

**Farm Hazards to Household Youth on Minority Operated Farms
in the United States, 2000: Exposures and Injuries from Work,
Horses, ATVs and Tractors**

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Abstract

The farm is a unique environment composed of many different injury hazards. Many routine farm activities expose household youth to a variety of these hazards just by virtue of the youth living on the farm. Youth living on minority operated farms, which represent less than 3% of all U.S. farms, are likely to face similar hazards. However, since this population is not well represented in most general farm studies, such information is not available. This paper will fill in some of these gaps by examining four specific exposures and the associated injuries: work, horses, all terrain vehicles (ATVs), and tractors.

Data were obtained from the Minority Farm Operator Childhood Agricultural Injury Survey (M-CAIS), a telephone survey of 49,270 minority farms across the U.S. The M-CAIS collected information on all nonfatal injuries to youth less than 20 years of age on minority operated farms for the calendar year of 2000. Minority operated farms included four racial minorities (Black, Asian, American Indian, and Other) and Hispanic ethnicity. In addition to injury information, data were also collected on household youth exposure to work, horses, ATVs, and tractors.

There were approximately 28,600 youth less than 20 years of age living on farms with a racial minority operator in 2000. During that year, about 11,753 (41%) of these youth reported working on the farm, 7,459 (26%) rode a horse on the farm, 6,514 (23%) drove an ATV on the farm, and 6,452 (23%) operated a tractor on the farm. Work injuries accounted for about 40% of the total injuries to youth living on racial minority operated farms. Horses, tractors, and ATVs combined were involved in about 30% of the injuries.

There were an estimated 17,998 youth less than 20 years of age living on farms with a Hispanic operator in 2000. Of these youth, about 7,921 (44%) worked on the farm during 2000, 5,331 (30%) rode a horse on the farm, 4,872 (27%) drove an ATV on the farm, and 4,412 (25%) operated a tractor. Work injuries accounted for about half of the injuries to youth living on Hispanic farms, while tractors, ATVs, and horses accounted for approximately 30% of the injuries.

Data on exposures, injuries, and injury rates from these hazards will be presented. This examination will also provide a discussion of strategies which may reduce the number of injuries to youth on farms.

Introduction

The farm can be a wonderful environment for children to grow and learn. Unfortunately, it is also an environment where children are exposed to a wide variety of hazards. Approximately 1.26 million youth less than 20 years of age live on U.S. farms and over half of these youth perform work on the farm (Myers and Hendricks, 2001).

Work has been well documented as a contributor to youth injuries on farms (Schulman et al. 1997, CDC 1999a, Purschwitz and Field 1990). In addition to work, three common hazards associated with farm injuries are horses, all terrain vehicles (ATVs) and tractors. Although there has been a great deal of research on the injuries associated with these hazards (Chitnavis et al. 1996, Chapman and Spinks 1994, Etherton et al. 1991, Hendricks and Adekoya 2001, CPSC 2003), data on youth exposure to these hazards are limited.

Youth living on minority operated farms, a population not frequently studied by the agricultural research community, are likely to face similar hazards. In an effort to gain a better understanding of this particular population, this paper examines the exposures and injuries associated with: work, horses, ATVs, and tractors.

Methods

Data for this study were obtained from the Minority Farm Operator Childhood Agricultural Injury Survey (M-CAIS) which was conducted for the National Institute for Occupational Safety and Health (NIOSH) by the United States Department of Agriculture, National Agricultural Statistics Service. The M-CAIS was a telephone survey of minority operator farm households across the U.S. Data were collected for all nonfatal, on-farm injuries occurring to youth less than 20 years of age during the 2000 calendar year.

Because minority farms represent less than 3% of all farms in the U.S., they are not well represented in most surveys covering general farm populations. The M-CAIS was conducted to gain a better understanding of the youth population on minority operated farms. For the purpose of this study, minority operated farms included four racial minorities (Black, Asian, American Indian, and Other) and Hispanic ethnicity. Because of the weighting scheme used for this survey, which involved benchmarking the data to the 1997 Census of Agriculture, it was not possible to combine the race and ethnicity data. Further, because there is the possibility of overlap between the racial and Hispanic data (i.e., an operator may be considered both a racial and ethnic minority), the racial and Hispanic analyses must be presented separately.

The sampling frame for the M-CAIS was obtained from the 1997 Census of Agriculture and included 49,270 minority operated farms. A response was obtained from 27,170 farms, 9,254 farms declined to participate in the study, and the remainder (12,846) of the minority operated farms were unable to be contacted. The survey response rate for those farms which were contacted was 74.6%.

For the M-CAIS, an injury was defined as any event occurring on the farm operation that resulted in at least four hours of restricted activity or required the individual to seek professional medical attention. Information was collected for both work and non-work injuries occurring to youth who were either living on, visiting, or directly hired to work on the farm (excluding contract laborers which are defined as workers who are hired by and work for a contractor). A work-related injury was defined as any injury that occurred while performing activities that had a direct impact on the farming operation as a business, regardless of whether the activity was performed for pay. For an injury to be considered work-related, the youth must have been performing work; just being present where work was being conducted would not qualify as work-related.

Demographic information was collected for members of the farm household and for any youth directly hired to work on the farm. Household youth were defined as all youth who resided on the farm. In addition to injury information, data were also collected on household youth exposure to work, horses, ATVs, and tractors. For this study, data analyses were limited to youth living in the household.

For all reported injuries, common injury information, such as nature of injury, body part, and a narrative description of the injury was collected. Source and event were coded per the Occupational Injury and Illness Classification System (OIICS) (BLS, 1992). Injury rates were calculated as the estimated number of injuries, divided by the estimated number of youth obtained from the M-CAIS. The rates are expressed in terms of 1,000 household youth for general injury rates, and per 1,000 exposed youth for injury rates where the denominator is based on the number of youth exposed to a specific hazard. Rate ratios were calculated where possible. Estimates for both the injury and demographic data were obtained using the unbiased estimators for a stratified simple random sample (Cochran, 1977). All confidence intervals provided are at 95%.

Results

Racial Minority

Exposed Youth

In 2000, there were an estimated 28,577 (CI: 28,080 to 29,074) youth less than 20 years of age living on farms operated by a racial minority. An estimated 14,643 (51%) of these youth were males. Approximately 9,339 youth were under the age of 10 years, with 10,577 between the ages of 10-15 years, 7,648 between the ages of 16 and 19 years, and 1,013 youth had no age reported.

Table 1 shows that an estimated 11,753 (41%, CI :11,442 to 12,064) youth living on racial minority operated farms worked on the farm during the 2000 calendar year. An estimated 7,459 (26%, CI: 7,205 to 7,713) household youth reported riding a horse on the farm for either work or recreation, 6,514 (23%, CI: 6,285 to 6,743) youth living on the farm drove an ATV, and an estimated 6,452 (23%, CI: 6,244 to 6,660) youth reported operating a tractor on the farm.

Table 1 also shows the breakdown by sex for these exposures. Males experienced a higher proportion of exposures than females for all four hazards.

Figure 1 illustrates the exposures experienced by youth living on racial minority operated farms by age group. Work was the most common exposure for youth 10-19 years old. For youth less than 10 years old, horses were the most common exposure followed by work. In general, 10-15 year olds had the highest exposures. Tractors were the only exception, where 16-19 year olds had more exposure.

Table 2 shows the number of youth for which information on their exposure to work, horses, ATVs, and tractors was not reported. The number of unknowns were relatively small for reported exposure to work and horses for all ages, and for ATVs and tractors for youth 10-15 years old and 16-19 years old. However, for youth less than 10 years old, the number of unknowns for reported exposure to ATVs and tractors rose significantly.

Injury and Rates

During the year 2000, there were an estimated 531 (CI: 473 to 589) injuries to youth less than 20 on racial minority operated farms in the U.S. An estimated 348 (66%, CI: 300 to 396) of these injuries occurred to youth living on the farm (12.2 injuries/1,000 household youth). The majority of the injuries (245, 70%) occurred to males living on the farm. Youth less than 10 years of age incurred 112 (32%) injuries, with youth 10-15 incurring 161 (46%) injuries, and 73 (21%) injuries to youth 16-19 years. Age was not reported for two injured household youth.

Table 3 shows an estimated 138 (40%, CI: 109 to 167) injuries were to household youth who reported performing work on the farm, resulting in an injury rate of 11.8 per 1,000 exposed youth. An estimated 60 injuries (17%, CI: 42 to 78) associated with horseback riding were reported for youth living on racial minority operated farms, 29 (8%, CI: 17 to 42) injuries were associated with operating an ATV, and 14 (4%, CI: 5 to 23) injuries were tractor-related.

Males experienced the majority of work-related injuries (114, 83%) with a rate of 15.6/1,000 exposed males compared to an injury rate of 5.5/1,000 exposed females. The rate ratio for males to females was 2.85. A rate ratio is simply a comparison of two rates (x/y) to determine the relative risk to an individual. The majority of the work-related injuries (72, 52%) occurred to youth aged 10-15 years of age, followed by 51 (37%) injuries to youth 16-19 years of age; and 15 (11%) injuries to youth less than 10 years. The corresponding injury rates were 12.9, 11.4, and 9.4/1,000 exposed youth, respectively.

An estimated 31 (52%) horse-related injuries occurred to males and 29 (48%) to females. The injury rate for males who experience horse riding injuries was 7.8/1,000 exposed males and for females 8.2/1,000 exposed females; the rate ratio was .96 for males compared to females. None of the youth injured while riding a horse were wearing a helmet.

Twenty-four percent (7) of ATV injuries were to youth less than 10 years old (8.8/1,000 exposed youth), compared to youth 10 years and older who experienced 22 (76%) of the reported ATV injuries (3.9/1,000 exposed youth). The rate ratio for youth less than 10 years of age to youth 10 years of age and older is 2.3. An estimated 24% (7) of the youth reporting ATV-related injuries were wearing a helmet at the time of the injury.

The small number of tractor-related injuries prohibits further examination of injuries by age or sex. However, information on whether or not the tractor was equipped with a roll over protective structure (ROPS) was collected. Slightly more than half (8) of the tractors youth were injured on were not equipped with a ROPS.

Hispanic

Exposed Youth

In 2000, there were an estimated 17,998 (CI: 17,600 to 18,396) youth less than 20 years of age living on Hispanic operated farms. Of these, 9,235 (51%) were males. An estimated 6,015 (33%) youth were under the age of 10 years, with 6,589 (37%) between the ages of 10-15 years, and 4,969 (28%) between the ages of 16 and 19 years. For 425 youth, age was not reported.

Table 4 shows that an estimated 7,921 (44%, CI: 7,665 to 8,177) household

youth on Hispanic operated farms reported working on the farm during the 2000 calendar year. An estimated 5,331 (30%, CI: 5,106 to 5,556) household youth reported riding a horse on the farm for either work or recreation, 4,872 (27%, CI: 4,674 to 5,070) youth reported operating an ATV on the farm, and an estimated 4,412 (25%, CI: 4,235 to 4,589) youth living on a Hispanic operated farm reported operating a tractor on the farm.

Table 4 also shows the breakdown by sex for these exposures. Males reported experiencing a higher proportion of exposures than females for work, ATVs, and tractors. However, for youth who reported riding a horse, the sex distribution was very similar. Figure 2 illustrates the exposures experienced by youth living on Hispanic operated farms by age group. Work was the most common exposure for youth 10-19 years old. For youth less than 10 years old, horses were the most common exposure followed by work. In general, 10-15 year olds had the highest exposures. Tractors were the only exception, where 16-19 year olds had more exposure.

Table 5 shows the number of youth living on Hispanic operated farms for which information on their exposure to work, horses, ATVs, and tractors was not reported. The number of unknowns were relatively small for reported exposure to work and horses for all ages and for ATVs and tractors for youth 10-15 years old and 16-19 years old. However, for youth less than 10 years old, the number of reported unknowns for exposure to ATVs and tractors rose significantly.

Injury and Rates

During the year 2000, there were an estimated 366 (CI: 321 to 411) injuries to youth less than 20 on Hispanic operated farms in the U.S. An estimated 259 (71%, CI: 221 to 297) of these injuries occurred to youth living on the farm (14.4/1,000 household youth). The majority of the injuries (188, 73%) occurred to males living on the farm. Youth less than 10 years old incurred 84 (32%) injuries, with youth 10-15 years incurring 111 (43%) injuries, and 60 (23%) injuries occurring to youth 16-19 years. Age was not reported for 7 injured household youth.

Table 6 shows an estimated 114 (44%, CI: 90 to 138) injuries were incurred by youth who had performed work on the farm, resulting in an injury rate of 14.3 per 1,000 exposed youth. An estimated 31 (12%, CI: 19 to 43) injuries associated with horseback riding were reported for youth living on Hispanic operated farms in 2000, ATVs were involved in 25 (10% CI: 12 to 37) injuries resulting in an injury rate of 5.1/1,000 exposed youth, and tractors were involved in 22 (8% CI: 11 to 33) of the injuries resulting in an injury rate of 4.9/1,000 exposed youth. Males experienced the majority of work-related injuries (83, 73%) and had an injury rate of 17.1/1,000 exposed males compared to the rate for females

(10.0/1,000 exposed females) resulting in a rate ratio of 1.7. A similar number of work-related injuries occurred to youth aged 10-15 years (47, 41%) and youth aged 16-19 years (48, 42%), followed by 16 (14%) injuries to youth less than 10 years of age.

Males incurred 11 (25%) of the horse-related injuries and 20 (65%) injuries occurred to females. The injury rates for males and females with horse riding injuries were 4.0/1,000 exposed males and 7.6/1000 exposed females, respectively. The rate ratio for males to females was .53. Helmets were being worn by youth in only 10% (3) of these injuries.

Males were involved in 15 (60%) of the ATV-related injuries with an injury rate of 5.2/1,000 exposed males, compared to females who were injured in 10 (40%) of the cases, resulting in an injury rate of 5.1/1,000 exposed females. The rate ratio for ATV injuries for males to females is 1.02. Less than half (12) of the youth injured on an ATV were wearing a helmet.

Youth less than 10 years old were involved in 8 (36%) tractor-related injuries with an injury rate of 38.6/1,000 exposed youth. In comparison, youth 10 years and older experienced 14 (64%) injuries for an injury rate of 3.3/1,000 exposed youth, resulting in a rate ratio of 11.8. Approximately 50% (11) of the tractors involved in the injuries reported in this study were not equipped with a ROPS

Discussion

This study provides much needed data on the understudied population of youth living on minority operated farms. Injury surveillance data provide a valuable tool to understanding the causes of injury to youth on farms. Equally important is having some measure of how many youth are exposed to known hazards. Knowing both the exposure and injury experience of youth living on minority operated farms is needed to develop effective injury prevention strategies.

This study estimates that for youth living on racial minority operated farms, 1 of every 2.5 injuries is work-related, 1 of every 6 injuries is horse-related, and 1 of every 12 injuries is associated with operating an ATV. Horses, ATVs, and tractors account for 30% of injuries to youth living on racial minority operated farms. Work accounts for 40% of the injuries to these youth. The numbers for youth living on Hispanic operated farms are very similar. One of every 2.4 injuries is work-related, 1 of every 10 are horse-related, and 1 of every 13 are ATV-related. For youth living on Hispanic operated farms, horses, ATVs, and tractors also account for 30% of injuries, with work accounting for 44% of injuries.

When comparing the injury experiences of youth living on minority operated farms with household youth in the general farm population, the occurrence of work-related injuries is very similar. One of every 2.3 injuries are work-related for household youth in the general farm population, compared with 1 in 2.5 for racial minority farms and 1 in 2.4 for Hispanic operated farms. Injuries associated with operating an ATV are also fairly consistent. One of every 15 injuries are ATV-related in the general farm population compared to 1 in 12 on racial minority farms and 1 in 13 on Hispanic operated farms. Horse-related injuries are the only area where there is a considerable difference. For household youth in the general farm population, 1 in 16 injuries are horse-related compared to 1 in 10 on Hispanic farms and 1 in 6 for racial minority farms. The explanation for these differences is unclear and will require additional consideration.

The frequency of these types of injuries on farms supports the need to assess exposure to common hazards. This allows for a better understanding of the risk each hazard poses for youth. Additionally, exposure data allow for a more accurate calculation of injury rates, and therefore, a better assessment of risk. For example, if a horse-related injury rate is calculated for youth on racial minority operated farms using the number of youth in the household as the denominator, a rate of 2.1/1,000 household youth is obtained. However, if the number of youth who have actually ridden a horse is used as the denominator, the injury rate increases almost four-fold to 8.0/1,000 exposed youth. This four-fold increase in rates is fairly consistent across hazards and for both racial minority and Hispanic farms. This underestimation of risk could play an important role in impacting the types of injury prevention strategies implemented for youth on farms.

Previous research on youth in the general farm population (Rivara 1997, Wilk 1993) has shown males experience more injuries and have a higher injury rate than females. The most common explanation for this is that youth are often channeled into gender-specific farm tasks (Schulman et al. 1997, Buttel and Gillespie 1984). The only exception to this is horse-related riding injuries, where females experience an almost equal amount, if not greater number of injuries. For household youth, females had a higher horse-related injury rate than males for both racial minority and Hispanic operated farms. This gender reversal for horses has also been seen previously in the literature for the general farm population (Hendricks and Adekoya, 2001, Chapman and Spinks 1994, Chitnavis et al. 1996).

Horses, ATVs, and tractors are inherently dangerous and will continue to pose safety hazards to youth on farms. However, safety measures, such as rollover protective structures (ROPS), and helmets for both ATVs and horses, are widely available and have been shown to be effective for reducing injuries in the general farm population (CDC 1993, Myers et al. 1998, CDC 1999b, Tormoehlen and Sheldon 1996, Bond et al. 1995). Unfortunately, these safety devices are not

being fully utilized. As previously discussed, the use of helmets for ATVs and horses, and ROPS on tractors were minimal to nonexistent for the injuries reported in this study. In addition to increasing the use of protective equipment, the age appropriateness of youth activities should also be considered. The North American Guidelines for Childhood Agricultural Tasks (NAGCAT) present guidelines for parents to follow in assigning tasks to children age 7-16 based on their developmental abilities (National Children's Center for Rural and Agricultural Health and Safety 1999). The Consumer Product Safety Commission (CPSC) and NIOSH recommend that youth under the age of 16 be prohibited from operated ATVs with an engine size greater than 90cc (CPSC 2003, NIOSH 2002). NIOSH has also recommended that youth operation of tractors be limited to formally trained youth, and only with the use of ROPS and seatbelts (NIOSH 2002). Efforts should be made to educate farm youth and their families on the protective equipment that is available and the recommended age for operating tractors and ATVs. Educational campaigns in these areas could help to increase the use of protective equipment and possibly prevent many injuries.

Limitations

An interesting finding in this study is the high proportion of youth less than ten years old whose parents indicated that they did not know if their child had operated an ATV or tractor in the past year. For parental reports of work and horse activities for youth less than 10, on both racial minority and Hispanic operated farms, the proportion of unknowns was < 1%. When asked if the same youth had operated an ATV or tractor in the past year, the proportion of unknowns jumped to 28% on racial minority operated farms and 29% on Hispanic operated farms. A similar increase was not noted for other age groups.

One possible explanation for this increase is social desirability. Social desirability was originally defined as "the tendency of subjects to attribute to themselves in self-description, personality statements with socially desirable scale values and to reject those with socially undesirable scale values" (Edwards, 1957, p.vi). Due to the vast amount of research that has been completed on the hazards of youth on tractors and ATVs, parents may feel that it is socially unacceptable to admit that they permit youth living in their households to participate in these activities. Because of the suspected under-reporting of youth less than 10 who operate ATVs and tractors, the accuracy of the ATV and tractor rates presented in this paper is uncertain. Further, one must consider the possibility that under-reporting, due to social desirability issues, may carry over into other areas, such as reported injuries.

A potential limitation in this study is the effect of recall bias. The authors have attempted to limit this effect by having a recall period of one year, and requesting information on only the most serious injuries. Previous studies have found a 32% decrease in injury reports for surveys based on a 12 month recall period (Landen and Hendricks 1995). Furthermore, injuries that resulted in lost workdays (more severe) had a lower rate of under-reporting (22.5%) than injuries that did not result in lost work days (44.6%). Since this study collected information on injuries that required at least four hours of restricted activity or required professional medical attention, the number of injuries reported should be considered a conservative estimate.

An additional limitation is the inability to report consistent age groups and calculate rates for all subpopulations of interest. Injury rates and numbers of injuries were at times not reported due to either a small number of cases or a standard error which exceeded an acceptable level.

Conclusions

The study of household youth exposure to hazards on minority operated farms provides important information for researchers. In addition to providing unique data on an understudied group of farm youth, these data will assist researchers in the area of childhood agricultural injury prevention to focus prevention efforts on targeted areas. This research further supports the notion that the traditional division of labor by gender on the farm is an important influence on hazard exposure and injury rates. Further, the discovery of the large proportion of unknowns when examining the hazard exposure for youth less than 10 is significant. In future studies, it may be necessary to control for this effect.

References

Bond GR, Cristoph RA, and Rodgers BM (1995). Pediatric equestrian injuries: assessing the impact of helmet use. *Pediatrics* 94:487-489.

BLS (1992). Occupational Injury and Illness Classification Manual. Washington, DC: US Department of Labor, Bureau of Labor Statistics.

Buttel FH and Gillespie GW (1984). The sexual division of farm household labor: An exploratory study of the structure of on-farm and off-farm labor allocation among farm men and women. *Rural Sociology* 49(2): 183-209.

CDC (1999a). Childhood Work-Related Agricultural Fatalities - Minnesota, 1994-1997. *MMWR* 46(16): 332-335.

CDC (1999b). All-Terrain Vehicle-Related Deaths - West Virginia, 1985-1997. *MMWR* 48(1): 1-4.

CDC (1998). Youth Agricultural Work-Related Injuries treated in emergency departments - - United States, October 1995-September 1997. *MMWR* 47(35): 733-737.

CDC (1993). Public Health Focus: Effectiveness of Rollover Protective Structures for Preventing Injuries associated with Agricultural Tractors. *MMWR* 42(3): 57-59.

CPSC (2003). All-Terrain Vehicle 2001 Injury and Exposure Studies. US Consumer Product Safety Commission, Washington, DC.

Chapman P and Spinks D (1994). Recognition of farm hazards by children engaged in farming activities. *J Occup Safety and Health*. 10(4): 331-337.

Chitnavis JP, Gibbons CL, Hirigoyen M, Parry JL, and Simpson A (1996). Accidents with horses: what has changed in 20 years? *Injury: International Journal of the Care of the Injured*. 27: 103-105.

Cochran WG (1977). Sampling Techniques, 3rd edition. New York: Wiley.

Edwards AL (1957). The social desirability variable in personality assessment and research. New York: Holt, Rinehart and Winston.

- Etherton JR, Myers JR, Jensen RC, Russell JC, and Braddee RW (1991). Agricultural Machine-Related Deaths. *AJPH* 81(6): 766-768.
- Hendricks KJ and Adekoya N (2001). Non-fatal animal related injuries to youth occurring on farms in the United States, 1998. *Injury Prevention* 7(4): 307-311.
- Landen DD and Hendricks S (1995). Effect of recall on reporting of at-work injuries. *Public Health Rep* 110:350-354.
- Myers JR and Hendricks KJ (2001). Injuries among youth on farms in the United States, 1998. Cincinnati OH: US Department of Health and Human Services, National Institute for Occupational Safety and Health (NIOSH Publication No. 2001-154).
- Myers J, Snyder K, Hard D, Casini VJ, Cianfrocco R, Fields J, and Morton L (1998). Statistics and Epidemiology of Tractor Fatalities – a Historical Perspective. *JASH* 4(2): 95-108.
- National Children's Center for Rural and Agricultural Health and Safety (1999). North American Guidelines for Children's Agricultural Tasks. Marshfield, WI: NCCRAHS.
- NIOSH (2002). National Institute for Occupational Safety and Health (NIOSH) Recommendations to the U.S. Department of Labor for Changes to Hazardous Orders. Morgantown, WV: Centers for Disease Control and Prevention, NIOSH.
- Purschwitz MA and Field WE (1990). Scope and magnitude of injuries in the agricultural workplace. *AJIM* 18(2): 179-192.
- Rivara FP (1997). Fatal and non-fatal farm injuries to children and adolescents in the United States, 1990-93. *Inj Prev*. 3: 190-194.
- Schulman MD, Evensen CT, Runyan CW, Cohen LR, and Dunn KA (1997). Farm work is dangerous for teens: agricultural hazards and injuries among North Carolina Teens. *The Journal of Rural Health* 13(4): 295-305.
- Tormoehlen RL and Sheldon EJ (1996). ATV Use, Safety Practices, and Injuries among Indiana's Youth. *JSR* 27(3)147-155).
- Wilk V (1993). Health Hazards to Children in Agriculture. *AJIM* 24: 283-290.

Table 1. National estimates of youth less than 20 years living on racial minority operated farms: exposure to work, horses, ATVs and tractors by sex: 2000.

Sex	Work (%)	Horse (%)	ATV (%)	Tractor (%)
Male	7,303 (62)	3,966 (53)	4,047 (62)	4,675 (73)
Female	4,441 (38)	3,491 (47)	2,467 (38)	1,777 (28)
Unknown	9 (0.1)	2 (<0.01)	0	0
Total	11,753 (100)	7,459 (100)	6,514 (100)	6,452 (100)

Figure 1. National estimates of youth less than 20 years living on racial minority operated farms: exposure to work, horses, ATVs and tractors by age group, 2000.

Table 2. National estimates of reported unknowns for exposure to work, horses, ATVs and tractors for youth less than 20 living on racial minority operated farms by age group, 2000.

Age Group	Exposure			
	Work Unknown	Horse Unknown	ATV Unknown	Tractor Unknown
< 10	12	17	2,646	2,644
10-15	15	22	21	23
16-19	26	31	38	38
Unknown Age	847	866	1,012	1,012

Table 3. National estimates of injuries, exposure, and rates to work, horses, ATVs and tractors for youth less than 20 living on racial minority operated farms, 2000.

Exposure	Number of injuries (CI*)	Number of youth exposed (CI)	Rate/1,000 exposed youth (CI)
Work	138 (±29.0)	11,753 (±310.6)	11.8 (±2.5)
Horse	60 (±17.8)	7,459 (±254.0)	8.0 (±2.4)
ATV	29 (±12.3)	6,514 (±228.7)	4.5 (±1.9)
Tractor	14 (±9.2)	6,452 (±207.8)	2.2 (±1.4)

* 95% Confidence Interval

Table 4. National estimates of youth less than 20 years living on Hispanic operated farms: exposure to work, horses, ATVs and tractors by sex: 2000.

Sex	Work (%)	Horse (%)	ATV (%)	Tractor (%)
Male	4,843 (61)	2,675 (50)	2,909 (60)	3,146 (71)
Female	3,076 (39)	2,652 (50)	1,960 (40)	1,266 (29)
Unknown	2 (<0.001)	5 (<0.001)	3 (<0.001)	0
Total	7,921	5,331	4,872	4,412

Figure 2. National estimates of youth less than 20 years living on Hispanic operated farms: exposure to work, horses, ATVs and tractors by age group, 2000.

Table 5. National estimates of reported unknowns for exposure to work, horses, ATVs and tractors for youth less than 20 living on Hispanic operated farms by age group, 2000.

Age Group	Exposure			
	Work Unknown	Horse Unknown	ATV Unknown	Tractor Unknown
< 10	5	8	1,735	1,735
10-15	3	5	8	8
16-19	15	15	15	13
Unknown Age	336	353	0	0

Table 6 National estimates of injuries, exposure, and rates to work, horses, ATVs and tractors for youth less than 20 living on Hispanic operated farms, 2000.

Exposure	Number of injuries (CI*)	Number of youth exposed (CI)	Rate/1,000 exposed youth (CI)
Work	114 (±24.1)	7,921 (±256.0)	14.3 (±3.1)
Horse	31 (±12.2)	5,331 (±224.6)	5.8 (±2.3)
ATV	25 (±12.5)	4,872 (±198.4)	5.1 (±2.6)
Tractor	22 (±10.9)	4,412 (±177.2)	4.9 (±2.5)

* 95% Confidence Interval