Fatal Unintentional Injuries Among Kentucky Farm Children: 1979 to 1985*

Lorann Stallones

ABSTRACT: *The hazards of farming among adults have been well described, but less has been published regarding the nature of farm injuries among children. Fatal farm injuries in Kentucky among children under 14 years of age usually have involved agricultural equipment, primarily tractors. The average annual age specific rates for fatal injuries in Kentucky among farm children ranged from 14.8 per 100,000 to 28.5 per 100,000 for boys, and from 11.8 per 100,000 to 3.1 per 100,000 for girls. Many of these deaths could have been prevented by not allowing children to ride on tractors, or by using infant and child restraints in motor vehicles. In the older age group (10 to 14 years of age), many deaths were due to drowning, so drowning prevention programs could reduce the number of fatal injuries. Exposure to environmental hazards differ for farm children and prevention programs in this population need to target those special hazards.*

Fatal injuries are the leading cause of death among children ages 1 to 14 years in the United States (Pless & Stulginskas, 1982). While deaths from other causes have declined, fatal injuries have not and currently comprise approximately half of all deaths (Pless & Stulginskas, 1982). The leading agent of death for children under 14 is the motor vehicle, followed by drowning and burns (Pless & Stulginskas, 1982). The recognition of the motor vehicle as a major agent has led to state laws regarding restraining children in vehicles. If the experience in Washington State is duplicated (Scherz, 1976), a significant reduction in deaths will occur. In Sweden, a targeted program for the prevention of childhood injuries resulted in a dramatic reduction in drownings, burns, suffocation and poisoning (Berfenstam, 1977).

Prevention programs should target the leading agents of fatal injury, but these may differ greatly from one population to another because exposure patterns differ. One population of children that has been reported to have a high number of injuries is farm children (Field & Tormoehlen, 1982). Farm work experience begins at an early age with children riding on tractors driven by parents or grandparents (Murphy, 1986). The children then begin to operate tractors at an early age and are allowed to drive tractors around the farm by age 10 (Murphy, 1986). By age 14 children are involved in chores using tractors including some field work (Murphy, 1986). This results in the

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accounted for 20 percent of inju
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Among those children injured
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Materials and Methods

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combined exposure to a hazardous play and a hazardous work environment (Field & Tormoehlen, 1982). The tractor was the primary agent of injury in 61 percent of the deaths among farm children in Indiana occurring between 1970 and 1981 (Field & Tormoehlen, 1982). Other farm machinery accounted for 20 percent of injury deaths (Field & Tormoehlen, 1982). The tractor fatalities were the result of being run over in 44 percent of the deaths. Among those children injured by farm equipment other than tractors, 27 percent were run over (Field & Tormoehlen, 1982). Similarly, in Wisconsin between 1970 and 1984, 41 percent of fatal farm injuries among children resulted from exposure to tractors, and 31 percent were from exposure to other farm equipment (Tormoehlen, 1986).

The farm environment varies radically from one state to another based on geography and on primary type of agriculture. Reviewing detailed descriptions on death certificates may yield a more accurate assessment of the magnitude of the problem of fatal farm related injuries among children.

The purpose of this study is to describe the pattern of occurrence of fatal farm related injuries among children under 15 years of age in Kentucky. Currently, the major prevention strategy related to all farm injuries has been safety education usually conducted by cooperative extension agents. Without good baseline information, however, educational programs cannot be evaluated. Therefore, the current study was also conducted to identify education strategies which would be useful in preventing fatal farm injuries among children in Kentucky and to provide baseline data for future evaluations of ongoing safety education programs.

Materials and Methods

All death certificates indicating an intentional or unintentional injury (E800-E989, Ninth Revision of the International Classification of Diseases) occurring among Kentucky residents from 1979 to 1985 were manually reviewed seeking any mention of farm, farm equipment, farm produce or farm-related activity. Only those unintentional injuries (E800-E949) that occurred among children under 15 years of age were used for the present report. Death certificates were not restricted to deaths occurring on the farm because the children often travel with a parent when transporting produce to market. These injuries would occur on the road or highway, but should be considered in prevention strategies targeted at fatal farm-related injuries occurring among children. Additionally, a computer file with information from all deaths occurring among Kentucky residents between 1979 to 1985 coded E800-E989 was obtained from the Kentucky Division of Health and Vital Statistics. Deaths from the same ICDA codes for the United States were obtained from the published vital statistics for the U.S. for 1980 (U.S. Department of Health and Human Services, 1982). Because all farm-related deaths occurred among whites, only those deaths occurring among white

Table 1. Unintentional Fatal Injuries (ICDA E800-949) per 100,000 Population Among Children by Age and Gender.

Gender/Age	Kentucky Farm Population*	Kentucky Whites*	United States Whites**
Boys			
0-4	14.8	23.2	28.8
5-9	27.4	17.8	16.4
10-14	28.5	25.9	20.9
Overall	24.5	22.4	21.9
Girls			
0-4	11.8	15.7	20.5
5-9	11.6	11.6	9.7
10-14	3.1	9.1	8.8
Overall	8.2	11.4	12.8

* Average annual rates based on deaths occurring between 1979 and 1985. Denominators are from the 1980 census.
** Rates are based on deaths occurring in 1980. Denominators are from the 1980 census.

Kentucky children and white U.S. children were used to calculate rates.

Denominators used to calculate rates for the farm children were obtained from the U.S. Bureau of the Census as a special tabulation based on the 1980 census count of the farm population in Kentucky by age (in five-year intervals), race, gender, and county of residence. Denominators for the population of Kentucky are based on the 1980 census (U.S. Department of Commerce, 1982) and denominators for the U.S. white children also are based on the 1980 census (U.S. Department of Commerce, 1988).

Results

Using the farm place of injury code, 48 children were identified as having died between 1979 and 1985 on Kentucky farms. However, in the hand search, an additional 13 deaths were identified as farm-related according to detailed death certificate information. Of the 13, five died at home, but somewhere in the description farm or farm equipment was mentioned; three died on a street with farm equipment mentioned; three died elsewhere; and in two deaths the place of injury was not stated. Of the 48 children identified as having died on a farm, three children were killed in small

Table 2. Motor Vehicle Fatalities (Population Among Child

Gender/Age	Kentucky Farm Population*
Boys	
0-4	2.1
5-9	5.5
10-14	2.7
Overall	3.4
Girls	
0-4	4.7
5-9	0.0
10-14	0.0
Overall	1.3

* Average annual rates based on deaths oc tors are from the 1980 census.
** Rates are based on deaths occurring in 19

plane crashes that occurred on Kent the current report because they did n One additional death that had bee actually occurred on a school playgr the reported deaths in this study. T among Kentucky farm children unde 1979 and 1985 was 57.

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Table 2. Motor Vehicle Fatalities (ICDA E810-825) per 100,000 Population Among Children by Age and Gender.

Gender/Age	Kentucky Farm Population*	Kentucky Whites*	United States Whites**
Boys			
0-4	2.1	7.6	9.0
5-9	5.5	9.5	8.7
10-14	2.7	10.9	10.9
Overall	3.4	9.4	9.6
Girls			
0-4	4.7	7.0	7.6
5-9	0.0	6.7	5.7
10-14	0.0	6.3	5.7
Overall	1.3	6.3	6.3

* Average annual rates based on deaths occurring between 1979 and 1985. Denominators are from the 1980 census.
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plane crashes that occurred on Kentucky farms. These are excluded from the current report because they did not clearly occur among farm children. One additional death that had been coded as occurring on a farm had actually occurred on a school playground and also has been excluded from the reported deaths in this study. Therefore, the total number of deaths among Kentucky farm children under the age of 15 years reported between 1979 and 1985 was 57.

Table 1 contains the fatal injury rates by age and gender. Between birth and 4 years of age the injury rates were similar for the boys and girls living on farms. By ages 5 to 9 years, the rate for boys was twice the rate for girls and about seven times the rate for girls by ages 10 to 14 years. Rates for the Kentucky farm children were slightly higher than for Kentucky children in general, or for children throughout the U.S. However, age specific rates were higher only for boys 5 years of age and older. The female farm children had lower overall injury rates compared to the rates for Kentucky girls or U.S. girls. The most marked differences were for farm girls who were under 5 years of age and who were 10 to 14 years of age.

Motor vehicle injuries were separated from nonmotor vehicle injuries to assess whether the rates were different for the farm population contrasted with the Kentucky and U.S. children. Motor vehicle fatalities were more

Table 3. Nonmotor Vehicle Fatalities (ICDA E800-949 excluding E810-825) per 100,000 Population Among Children by Age and Gender.

Gender/Age	Kentucky Farm Population*	Kentucky Whites*	United States Whites**
Boys			
0-4	10.6	15.6	19.8
5-9	18.3	8.3	7.7
10-14	19.0	15.0	9.9
Overall	16.5	13.0	12.3
Girls			
0-4	7.1	8.7	12.9
5-9	11.6	4.9	4.0
10-14	3.1	2.7	3.1
Overall	6.9	5.1	6.5

* Average annual rates based on deaths occurring between 1979 and 1985. Denominators are from the 1980 census.
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Figure 1. Male Farm Children Injury Deaths By External Cause—1979-1985.

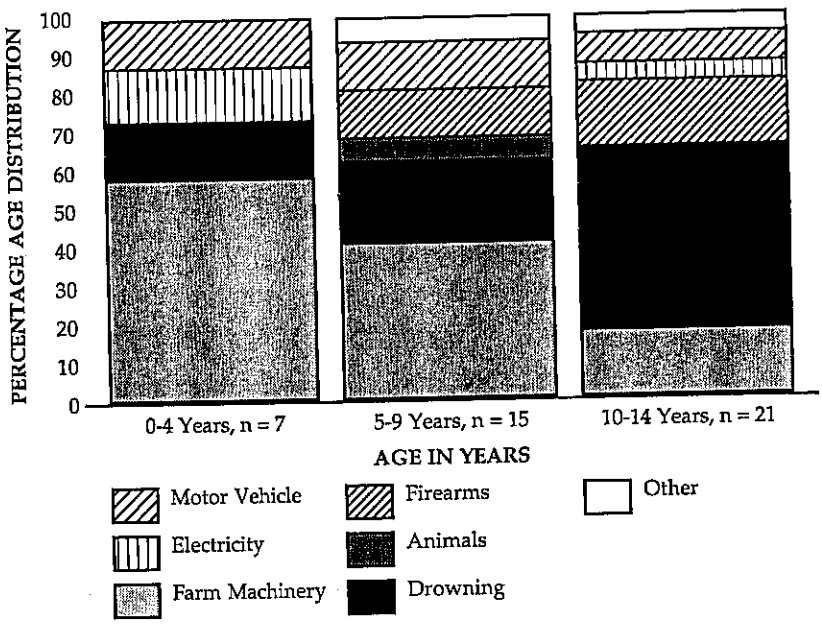
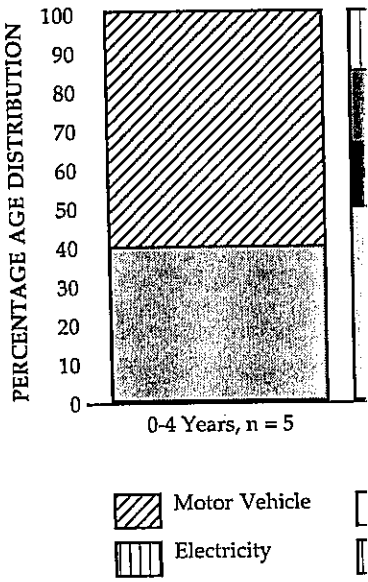


Figure 2. Female Farm Children I 1979-1985.



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Kentucky Whites*	United States Whites**
15.6	19.8
8.3	7.7
15.0	9.9
13.0	12.3
8.7	12.9
4.9	4.0
2.7	3.1
5.1	6.5

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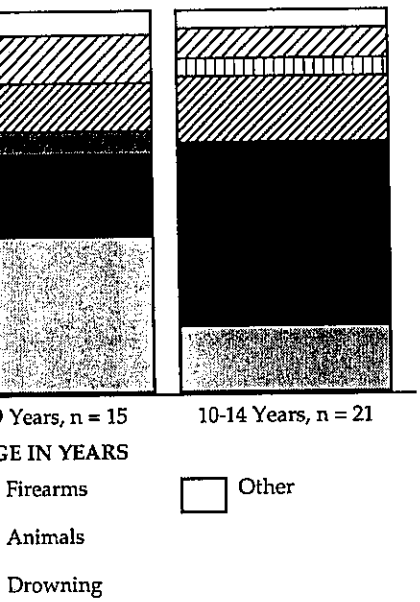
Deaths By External Cause—



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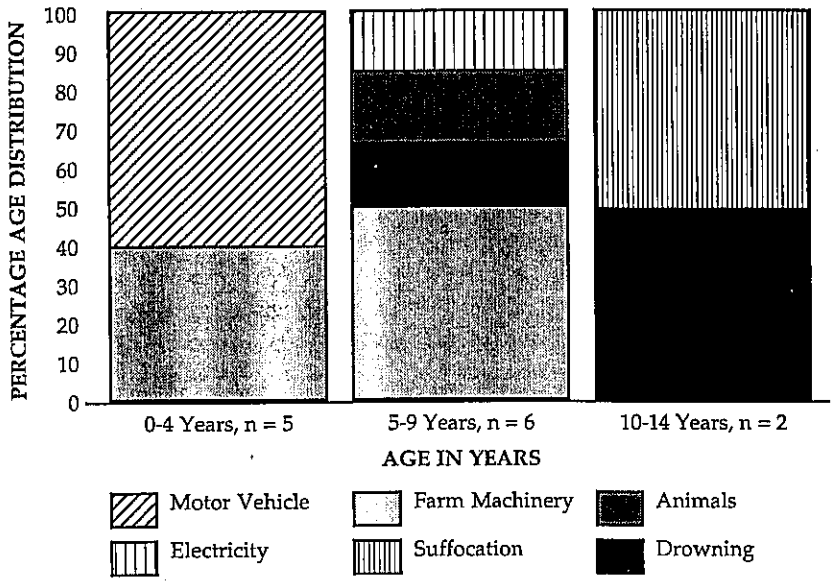

common among the Kentucky and U.S. children then they were for the Kentucky farm children.

Nonmotor vehicle fatalities were more common among the Kentucky farm children than among the Kentucky or the U.S. children. The difference was greatest among boys and girls who were 5 to 9 years of age.

Figure 1 contains the percentage distribution of deaths by external cause and age group for the Kentucky farm boys. Figure 2 contains the same information for the Kentucky farm girls. Table 4 contains the overall distribution of deaths among farm girls and boys by external cause of death. Children under 5 years of age were at high risk of dying because of exposure to agricultural machinery. All five of the girls under age 5 were killed as a result of falling off a tractor and being run over, by being run over by a truck driven by a parent, or by falling from a pick-up truck. Four of the seven boys under age five who died fell from a tractor, one was hit by a pick-up truck, one drowned one, and one was electrocuted when he walked into an electric fence.

Children between the ages of five and nine were similarly at risk of dying from exposure to farm machinery. Half of the girls 5 to 9 years of age who died fell off a farm tractor. Forty percent of the boys who died in this age group were killed due to exposure to agricultural equipment. One boy died in a gravity grain bin, and five were either run over or killed by a fall from a tractor.

Table 4. Percentage Distribution of Fatal Injuries Among Farm Children in Kentucky by External Cause of Death and Gender, 1979 to 1985.

External Cause of Death	Boys percent	Girls percent
Farm Machinery (tractors, others)	30.2	38.5
Drowning	34.9	15.4
Suffocation/Asphyxiation	0.0	7.7
Animals	2.3	7.7
Firearms	13.9	0.0
Electricity	4.6	7.7
Motor Vehicle (trucks, cars)	9.3	23.1
All Other	4.6	0.0

By the ages of 10 to 14 years, children on farms were more likely to die from drowning in farm ponds than from exposure to agricultural machinery. No girls died as a result of exposure to machinery and only 18 percent of the boys did. Another 18 percent of the boys 10 to 14 years of age died as the result of accidental gunshot wounds.

Discussion

The hazards of farming among adults have been well described, but less has been published regarding the nature of injuries occurring among children on farms. This report contains information useful in preparing safety education materials for parents of Kentucky farm children. The need to protect children who live on farms from the hazards of the environment is evident. All but one of the fatal injuries that occurred under the age of 5 would likely have been prevented by not allowing children to ride tractors and by using infant restraint seats in motor vehicles. Similarly, 50 percent of the deaths among girls aged 5 to 9 would have been prevented if they had not been allowed on tractors, and 40 percent of the boys would not have died if they had not been exposed to farm equipment, primarily tractors. There were significant numbers of children 5 to 9 years of age who drowned in

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farm ponds (20 percent of the boys and 16.7 percent of the girls), which might have been prevented if the children were taught to swim and were not allowed to play around the farm ponds without adult supervision. One family lost two children in the same episode. By the age of 10 to 14 years, boys (45 percent) and girls (50 percent) killed in farm-related episodes were at high risk of drowning.

Other investigators (Cogbill, Busch & Stiers, 1985) have concluded that children were working on farms at young ages and that this should be considered in prevention programs. Evidence from this study does not support that observation for the girls, but does for the boys. The boys have an increased mortality with age in the nonmotor vehicle farm-related group in contrast to the nonmotor vehicle nonfarm population. However, the farm girls appear to be at lower risk of dying from injuries than the nonfarm population. One could suggest that the difference is due to changing patterns of exposure with the farm boys increasing risky behavior in the work environment. The exception to this is among the very young farm girls and boys (birth to 4 years) when parents apparently supervise the children while they are actively involved with farm work. This practice did not seem to differ for the boys and girls, as evidenced by similar mortality rates in the youngest age group and similar external agents of injury.

In contrast, the farm boys were increasingly likely to die as the result of exposure to firearms as they got older. These deaths were often due to hunting, but the boys also were more likely to be playing with guns believed to be unloaded. This did not happen among the farm girls, therefore exposure to guns comparing boys and girls most likely differed.

In a report of nonfatal injuries on Wisconsin farms among children under 18 years of age, the distribution by agent was slightly different with animals the primary agent in 40 percent of injuries, tractors or wagons in 26 percent of injuries, and other farm machinery in 20 percent of all childhood farm-related injuries admitted to LaCrosse Lutheran Hospital during a six and one-half year period (Cogbill, Busch & Stiers, 1985). Injury severity scores were assigned and 11 percent had scores greater than or equal to 25—indicative of a life-threatening event (Cogbill, Busch & Stiers, 1985). The authors concluded that children raised on farms were at high risk of injury (Cogbill, Busch & Stiers, 1985). The primary agents of injury differed from those reported in urban areas (Cogbill, Busch & Stiers, 1985). This should be considered in injury prevention programs in rural areas of the country.

In 1985, a national study of fatal and nonfatal farm injuries to children was published (Rivara, 1985). Data from the National Center for Health Statistics (NCHS) and the death certificate data base of the Consumer Product Safety Commission (CPSC) were used for fatal injuries. The National Electronic Injury Surveillance System (NEISS) was used for nonfatal injuries. The overall mortality between 1979 and 1981 from farm injuries among children under 20 years of age was 21.5 per 100,000 among males and 3.8 per 100,000 among females (Rivara, 1985). Annual nonfatal farm injury

estimates among children under 20 years of age were 1,740 per 100,000 for males and 343 per 100,000 for females (Rivara, 1985). While these data are useful in beginning to assess the magnitude of the problem, detailed descriptions of circumstances surrounding the injuries available on death certificates are not available on the summary data tapes supplied by the NCHS. In particular, the authors were only able to include nontransport fatalities—because place of injury could not be separated from transport fatalities (Rivara, 1985). Among Georgia adults, 9 percent of all fatal tractor injuries occurred on roads (Goodman, Smith, Sikes, Rogers & Mickey, 1985). The study presented indicated that using only the place of occurrence of an injury may result in an underestimate of the number of farm-related deaths that occur each year among children. Almost 23 percent of all farm-related injury deaths that were identified in the study were not identified in the computer file as having occurred on the farm. This was true even when farm ponds, farm equipment or some other indication of farm-related activity was clearly mentioned somewhere on the death certificate. These differences may account for the slightly higher rates of mortality in this study compared to the national data. Among boys in the U.S., rates per 100,000 were as follows: birth to 4 years—14.9; 5 to 9 years—13.9; ages 10 to 14 years—22.4 (Rivara, 1985). Among girls in the United States, rates per 100,000 were: birth to 4 years—6.5; 5 to 9 years—4.8; 10 to 14 years—3.6. The differences between rates reported for Kentucky are very different for girls birth to 9 years of age and for the boys 5 to 9 years of age. Whether these differences are due to the small number of deaths in Kentucky or reflect differences in methods of ascertaining cases is not known but should be investigated in future work on farm-related injuries among children. Further, those additional deaths identified in the hand search did *not* occur on the highways, they primarily occurred on a farm road, in a farm pond, or in the farm home.

The fact that motor vehicle injury fatalities were significantly lower for the farm children should not be taken as an indication that these children are not at risk. The Kentucky death certificate does not identify residence at a more refined level than the county. Therefore, if *no* mention of farm, farm equipment, or farm produce was on the certificate in the detailed description, we could not identify the child as a farm resident. This problem exists for any of the studies reporting fatal injuries for farm children based on death certificate data. Prevention activities related to motor vehicles should be the same in this population as in any other population of children.

As noted by other investigators (Wintemute, Teret & Kraus, 1987), the serious effects of these injuries are not limited to the children who died. Family members often were involved in driving the vehicles that were the external cause of death, and they may well be at risk for acute or chronic emotional distress. The loss of a child can severely disrupt the family involved. Many of these injuries can and must be prevented. Using this type of information to guide safety education programs may well make the

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Dietz, P.E., & Baker, S.P. (1974). Drown
Public Health, 64 (4), 303-12.
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tificate does not identify residence at a
Therefore, if *no* mention of farm, farm
n the certificate in the detailed descrip-
as a farm resident. This problem exists
tal injuries for farm children based on
tivities related to motor vehicles should
any other population of children.
(Wintemute, Teret & Kraus, 1987), the
not limited to the children who died.
ed in driving the vehicles that were the
nay well be at risk for acute or chronic
child can severely disrupt the family
and must be prevented. Using this type
ucation programs may well make the

message more meaningful for the farm parents. The need to improve the education programs is evident in the magnitude of this problem as reported in this study and in previous work (Cogbill, Bush & Stiers, 1985; Field & Tormoehlen, 1982; Murphy, 1986; Rivara, 1985). The fact that childhood injury prevention programs can be successful also has been demonstrated (Berfenstam, 1977; Scherz, 1976). Predisposing factors that have been reported to be associated with injuries in children and adolescents include unawareness of risk, lack of experience, the need to explore, role models, and risk-taking behavior (Manciaux, 1985). Therefore, programs to reduce the risk of injury should target these factors. For example, drowning prevention programs in urban areas have focused on building fences that are high enough to discourage children from playing in pools unattended. The issue of farm ponds as a problem has not been raised because most studies have been done in urban areas (Dietz & Baker, 1974). The purpose of the farm pond makes the suggestion that a six foot fence be built around it unrealistic, therefore parents and children need to be alerted to the hazard and possible solutions, such as teaching children to swim and teaching children not to swim by themselves.

Most important, however, is the need for parents of small children to recognize the risk of having their toddlers on tractors and riding in the back of pick-up trucks. Children should not be in a position where they can fall off tractors, be run over by a tractor or a piece of equipment being towed by a tractor, and they should not be driving tractors until they are old enough to operate them safely. Details of prevention education strategies targeted at farm children can be obtained from the Department of Health Centre de Hospitalier Universitaire de Sherbrooke, Quebec, Canada (Farm Safety Activity Guide for Elementary School Teachers) and for all children from the Centers for Disease Control, Prevention of Injuries to Children and Youth: A Selected Bibliography (U.S. Department of Health and Human Services, 1987). Safety programs directed at adults should be developed that raise awareness of the hazards in which parents place their children considering the environment in terms of children working and playing around equipment designed with safety features appropriate for adults, but clearly not designed for the safety of small children.

REFERENCES

Berfenstam, R. (1977). The work of the Swedish Joint Committee of Childhood Accident Prevention. In Jackson R.H. (Ed.) *Children, the Environment and Accidents*. Turnbridge, Kent, England: Pitman Medical Publishing Co. Ltd.

Cogbill, T.H., Busch, H.M. & Stiers, G.R. (1985). Farm accidents in children. *Pediatrics*, 76 (4), 562-566.

Dietz, P.E., & Baker, S.P. (1974). Drowning epidemiology and prevention. *American Journal of Public Health*, 64 (4), 303-12.

Field, W.E., & Tormoehlen, R.L. (1985). *Analysis of fatal and nonfatal farm accidents involving children*. (Paper No. 82-5501). Chicago, IL: American Society of Agricultural Engineers.

Goodman, R.A., Smith, J.D., Sikes, R.K., Rogers, D.L., & Mickey, J.L. (1985). Fatalities associated with farm tractor injuries: An epidemiologic study. *Public Health Reports*, 100 (3), 329-340.

Manciaux, M.R.G. (1985). Accidents in childhood: From epidemiology to prevention. *Acta Paediatrica Scandinavia*, 74: 163-171.

Murphy, D.J. (1986). Working unsafely on the farm. *Applied Agricultural Research*, 1 (1), 2-5.

Pless, I.B., & Stulginskas, J. (1982). Accidents and violence as a cause of morbidity and mortality in childhood. *Advances in Pediatrics*, 29, 471-494.

Rivara, F.P. (1985). Fatal and nonfatal farm injuries to children and adolescents in the United States. *Pediatrics*, 76 (4), 567-573.

Scherz, R. (1976). Restraint systems for prevention of injury to children. *American Journal of Public Health*, 66, 451.

Tormoehlen, R.L. (1986). *Fatal farm accidents occurring to Wisconsin children, 1970-1984.* (Paper No. 86-5514). Chicago, IL: American Society of Agricultural Engineers.

Wintemute, G. J., Teret, S.P., & Kraus, J.F. (1987). When children shoot children: 88 unintended deaths in California. *Journal of the American Medical Association*, 257 (22), 3107-3109.

U.S. Department of Commerce. (1982). *1980 Census of the population. Vol. 1 Characteristics of the population. General population characteristics of the population. General population characteristics, Part 19. Kentucky.* Washington, DC: U. S. Government Printing Office.

U.S. Department of Commerce. (1988). Statistical abstracts *of the United States. 1988.* 108th Edition. Washington, DC: Bureau of the Census, U.S. Government Printing Office.

U.S. Department of Health and Human Services. (1985). *Vital Statistics of the United States, 1980, Volume 2. Mortality. Part A.* (DHHS Publication No. [PHS] 85-1101). Washington, DC: U.S. Government Printing Office.

U.S. Department of Health and Human Services (1987). *Prevention of injuries to children and youth: A selected bibliography.* Center for Environmental Health and Center for Health Promotion and Education. Washington, DC: U.S. Government Printing Office.

Farming: Primary Preve
Effects of Employment

Marthe R. Gold and Peter Franks

ABSTRACT: *We report findings fr primary care approach initiated in a fin New York that sought to characterize t lar and cerebrovascular mortality in t aged 16 years and older employed in standard sociodemographic data, info health care and preventive services, ca measurements. Compared to other wo low income households, less educati expenses, and ate more eggs. After farmers had significantly lower mea confidence interval [CI] = 1, 5.5) tha significant predictor of mean blood pr 0.18, 0.32), but not for farmers (.09 m congruent with previous studies that l ity and mortality among farmers. Invo provide approaches to the primary pr gested by a focus on individual risk fa*

Hypertension is a common chr United States nearly 30 percent of have blood pressures over 140/90 cation (Hypertension Prevalence, tension include coronary artery dis together account for 40 percent of a decline in stroke deaths over the pa for Health Statistics, 1983]) is wide hypertension. Deaths from corona than 60 percent over the same tin weather, 1985; Friedman, 1979) ha myocardial infarctions, and Pell a major contributor to that decline hypertension. However, the morta high, and other approaches, partic

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