

# ATV riding and helmet use among youth aged 12–17 years, USA, 2011: results from the YouthStyles survey

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## ABSTRACT

**Background** National estimates of all-terrain vehicle (ATV) riding patterns among youth in the USA are lacking.

**Methods** We analysed the 2011 YouthStyles survey to estimate the proportion of 12–17 year olds in the USA who had ridden an ATV at least once during the past 12 months and summarise their patterns of helmet use.

**Results** Of the 831 youth respondents, an estimated 25% reported riding an ATV at least once during the past year. The proportion of youth living outside of a Metropolitan Statistical Area who reported riding an ATV was twice that of those living inside of a Metropolitan Statistical Area. Males and females reported similar proportions of riding at least once during the past year, but among riders, the proportion of males who rode  $\geq 6$  times was triple that of females. Only 45% of riders reported always wearing a helmet, and 25% reported never wearing a helmet. The most frequent riders had the lowest consistent helmet use, with 8 of 10 youth who rode  $\geq 6$  times during the past year not always wearing a helmet.

**Conclusions** ATV riding appears to remain popular among youth in the USA, particularly in rural areas, and consistent helmet use while riding is low. A more thorough understanding of gender differences in ATV riding patterns among youth and perceived risks and benefits of both safe and unsafe riding practices might help inform future ATV injury prevention efforts.

## INTRODUCTION

All-terrain vehicles (ATVs) are motorised, gasoline-powered vehicles, weighing up to 1000 pounds, with large, low-pressure tyres, a seat to be straddled by the user and handlebars for steering. These vehicles are designed for use by riders on off-road, non-paved surfaces. ATVs were first introduced in the 1970s, and by 2010, an estimated 10.6 million 4-wheel ATVs were in use in the USA.<sup>1</sup> As ATVs gained in popularity, particular concern arose about ATV-related injuries among children. Because young riders often lack the physical strength, cognitive abilities and fine motor skills to operate ATVs properly, their risk for injury is greater.<sup>2</sup>

ATV-related fatalities and non-fatal injuries to children and youth in the USA have been well documented.<sup>1 3 4</sup> Since 1985, the US Consumer Product Safety Commission (CPSC) has published annual national estimates of ATV-related fatalities and emergency department visits for ATV-related non-fatal injuries among children and adults.<sup>1</sup> Much less is known, however, about ATV riding among US children and youth. To our knowledge,

the most recent publicly available national estimates of ATV riding among youth are more than a decade old.<sup>5</sup> This report estimates the proportion of youth in the USA aged 12–17 years who, in 2011, had ridden an ATV at least once during the past 12 months and reports on their patterns of helmet use.

## METHODS

### Survey data

Estimates of ATV riding among youth aged 12–17 years were obtained from the 2011 YouthStyles survey. YouthStyles is an online, self-administered, cross-sectional survey for 12–17 year-olds about health-related beliefs and behaviours conducted by Porter Novelli, Washington, DC. It is conducted annually in conjunction with the HealthStyles survey, which assesses health-related beliefs and behaviours among adults. The HealthStyles survey methods are described in greater detail elsewhere.<sup>6 7</sup> Briefly, panel members for an online, consumer research panel are randomly recruited using an addressed-based probability sampling method that covers approximately 97% of US households.<sup>7</sup> The panel is continuously replenished and maintains about 55 000 panellists.<sup>7</sup> From 20 to 29 May 2011, the spring HealthStyles survey was sent to a random sample of 14 598 panel-lists aged  $\geq 18$  years. A total of 8110 adults completed the spring survey for a response rate of 56%. Then, from 16 July to 3 August 2011, the YouthStyles survey was sent to a random sample of 1614 potential respondents aged 12–17 years living in households in which a parent had participated in the 2011 spring HealthStyles survey; 840 (52%) youth participated. Seven participants did not answer the ATV riding question and were excluded, leaving 833 respondents.

Porter Novelli provided the Centers for Disease Control and Prevention (CDC) with both unweighted and weighted data from the 2011 YouthStyles survey; the data were weighted to match the 2010 US Census benchmarks for age, race, gender, household income, number of youth aged 12–17 years in household, education, census region, metropolitan statistical area (MSA) status and internet access (personal communication, Deanne Weber of Porter Novelli, 2012).<sup>7</sup> Institutional review board approval was not required for this study because Porter Novelli provided the CDC with a final, de-identified data set.

Survey respondents were asked, “During the past 12 months, how many times did you ride (as either a driver or passenger) an ATV (all-terrain vehicle), also called a 3-wheeler or 4-wheeler?” Response



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options included 'never'; 'once in the past 12 months'; '2–5 times in the past 12 months'; '6–11 times in the past 12 months'; 'once a month' or 'once a week'. Due to small sample sizes for some response options, positive responses were grouped into the following tertiles: once; 2–5 times or  $\geq 6$  times during the past year.

Respondents who rode an ATV at least once during the past 12 months were then asked, "How often do you wear a helmet when you ride or drive an ATV?" Response options included 'always'; 'nearly always'; 'sometimes'; 'seldom or rarely' or 'never'. Responses were first grouped into the following four categories: always; nearly always or sometimes; seldom or rarely; and never, and helmet use among all riders was reported using all four categories. Due to small cell sizes, for subsequent cross-tabulations, helmet use was dichotomised as either always or not always (including nearly always, sometimes, seldom or rarely, and never).

### Data analyses

Frequency distributions of ATV riding were calculated for riders overall and by gender, geographic region and MSA status. Frequency distributions of helmet use were calculated for riders overall and by gender, MSA status and riding frequency. The standard four US Census regions (west, south, northeast and midwest) were used.<sup>8</sup> MSA was defined as a core urban area of  $\geq 50\,000$  population.<sup>9</sup> Cross-tabulation results were reported for pairs of variables with  $>20$  unweighted observations in each response category and coefficients of variation  $<30\%$ . All analyses were conducted using SAS V.9.3 (SAS Institute Inc, Cary, North Carolina, USA). Standard Wald CIs for proportions were produced using the 'surveyfreq' procedure. Differences between proportions were considered statistically significant if the 95% CIs did not overlap.

### RESULTS

A total of the 833 YouthStyles respondents provided information about ATV riding. After sampling weights were applied, the data set contained 831 observations. Table 1 presents both unweighted and weighted sample sizes and weighted percent

distributions by gender, region and MSA status for all of the survey respondents. All subsequent tables report weighted sample sizes and proportions. Overall, 25% (95% CI 22% to 29%) of US youth aged 12–17 years reported having ridden an ATV at least once during the past year (table 2). By gender, 26% (95% CI 21% to 32%) of males and 24% (95% CI 19% to 30%) of females reported riding in the past year. The proportion of youth living outside of an MSA who reported riding an ATV was twice that of those living within an MSA (44%; 95% CI 32% to 56% vs 22%; 95% CI 18% to 26%). The proportions of youth living in each of the four regions who reported riding at ATV were similar (table 2).

Among youth who reported riding an ATV, one-third (33%; 95% CI 24% to 42%) rode only once during the past year, another one-third (34%; 95% CI 26% to 41%) rode two to five times and the remaining one-third rode (33%; 95% CI 25% to 42%)  $\geq 6$  times (table 3). Fifty-five per cent of ATV riders were male and 45% were female. More ATV riders lived in the south (34%; 95% CI 26% to 42%) than the northeast region (16%; 95% CI 10% to 22%). More ATV riders lived within an MSA (72%; 95% CI 64% to 80%) compared with ATV riders who lived outside of an MSA (28%; 95% CI 20% to 36%). Forty-eight per cent (95% CI 36% to 60%) of males and 16% of females (95% CI 8% to 23%) rode an ATV  $\geq 6$  times during the past year. Forty-seven per cent (95% CI 29% to 64%) of youth living outside of an MSA rode  $\geq 6$  times during the past year, whereas 28% (95% CI 20% to 37%) of their counterparts living within an MSA rode as frequently.

Only 45% (95% CI 36% to 54%) of riders reported always wearing a helmet, and 25% (95% CI 18% to 32%) reported never wearing a helmet (table 4). Fifty-five per cent of both male and female riders reported not always wearing a helmet. Riding unhelmeted was more common among more frequent riders; 81% (95% CI 70% to 92%) of those riding  $\geq 6$  times a year did not always wear a helmet, whereas 52% (95% CI 39% to 65%) of those who rode two to five times and 32% (95% CI 18% to 46%) who rode only once during the past year did not always wear a helmet.

### DISCUSSION

To our knowledge, this report provides the first national estimates of ATV riding among US youth since 2001, when Levenson<sup>5</sup>

**Table 1** Characteristics of youth aged 12–17 years who answered the ATV riding question on the 2011 YouthStyles survey

Respondent characteristics	Unweighted number* (%)	Weighted number† (%)	95% CI‡ for per cent
Gender			
Male	444 (53)	443 (53)	49 to 58
Female	389 (47)	387 (47)	42 to 51
Region			
Northeast	160 (19)	146 (18)	15 to 21
Midwest	230 (28)	192 (23)	19 to 27
South	273 (33)	305 (37)	32 to 41
West	170 (20)	188 (23)	19 to 27
MSA§ status			
Live within MSA	713 (86)	699 (84)	81 to 88
Live outside MSA	120 (14)	132 (16)	12 to 19

\*Unweighted n=833.

†Weighted N=831, data were weighted to match the 2010 US Census benchmarks for age, race, gender, household income, number of youth aged 12–17 years in household, education, census region, metro status and internet access. Totals do not always equal 831 due to rounding.

‡95% CI for the weighted percent.

§MSA is a core urban area of  $\geq 50\,000$  population.

ATV, all-terrain vehicle; MSA, metropolitan statistical area.

**Table 2** Estimated proportion of youth aged 12–17 years who rode an ATV at least once during the past 12 months, YouthStyles survey, 2011 (N=831)

Characteristic	Weighted number (%)	95% CI for per cent
Total	211 (25)	22 to 29
Gender		
Male	116 (26)	21 to 32
Female	94 (24)	19 to 30
Region		
Northeast	34 (23)	15 to 31
Midwest	53 (28)	20 to 35
South	71 (23)	17 to 29
West	53 (28)	18 to 38
MSA* status		
Live within MSA	152 (22)	18 to 26
Live outside MSA	58 (44)	32 to 56

\*MSA is a core urban area of  $\geq 50\,000$  population.

ATV, all-terrain vehicle; MSA, metropolitan statistical area.

**Table 3** Characteristics of youth aged 12–17 years who rode an ATV at least once during the past 12 months, YouthStyles survey, 2011 (N=211)

Characteristic	Weighted number (%)	95% CI for per cent
Gender		
Male	116 (55)	47 to 64
Female	94 (45)	36 to 53
Region		
Northeast	34 (16)	10 to 22
Midwest	53 (25)	18 to 32
South	71 (34)	26 to 42
West	53 (25)	16 to 34
MSA* status		
Live within MSA	152 (72)	64 to 80
Live outside MSA	58 (28)	20 to 36
ATV riding frequency		
1 time per year	69 (33)	24 to 42
2–5 times per year	71 (34)	26 to 41
≥6 times per year	71 (33)	25 to 42
ATV riding frequency by gender		
Male		
1 time per year	25 (21)	13 to 30
2–5 times per year	36 (31)	20 to 41
≥6 times per year	56 (48)	36 to 60
Female		
1 time per year	45 (47)	34 to 61
2–5 times per year	35 (37)	26 to 49
≥6 times per year	15 (16)	8 to 23
ATV riding frequency by MSA status		
Live within MSA		
1 time per year	53 (35)	24 to 45
2–5 times per year	56 (37)	28 to 46
≥6 times per year	43 (28)	20 to 37
Live outside MSA		
1 time per year	–†	–†
2–5 times per year	–†	–†
≥6 times per year	27 (47)	29 to 64

\*MSA is a core urban area of ≥50 000 population.

†Estimates were suppressed because the unweighted sample size was ≤20.

ATV, all-terrain vehicle; MSA, metropolitan statistical area.

estimated that 14% of youth aged 12–17 years had ridden an ATV at least once during the past year. We estimated that in 2011, 25% of youth aged 12–17 years rode an ATV at least once during the past year. Because of differences in the methodologies, estimates from these two reports are not directly comparable. Nonetheless, results of the current report suggest that the proportion of youth aged 12–17 years who rode an ATV at least once during the past year may have increased since the early 2000s.

The proportion of youth living outside of MSAs who reported riding an ATV at least once during the past year was twice that of those living inside of MSAs. Because of the small number of youth living outside of MSAs, we were unable to fully compare frequency of riding among riders by MSA status. Nonetheless, the results suggest that youth living outside of MSAs who rode ATVs might have ridden more frequently (47% (95% CI 29% to 64%) rode ≥6 times per year) compared with their counterparts living inside of MSAs (28% (95% CI 20% to 37%) rode ≥6 times per year).

Our finding that similar proportions of male and female youth reported riding at least once during the past year confirms

**Table 4** Helmet use characteristics among youth aged 12–17 years who rode an ATV at least once during the past 12 months, YouthStyles survey, 2011 (N=210)

Characteristic	Weighted number (%)	95% CI for per cent
Helmet use		
Always	94 (45)	36 to 54
Nearly always or sometimes	41 (20)	13 to 26
Seldom or rarely	22 (10)	6 to 15
Never	52 (25)	18 to 32
Helmet use by gender		
Male		
Always	52 (45)	33 to 56
Not always*	64 (55)	44 to 67
Female		
Always	43 (45)	32 to 59
Not always	52 (55)	41 to 68
Helmet use by MSA† status		
Live within MSA		
Always	72 (47)	37 to 58
Not always	80 (53)	42 to 63
Live outside MSA		
Always	23 (39)	22 to 55
Not always	36 (61)	45 to 78
Helmet use by frequency of riding		
1 time per year		
Always	47 (68)	54 to 82
Not always	22 (32)	18 to 46
2–5 times per year		
Always	34 (48)	35 to 61
Not always	37 (52)	39 to 65
≥6 times per year		
Always	–‡	–‡
Not always	56 (81)	70 to 92

\*‘Not always’ helmet use includes nearly always or sometimes, seldom or rarely, and never.

†MSA is core urban area of ≥50 000 population.

‡Estimates were suppressed because the unweighted sample size was ≤20.

ATV, all-terrain vehicle; MSA, metropolitan statistical area.

findings from other recent studies of North American youth.<sup>10 11</sup> However, neither of the two previous studies reported frequency of riding by gender. We found that the proportion of males who rode ≥6 times during the past year was triple that of females. Although this finding should be interpreted with some caution due to the small sample size of females who rode ≥6 times during the past year (unweighted n=22), similar findings were reported in a 2007 survey of ATV riding among Connecticut youth. Campbell *et al*<sup>12</sup> reported that 38% of male riders and 18% of female riders rode ‘a lot’. This pattern of increased exposure among young males may help explain their increased prevalence of ATV-related injury and death.<sup>3 4 13 14</sup>

Inconsistent helmet use by young ATV riders is a long-standing, well-documented problem.<sup>10–12 14–19</sup> For example, more than half of riders aged 8–18 years in three rural states reported never or almost never wearing a helmet.<sup>11 16 17</sup> We found that the most frequent riders had the lowest consistent helmet use, with 8 of 10 youth who rode at least six times during the past year not always wearing a helmet. Helmet non-use among youth is of particular concern because young ATV riders have a greater likelihood of crashing than adults<sup>5 18</sup> and the likelihood of dying or sustaining a serious non-fatal traumatic brain injury in an ATV crash is substantially higher

among unhelmeted ATV riders.<sup>18–21</sup> Although in 2012 31 US states had a helmet requirement for ATV riders, these regulations include various qualifiers such as when and by whom helmets must be worn, and exceptions for age requirements if a child is supervised by an adult, riding on private property, or has a safety certificate.<sup>22</sup> Effectiveness studies of such state-imposed regulations in reducing injuries and deaths among young riders have produced equivocal results.<sup>13 20 23–25</sup> Enforcement of these regulations is limited in part because many states' laws pertain only to the use of ATVs on public lands, and according to a 2008 ATV owners' survey obtained by the US Government Accountability Office, nearly 80% of ATV riding among riders of all ages occurs on private property.<sup>26</sup> Further evaluation of the effectiveness of ATV helmet regulations and enforcement strategies is needed.<sup>27</sup>

### Limitations

This study has limitations. First, the YouthStyles survey was not administered to a nationally representative random sample of US youth. Instead, youth who were invited to complete the survey were randomly selected from only those households that participated in the HealthStyles survey administered months earlier. Furthermore, the response rate was 52%, so the results may not be representative of the US population of youth aged 12–17 years. However, as illustrated in table 1, the survey sample characteristics closely approximated characteristics of the 2010 US Census, providing some insight into the representativeness of the sample. Second, for the question about riding frequency, the response options of riding every 2 or 3 weeks were inadvertently excluded. Although the effect of this omission cannot be emphatically quantified, any effect is thought to be small because only seven respondents did not answer the question, and the five positive response options were collapsed into three categories for the analysis. Third, because of the study's small sample size, some of the response categories for the questions about riding frequency and helmet use were combined. By combining the response categories, we may have obscured important differences in riding exposure or frequency of helmet use. Fourth, because ATV riding and helmet use were self-reported and the recall period was 12 months, the estimates presented may be subject to misreporting and recall bias. Fifth, the survey did not collect other important variables such as the size of ATV most often ridden, seating position (driver or passenger) or crash experience. Previous studies have reported that most young riders ride adult-sized ATVs.<sup>5 11 16 28</sup> This pattern persists despite the CPSC's recommendation that children aged ≤15 years not ride or drive adult-sized ATVs<sup>29</sup> and a voluntary agreement by ATV manufacturers and distributors "to use their best efforts to prevent their dealers from selling adult-sized ATVs for use by children under the age of 16".<sup>26</sup> Additionally, surveys of young ATV riders report that riding as a passenger or allowing others to ride as a passenger is common.<sup>11 12 17 30</sup>

### CONCLUSION

Given the popularity of ATV riding among youth and the potential for serious injuries,<sup>2–4</sup> effective interventions to reduce ATV-related injury among youth are needed.<sup>31</sup> Education-based approaches to improving ATV safety behaviours among youth face multiple challenges. As discussed above, three contraindicated behaviours, youth aged <16 years riding adult-sized ATVs, non-use of helmets, and allowing passengers, are quite common among young ATV riders. Furthermore, ATV crashes are common,<sup>11 14 17 30</sup> and most do not result in serious injury. For example, two-thirds of young

riders in Illinois reported having crashed an ATV during the past 6 months, with 11% of those injured requiring medical care.<sup>11</sup> Because many young ATV riders routinely do not follow ATV safety recommendations and perceive few serious negative outcomes,<sup>31</sup> messages regarding the risks of engaging in unsafe riding behaviours may have limited impact.<sup>32 33</sup> Because risk taking is a normal part of adolescent development and adolescents gain tangible benefits from some risk taking,<sup>32 34–36</sup> educational approaches to improve ATV safety that acknowledge these realities may be more likely to succeed.<sup>32 35 36</sup> A more thorough understanding of gender differences in ATV riding patterns among youth and perceived risks and benefits of both safe and unsafe riding practices might also help inform future ATV injury prevention efforts.<sup>15 37</sup> Last, in light of the developmental realities that encourage adolescent risk-taking and the limited availability of known effective strategies for reducing ATV-related injuries, young ATV riders in particular could benefit from research leading to safer designs for ATVs of the future.<sup>38 39</sup>

### What is already known on this subject

- ▶ All-terrain vehicle (ATV) riding is common among US youth, particularly in more rural settings.
- ▶ Inconsistent helmet use by young ATV riders is a long-standing, well-documented problem.

### What this study adds

- ▶ In 2011, an estimated 1 in 4 US youth aged 12–17 years reported riding an ATV at least once during the past year.
- ▶ Males and females had similar proportions of riding at least once during the past year, but among riders, the proportion of males who reported riding ≥6 times during the past year was triple that of females. Only 45% of riders always wore a helmet. The most frequent riders had the lowest consistent helmet use, with 8 of 10 youth who rode at least six times during the past year not always wearing a helmet.

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**Competing interests** None.

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**Data sharing statement** CDC does not have permission to share additional unpublished data from the study with researchers outside of CDC.

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### Youngest children from large families more at risk of fractures

A study from Nottingham based on the same database as that described above, concluded that children under 5 years old are more likely to fracture bones in their arms and legs if they were older than one, had older brothers or sisters, had young mothers or mothers with a history of alcohol misuse. These fractures were independently associated with younger maternal age and higher birth order. *Source:* Baker R, Orton E, Tata LJ, *et al.* Risk factors for long-bone fractures in children up to 5 years of age: a nested case-control study. *Arch Dis Child* Published Online First: 14 Nov 2014. doi:10.1136/archdischild-2013-305715.