit, deer, and squirrel. In Virginia (Kerrick et al. 1978), big game hunting (deer, turkey, and bear) accounted for only 28% of hunting effort, but 47% of hunting accidents.

Deer and turkey hunting accidents increased over the study period, while number of accidents for all other game varied considerably and showed no evident trend. When considered in terms of accidents/million hunter days, deer and turkey (particularly turkey) accidents increased.

Equipment

Shotguns were used in the majority (70.3%) of the 384 hunting accidents for which type of equipment was recorded. These data are comparable to accidents in Virginia (shotgun accidents = 71.6%), but in Michigan and North America, shotguns were used in only 62% and 57.9% of accidents, respectively. Kerrick et al. (1978) believed that hunters in Virginia probably hunted more with shotguns and less with rifles than other American hunters. Michigan hunter-effort statistics showed that handguns there had the highest accident rate (35.6 accidents/million hunter-days), followed by shotguns (6.9), rifles (6.4), and bow and arrow (0.7). Comparable data were not available for Alabama hunting accidents.

In Michigan, 52.3% of deer-hunting accidents were caused by rifles, while only 33.5% were caused by shotguns. Statistics on hunter effort by both game and equipment are not available for Alabama. In Mississippi, Steffen (1987) reported that 65.6% of hunters preferred rifles for deer hunting compared with only 33.9% who preferred shotguns. However, he also noted regional differences, with 64.2% of hunters in the coastal and southeast regions preferring to hunt deer with shotguns and buckshot.

Distance

Distance from the firearm to victim was reported for 344 of Alabama's hunting accidents. Total accidents declined as distance from firearm to victim increased. Very few intentional discharge accidents occurred at 0 to 9 m. Most occurred at 10 to 46 m and all accidents >46 m were caused by intentional discharge. Distance data for Alabama and Virginia are compared in Table 2. Over the study period,

Table 2. Distribution of all and intentional discharge hunting accidents by distance from firearm to victim in Alabama and Virginia.

State	0–9 m	10–46 m	47–91 m	92 m
Alabama (1976–1985)	43.9%	37.2%	15.1%	3.8%
Intentional discharge	7.8%	58.3%	27.1%	6.8%
Virginia (1961–1976)	49.6%	28.7%	15.7%	6.0%
Intentional discharge	9.3%	50.1%	28.8%	11.8%

some increase in total accidents seemed evident in all distance classes. For intentional discharge accidents, increase over time was most prominent in the 10–46 m category, also occurred >46 m, but did not occur at 0 to 9 m.

Age of Shooter

Age of shooter was reported for 317 of the 385 hunting accidents. When the proportion of each age group in the hunter population is compared with the percent of accidents caused by that age group, older age classes appear to be safer hunters. The trend of fewer accidents in older age classes is also evident in North American hunting accidents from 1981 to 1984. However, all age classes may not spend equal time afield. A survey of first-year hunters in New Jersey revealed that hunters 14 to 19 years old spent an average of 19.0 days afield during the 1976–77 hunting season, while hunters under 14 (required by law to be accompanied by an adult when hunting) and over 20 spent an average of only 12 days afield (Applegate and Otto 1982). Young hunters may have greater opportunity to hunt than older hunters (who may be limited by employment responsibilities). Therefore, the disproportionality between percent of accidents caused and percent of the hunter population represented by younger age groups in Alabama could be attributed to their spending more time afield than older hunters.

Cause

Intentional discharge accounted for 59.0% of Alabama and 45.6% of North American hunting accidents. Through the study period these accidents increased as did skill and aptitude accidents (Fig. 5). Accidents caused by violations of laws or safety rules remained stable. Almost half of intentional discharge accidents were victims mistaken for game. Increase over time was evident for most of the specific causes in the intentional discharge category.

Cause by Age

Cause in association with age of shooter (Table 3, Fig. 6) was examined using data reported in the 1980 Survey of Fishing, Hunting, and Wildlife-associated Recreation. Percent of accidents in each age class by cause was compared with percent occurrence of that age group within Alabama's hunting population as a whole. Percent of intentional discharge accidents compared closely to percent occurrence by age group. A greater percentage of skill and aptitude and violation of laws or safety

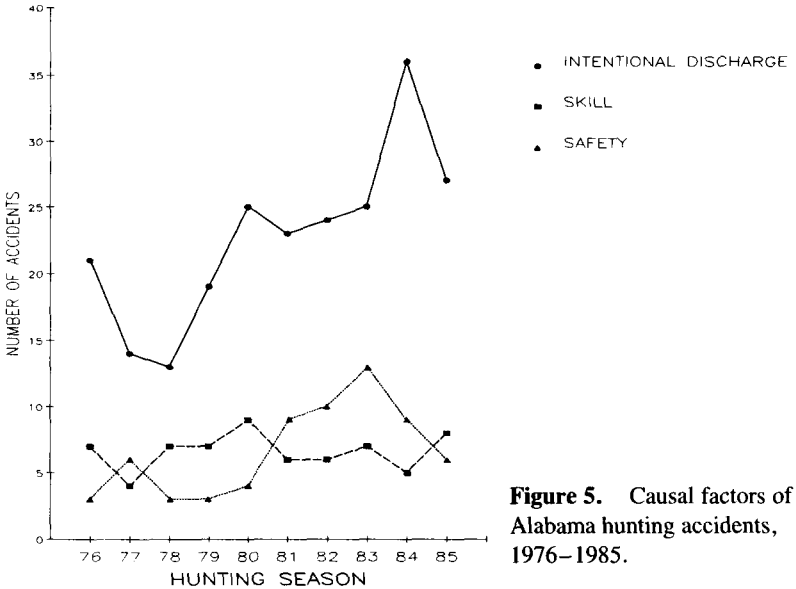

Figure 5. Causal factors of Alabama hunting accidents, 1976–1985.

Table 3. Percent of Alabama's hunting accidents by cause and age group.

Age group	% of hunter population (1980)	% of all accidents	% of intentional discharge accidents	% of skill accidents	% of safety accidents	% of mechanical failure accidents
<18	21.2	32.8	23.4	46.8	45.2	42.9
18–24	17.9	18.9	20.5	19.4	14.5	28.6
25–34	23.3	21.8	22.8	12.9	29.0	0.0
35–44	15.2	10.7	11.1	12.9	4.8	28.6
45–54	12.5	7.9	12.3	0.0	3.2	0.0
>54	9.9	7.9	9.9	8.1	3.2	0.0

rules accidents was caused by hunters <18 than predicted on the basis of this group's proportion in the hunter population. Percent violation of laws or safety rules was very low for the oldest 3 age categories. Sample size could influence these findings as well as variation in the age composition of the hunter population between years.

Cause by Equipment Type

Intentional discharge accidents were highest of causes examined for both shotguns and rifles. Where cause was known, there were 248 shotgun accidents, 3 (1.2%) of which occurred while loading or unloading the firearm. However, 11 (12.4%) of the 89 rifle accidents occurred while loading or unloading. Michigan deer rifle versus shotgun accidents showed similar differences in percent of accidents occurring while loading or unloading the firearm.

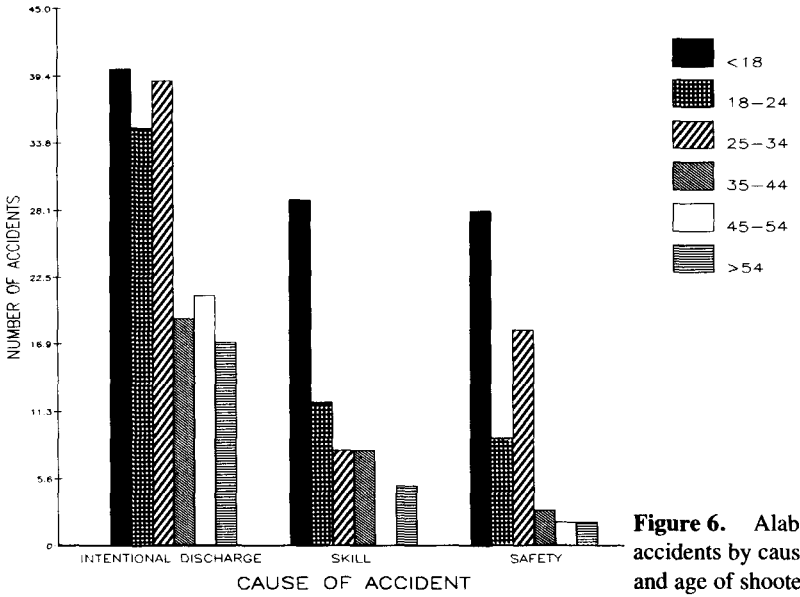

Figure 6. Alabama hunting accidents by causal factor and age of shooter.

Table 4. Alabama's hunting accidents by cause, type of equipment, and game pursued.

	Intentional discharge	Skill	Safety	Mechanical failure
Deer				
Shotgun	108 (31.30%)	10 (2.90%)	23 (6.67%)	—
Rifle	29 (8.41%)	20 (5.80%)	19 (5.51%)	2 (0.58%)
Handgun	1 (0.29%)	2 (0.58%)	—	—
Bow and arrow	2 (0.58%)	1 (0.29%)	—	—
Primitive	—	—	1 (0.29%)	—
Turkey				
Shotgun	30 (8.70%)	—	1 (0.29%)	—
Rifle	1 (0.29%)	—	—	—
Squirrel and rabbit				
Shotgun	24 (6.96%)	6 (1.74%)	10 (2.90%)	1 (0.29%)
Rifle	4 (1.16%)	7 (2.03%)	6 (1.74%)	1 (0.29%)
Handgun		1 (0.29%)	—	—
Dove and quail	18 (5.22%)	7 (2.03%)	5 (1.45%)	2 (0.58%)
Duck				
Shotgun	1 (0.29%)	2 (0.58%)	—	—

We also examined accidents stratified by cause, equipment used, and type of game hunted (Table 4). Nearly ⅓ of all accidents in Alabama resulted from the intentional discharge of shotguns while deer hunting. Almost all (94%) turkey hunting accidents were intentional discharge with shotguns.

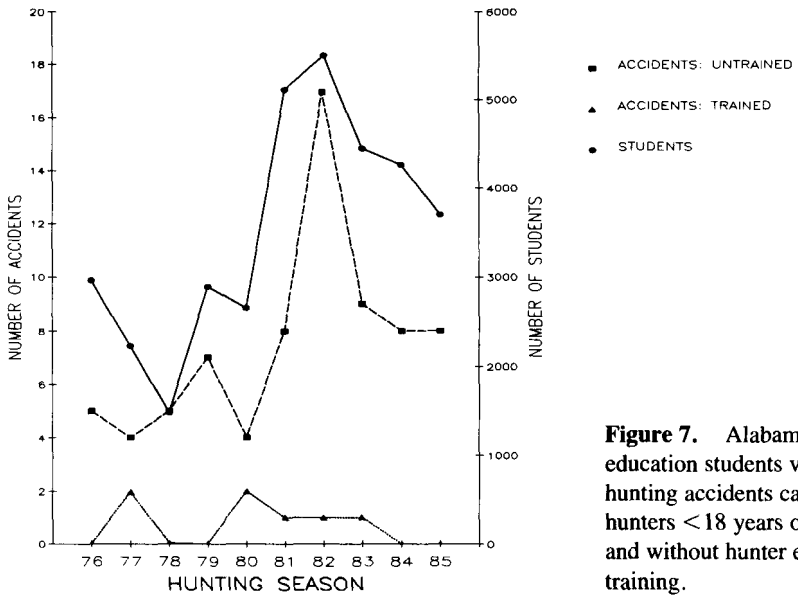

Figure 7. Alabama hunter education students versus hunting accidents caused by hunters <18 years old with and without hunter education training.

Accidents by Completion of Hunter Education

Students enrolled in hunter education classes in Alabama varied by year from a low of 1,484 to a high of 5,497 over the study period. A close correlation seemed evident when total students (all ages) were plotted with accidents caused by hunters <18 years old who had not taken a hunter education course; but no correlation was evident when the data were plotted with accidents caused by hunters <18 who had taken a hunter education course (Fig. 7). Where hunter training status was known, only 9 (4.1%) of 213 accidents in Alabama (1976–1985) were caused by trained hunters, compared with 69 (10.0%) of 691 accidents in Virginia (1961–1976). These data indicate that hunter education training has been effective in reducing hunting accidents among hunters <18 years old in Alabama. This conclusion assumes that trained and untrained hunters are similar, and that their numbers change proportionally through time in comparison with the total hunter population. This assumption is supported by the close correlation between hunters <18 years old in accidents and numbers of hunter education students through time.

Discussion and Conclusions

Hunting accidents in Alabama were not random events, but were instead heavily biased towards certain factors. Distribution of accidents within the state showed "hot" areas which probably are related to game densities and/or habitat types. Southeastern Cooperative Wildlife Disease Study maps for deer and turkey populations indicate high densities in the southwest quarter of Alabama, corresponding to the dense hunting accident quarter. Most accidents occurred while deer

hunting, and intentional discharge of shotguns while deer hunting accounted for a particularly high proportion of Alabama's hunting accidents. Both turkey populations and numbers of turkey hunters are increasing in the southeast. Data show a strong increasing trend in intentional discharge accidents occurring while turkey hunting. This trend is likely to continue unless specific actions are taken. Shotguns caused most accidents and were prominent in intentional discharge accidents while rifles dominated accidents when loading or unloading the firearm. Some rifles may be more difficult to load and unload than shotguns, and/or some hunters may be less skillful with rifles.

Hunters under 18 years old were involved in a high percentage of accidents. Either this age group hunted disproportionally more than other age groups examined, or the data suggest a strong bias in accidents caused by these ages. Correlations indicate that hunter education has reduced accidents among trained hunters <18 years old. This information should be verified by similar data analysis from other states; however, coupled with the results from Michigan and Virginia, a strong case exists for mandatory hunter education.

Recommendations

Most of the broad impacts of hunter education on accidents probably are reflected in the data currently being collected in most states. Now the task is to pinpoint the problem areas, modify hunter education programs to directly address those areas, then evaluate results in terms of changes in hunter behavior. Accomplishment of this task will require a more sophisticated data collection and analysis scheme than is currently in use. The greatest weakness in current results is that they are interpreted from a set of data created by accidents rather than a set of data on the entire hunter population for a given state or province (Kerrick et al. 1978). Baseline information is essential to draw a conclusion about a population of hunters just as it is to analyze interactions within a wildlife population; however, few states collect such data on an annual basis.

The following are recommended for improved data collection and analysis:

(1) Individual accident reports for several southeastern states should be pooled and analyzed using an ANOVA design which incorporates changes in the law to encourage hunter orange, hunter education, changes in demographics, differences in stringency of game laws between states, hunter density, economic factors, weather, game populations, and other factors identified by program professionals.

(2) A permanent database should be established and updated each year so trends can be analyzed quickly and prescribed changes in state regulations and hunter education programs evaluated.

(3) The database should be designed to address not just accidents, but the hunting population as a whole.

(4) An annual data collection design that incorporates demographic information with statistics on the hunter population should be established for each state in the Southeast.

(5) Agency administrators should strongly encourage all personnel reporting to fill out the Hunter Casualty Report Form completely.

(6) The Hunter Casualty Report Form should be modified to include: (a) exact location of the accident, including name of hunt area, if any, (b) an "other" designation within each of the 3 main cause categories (intentional discharge, skill, and safety), and (c) whether or not the shooter in an intentional discharge deer hunting accident was on an either-sex or bucks-only hunt.

(7) A 10% sample of accidents reported in each state should be investigated in detail by the hunter education coordinator to collect the maximum amount of data, such as who was in the hunting party (ages, relationships, personalities), what habitat, weather conditions, etc. This sample could then be used to establish otherwise difficult predictive relationships and answer such questions as "Do accidents occur more often in the <18 age group when adult supervision is not present on the hunt?" and "Is the age of the supervisor important?"

(8) To clarify exactly what constitutes a hunting accident, we recommend the states establish separate classes or levels of accidents, such as "Firearm (including bow and arrow) while hunting" (a hunting accident as defined in this paper), "Non-firearm while hunting" (tree and tree stand falls, heart attacks, drowning, etc.), and "Firearm while outside the actual activity of hunting" (e.g., occurring inside hunting cabin). Accident data from the last 2 categories should be collected, recorded, and analyzed separately from the first.

(9) Collected data should be expressed as hunter-days of effort by species and type of firearm, rather than per 100,000 hunters or licenses sold. The latter measure is hampered by variability of species hunted between states, firearms used, and lack of data on hunters not required to purchase licenses. Hunter effort may vary by age as well; therefore, care should be taken to obtain effort data from all hunter age groups, not just license buyers.

To be more effective in reducing hunting accidents, hunter education programs must improve information provided to the hunting public concerning intentional discharge accidents while hunting deer and turkey with shotguns. Most persons involved in this type of accident have not taken a hunter education course. An intensive program aimed at all hunters is needed to attack this problem. Timely, localized education efforts should be stressed in geographic accident "hot spots." A concise brochure, leaflet, and/or public service announcement targeting deer and turkey hunters and specifically describing conditions under which most accidents occur (times, locations, activities, etc.) should be shown to every hunter. The wearing of hunter orange should be strongly encouraged.

The prevalence of intentional discharge accidents mandates that hunter education courses stress that a hunter be sure of his target and think about where the shot will stop before pulling the trigger. Mandatory hunter education would increase safety among young hunters. Courses should stress safety to prevent all types of hunting accidents, particularly intentional discharge. Where possible, instructors should add realism to their courses through simulated field situations and hunting

activities. Special attention should be paid to safe loading and unloading of rifles, as well as shotguns, and students should be provided experience with both.

Enforced hunter orange laws covering all deer hunting activity could help reduce accidents during mid-morning and mid-afternoon when hunters are going to and from stands. Special emphasis should be placed on reducing the occurrence and severity of turkey hunting accidents. Research should be conducted on the reactions of turkeys to bright colors (such as hunter orange) and on the use of bullet-resistant cloth for use in face masks or veils. Special turkey hunting courses should stress the high rate of accidents caused by intentional firearm discharge and the importance of being sure of the target and impact zone.

Although some problem areas have been identified and solutions suggested, this analysis of Alabama's hunting accidents has raised more questions than it has answered. The resulting recommended data collection and analysis schemes should provide direction in finding answers to the many remaining questions concerning improvement of hunter safety.

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