Off-road and At Risk:  
The Challenge of Preventing All-terrain Vehicle Injury

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Arkansas Children’s Hospital  
University of Arkansas for Medical Sciences
A Case Illustration

• 2 year old by riding full size ATV with father
• Helmets not in use
• While idling, the child revved the engine
• ATV collided with tree
• Child sustained massive head injury
• CPR initiated at scene and child transported
• Died at hospital

"The whole thing was an accident. It was one of those freaks of nature where a phone rings, dad turns around, son leans forward, accelerator hits, dad falls off. Who would have thought?"

Boy ‘died ... having fun’ and child’s devastated family: ‘We and child loved his daddy,’ grandma says.
Objectives

• Review the epidemiology of ATV-related injury in children
• Update on research on ATV injury prevention
• Outline available resources and programs on ATV safety
ATV Types

4-Wheeler / Quad

Utility/UTV
4-Wheeler / Quad Characteristics

- Gasoline powered
- Knobby, low pressure tires
- High center of gravity
- Engine displacement 50 to over 900 cc
- Speeds \( \geq 80 \) MPH on some models
- Made for a single rider only – the driver
All-Terrain Vehicles

- ATVs are increasingly popular
- The number of ATVs in use in the U.S. has nearly tripled from about 3.6 million in 1999 to 10.2 million in 2008
- 1.1 million new ATVs were sold in the U.S. in 2007
- ATVs are becoming larger, heavier, and faster

US Government Accountability Office, 2010
Estimated Number of Emergency-Room Treated Injuries for All-terrain Vehicles, 1985-2010

Consumer Product Safety Commission, 2011
Deaths and ED Visits, Percentage of Children <16 Years

Consumer Product Safety Commission, 2011
Figure 1. Rate of ED visits for ATV-related injuries by age, 2009

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample, 2009
ATV related Deaths: Risk Factors: Child

• CPSC 2008 Pilot In-depth investigation of Youth fatalities. N=85 incidents; 93 fatalities
  ▪ 55% 12-15 years of age; 39% 6-11 yrs
  ▪ 76% male
  ▪ 75% ATV operators
  ▪ 34% Helmeted
  ▪ Training: ???????

Source: CPSC Pilot study on ATV Youth Deaths, 2008
ATV Related Youth Deaths
Risk Factors: Equipment

- 98% full size, adult models (>90cc)
- 90% >200cc engine displacement
- 70% Utility models
- 69% owned by family, friends (0 rented)

Source: CPSC Pilot study on ATV Youth Deaths, 2008
ATV Youth Deaths
Risk Factors: Event

- 39% Multiple passengers; 85% of whom were younger than 16 years
- 40% Collisions
  - 38% stationary object
  - 38% motor vehicle
- 32% Overturning/Ejection on uneven grade
- 13% Overturning/Ejection on level grade
- 11% Failure to turn with subsequent collision or ejection

Source: CPSC Pilot study on ATV Youth Deaths, 2008
Figure 14: Typical ATV Fatality and Injury Scenarios

**Going downhill**

Going downhill improperly can cause loss of control or cause ATVs to flip over. When going downhill, operators are to shift their weight to the rear and use a low gear.

**Going uphill**

Climbing hills improperly can cause loss of control or cause ATVs to overturn. Opening the throttle suddenly, for example, can cause the ATV to flip over backwards. When going uphill, operators are to shift their weight forward and, on steeper inclines, stand on the footboards and lean forward over the handlebars.

**Turning**

Turning at speeds too fast for the operator’s skills or for the conditions causes loss of control, resulting in the ATV tipping over. When turning, operators are to move forward and lean into the turn.

**Riding with passengers**

Most ATVs are designed for a driver only, and the long seat allows the operator to shift his or her weight and maneuver adequately. Carrying passengers on an ATV not designed for them reduces the operator’s balance and vehicle control. Children riding as passengers can easily fall off of ATVs being driven at a high speed.

**Striking objects**

In many states it is illegal to operate ATVs on public streets, roads, and highways. Riding on public roads can result in collisions with other vehicles. Collisions with other vehicles can also occur in off-road areas where ATVs cannot easily be seen. Trees, chains, and barbed wires are additional collision hazards for ATV operators.

Source: GAO based on reviews of ATV owners’ manuals, ATV Safety Institute training materials, and information provided by Consumer Product Safety Commission staff and ATV safety advocates.
Figure 2. Rate of ED visits for ATV-related injuries by location of patient residence, 2009

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample, 2009
Figure 1. ATV-related hospitalization rates by region (United States, children and adolescents 0 year to 17 years).

Still Unsafe, Still in Use: Ongoing Epidemic of All-Terrain Vehicle Injury Hospitalizations Among Children.
Bowman, Stephen; PhD, MHA; Aitken, Mary; MD, MPH

DOI: 10.1097/TA.0b013e3181ea283d
Estimated Risk of Death per 10,000 4-Wheel ATVs in Use
Crash rate per 10,000 registered vehicle type, from 2004 to 2008

Blecker et al, Pediatric Emergency Care & Volume 28, Number 5, May 2012
What about “child-sized” ATVs?

www.atv4kids.com
A changing paradigm

• Under current CPSC plans, shift from recommendations for children based on engine size to those based on speed

Table 1: ATV Requirements for Speed Limits for Youth-Sized ATVs

<table>
<thead>
<tr>
<th>Youth-sized age classification</th>
<th>Maximum limited speed capability— with a speed governor (mph)</th>
<th>Maximum unrestricted speed capability— without a speed governor (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y-6+: children 6 years old and older</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Y-10+: children 10 years old and older</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Y-12+: children 12 years old and older</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Transition: children 14 years old and older</td>
<td>20 and 30</td>
<td>38</td>
</tr>
</tbody>
</table>

American Academy of Pediatrics
Policy Statement

• Children under 16 should not operate ATVs.
• A drivers license should be required.
• ATVs should be banned on paved roads.
• A helmet should be required.
• Passengers should be prohibited.
## Prevention Challenges

<table>
<thead>
<tr>
<th></th>
<th>Motor Vehicle Safety</th>
<th>ATV Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evidence base</strong></td>
<td>Strong</td>
<td>Limited</td>
</tr>
<tr>
<td><strong>Message</strong></td>
<td>“Buckle up!”</td>
<td>Controversial</td>
</tr>
<tr>
<td><strong>Exposure</strong></td>
<td>Universal</td>
<td>Limited</td>
</tr>
<tr>
<td><strong>Policy approach</strong></td>
<td>Clear</td>
<td>Muddled</td>
</tr>
<tr>
<td><strong>Policy evidence</strong></td>
<td>Strong</td>
<td>Minimal</td>
</tr>
</tbody>
</table>
Key Messages, Skimpy Evidence Base

• Use an age-appropriate ATV
• Wear a helmet
• Get training
• No passengers
## Haddon Matrix for ATV Injury

<table>
<thead>
<tr>
<th></th>
<th>Human</th>
<th>Vehicle</th>
<th>Physical Environment</th>
<th>Socio-economic Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-event</strong></td>
<td>Driver experience, size, maturity</td>
<td>Vehicle size, HP, safety features, stability</td>
<td>Weather, Site of use, obstacles</td>
<td>Training, Legislation (helmets, etc)</td>
</tr>
<tr>
<td><strong>Event</strong></td>
<td>Helmet use, other protective gear</td>
<td>Vehicle size, speed</td>
<td>Trail design</td>
<td>Trauma systems</td>
</tr>
<tr>
<td><strong>Post-event</strong></td>
<td>Healthcare/EMS training</td>
<td>GPS or other signaling devices</td>
<td>Road/trail accessibility</td>
<td>Trauma systems, Insurance, Health Care, Rehabilitation</td>
</tr>
</tbody>
</table>
# Focusing on Key Messages

<table>
<thead>
<tr>
<th>Access Points</th>
<th>Opportunities for Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Event</strong></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Education</td>
</tr>
<tr>
<td>Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>Enactment/Enforcement</td>
<td>Enactment/Enforcement</td>
</tr>
<tr>
<td>Economics &amp; Environment</td>
<td>Economics &amp; Environment</td>
</tr>
<tr>
<td>Empowerment</td>
<td>Empowerment</td>
</tr>
<tr>
<td></td>
<td>4 Key messages</td>
</tr>
<tr>
<td></td>
<td>Safety equipment</td>
</tr>
<tr>
<td></td>
<td>Single rider</td>
</tr>
<tr>
<td></td>
<td>Training</td>
</tr>
<tr>
<td></td>
<td>Appropriate size</td>
</tr>
<tr>
<td></td>
<td>Education of Family</td>
</tr>
<tr>
<td></td>
<td>Children</td>
</tr>
<tr>
<td></td>
<td>Medical Legislatures</td>
</tr>
<tr>
<td></td>
<td>Helmet modification</td>
</tr>
<tr>
<td></td>
<td>Vehicle size</td>
</tr>
<tr>
<td></td>
<td>Horse power or governors on ATV</td>
</tr>
<tr>
<td></td>
<td>Safety features</td>
</tr>
<tr>
<td></td>
<td>Anti-roll device</td>
</tr>
<tr>
<td></td>
<td>Better stability</td>
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<tr>
<td></td>
<td>Encasing hot places</td>
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<tr>
<td></td>
<td>Licensing of user</td>
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<tr>
<td></td>
<td>Strengthening laws</td>
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<tr>
<td></td>
<td>Enforcing existing laws</td>
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<tr>
<td></td>
<td>Licensing/reg of vehicle</td>
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<tr>
<td></td>
<td>Parent fine for underage ATV use</td>
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<tr>
<td></td>
<td>Insurance rate reduction for training</td>
</tr>
<tr>
<td></td>
<td>Increase # of safe &amp; accessible riding areas</td>
</tr>
<tr>
<td></td>
<td>Advocacy grp in every county (IE: BACA)</td>
</tr>
<tr>
<td></td>
<td>Parent child contracts</td>
</tr>
<tr>
<td></td>
<td>Training of local fire/ems services</td>
</tr>
<tr>
<td></td>
<td>1 licensed instructor in every county</td>
</tr>
<tr>
<td><strong>Event</strong></td>
<td>1st responder training</td>
</tr>
<tr>
<td></td>
<td>Safety equipment</td>
</tr>
<tr>
<td></td>
<td>Size of atv</td>
</tr>
<tr>
<td></td>
<td>Speed of atv</td>
</tr>
<tr>
<td></td>
<td>Standards for trails &amp; riding areas (ie: like ski slopes)</td>
</tr>
<tr>
<td><strong>Post-event</strong></td>
<td>See bike matrix</td>
</tr>
<tr>
<td></td>
<td>Safety features</td>
</tr>
<tr>
<td></td>
<td>Flip alarm</td>
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<tr>
<td></td>
<td>Encasing hot places</td>
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<tr>
<td></td>
<td>Leak proof gas tank</td>
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<td></td>
<td>Cell phone</td>
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<td></td>
<td>GPS tracking</td>
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<td></td>
<td>Night riding</td>
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<td></td>
<td>Tickets/fines for violations</td>
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<tr>
<td></td>
<td>Surveillance system</td>
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<tr>
<td></td>
<td>Trauma services access to injured</td>
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<tr>
<td></td>
<td>Insurance</td>
</tr>
<tr>
<td></td>
<td>Health Care</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation</td>
</tr>
<tr>
<td></td>
<td>See bike matrix</td>
</tr>
</tbody>
</table>
# Understanding the Target Audience

<table>
<thead>
<tr>
<th>Access Points</th>
<th>Perception, Belief, and Behavior Influences on ATV Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Education</td>
</tr>
<tr>
<td>Pre-Event</td>
<td>Limited sources</td>
</tr>
<tr>
<td></td>
<td>Informal sources valued over authority</td>
</tr>
<tr>
<td>Event</td>
<td>Myths re: helmet use, safety of machines</td>
</tr>
<tr>
<td></td>
<td>Overestimating ability</td>
</tr>
<tr>
<td>Post-Event</td>
<td>Training of 1st responders</td>
</tr>
</tbody>
</table>
### Reverse Haddon Matrix: Identifying Unanswered Questions

<table>
<thead>
<tr>
<th></th>
<th>Human</th>
<th>Vehicle</th>
<th>Physical</th>
<th>Socio-Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Crash</strong></td>
<td>Physical readiness and maturity assessments from the industry, 4-H, and West VA – has anyone evaluated them? While developmental characteristics among children likely contributed to ATV crash frequency, mechanisms and injuries, prospective studies w/ prescriptively created ED care documentation is needed (Kute et al. 2007). This is an area of fertile ground and probably necessary to make much headway with policy Are crashes of novice drivers more or less severe than experienced drivers? Only 2 of 24 pts. w/ neuro abnormalities were inexperienced drivers &lt;16 yrs (Sanfilippo et al. 2008).</td>
<td>Are ATVs with smaller motors involved in fewer or less severe crashes? If so, is it a machine or human issue? Not being able to reach floorboards or foot pedals can result in child’s foot being caught in motor or chain mechanism. Younger children also sit astride differently to maintain balance. All children &lt;3 yrs had foot caught in chain mechanism whereas older children had foot caught between machine and stationary object (Thompson et al. 2008). Doesn't answer this question, but does start to give visual of why younger children need smaller motor ATV.</td>
<td>Are there minimum standards for a trail for public use? Signage? Slope grades and conditions? Are there standardized criteria and consistency from place to place?</td>
<td>Do we really know the barriers to not having training or are we speculating? Crash rate 11X higher for persons not completing high school; (Helmkamp et al. 2008). Literacy as barrier to training and adoption of safety? Logical leap from non-high grad to low income to lack of access to training and helmets.</td>
</tr>
</tbody>
</table>
Major Areas of Research Activity

- Epidemiology
  - Large database analyses
  - Coding and data quality
  - Trends for risk groups
- Education
  - Community projects
  - Targeted interventions
  - Qualitative research
  - Media studies
- Policy
  - Reviews of existing policies and effectiveness
- Engineering
  - ATV size and stability
  - Helmet design
Multi-disciplinary Work Group

- **Health:** Physicians, Nurses, Community Outreach, Public Relations, Government Relations, Researchers, Public Health
- **Community:** Insurance Industry, CPSC, Game and Fish Commission, ATV Industry, Cooperative Extension/4H
- **Activities:** Planning, research, education, and advocacy
- Practical and evidence-based solutions sought
What in ATV education works?

- 4H program developed in the 1980’s had promising evaluation—knowledge gains
- No known evaluation of consent-decree mandated training by SVIA to demonstrate it’s utility
- Doing education at all is controversial to some in the public health community
Project 1: Awareness Building

- First step: Develop educational materials
- Focus group responses to story board
- Public Service Announcements
- Print materials
- TRIPPS acronym
- Informational packets provided to physicians
Project 2: Community Education Campaign

- Non-randomized, controlled design
- Feasibility
- Tailored dissemination of materials for rural setting
- Worked through county-level health coalition
- Pre/post knowledge, self-reported behavior surveys in secondary schools
- First draft of an implementation guide

Dean’s CUMG Fund, Graham, PI
Baseline Risk Factors*

- ATV exposure (N= 1,950): 78%
- Passengers (occasionally+): 90.5%
- Helmet use (ever): 5%
- Any protective gear (ever): 54%
- Household exposure to ATVs reported:
  - 14% use by 0-6 year olds
  - 45% use by 7-12 year olds
  - 52% use by 13-15 year olds

* Among students reporting ATV exposure in previous 6 months
## Intervention Results by County

### ATV Use and Behavior by County and Time

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Exposure to ATV</td>
<td>85%</td>
<td>91%</td>
</tr>
<tr>
<td>Passenger Exposure</td>
<td>23%</td>
<td>20%</td>
</tr>
<tr>
<td>Helmet Use</td>
<td>15%</td>
<td>14%</td>
</tr>
<tr>
<td>Parent Awareness of ATV Use</td>
<td>63%</td>
<td>66%</td>
</tr>
<tr>
<td>Recall of ATV Safety Message</td>
<td>49%</td>
<td>63%*</td>
</tr>
<tr>
<td>Participation in ATV Safety Training</td>
<td>12%</td>
<td>29%*</td>
</tr>
</tbody>
</table>

* p<0.05
Project 3: Observational Surveys

- Attempt at measuring safety behaviors
- Trained local observers w/ stipends
- Subject to observer bias
  - no interview
  - observation from a distance

West Virginia University Injury Control Research Center, Aitken PI
Project 4: Targeting high risk groups

- More focused educational program
- Targeted youth and adults taking hunter safety class in Arkansas
- In collaboration with AR Game and Fish Commission
- Pre/post knowledge surveys
- Satisfaction surveys with instructors
Hunter Safety Class Intervention

Baseline Cycle
- Pretest: N = 1,641
- Standard Hunter Safety Class
- Posttest: N = 1,374

Intervention Cycle
- Pretest: N = 708
- Hunter Safety Class with ATV Safety Video
- Posttest: N = 694
Hunter Safety Education Project

Change in Correct Response, Safety Equipment
Baseline vs. Video Intervention (%)

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Baseline</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full coverage</td>
<td>4</td>
<td>11.8</td>
</tr>
<tr>
<td>Boots</td>
<td>3.9</td>
<td>9</td>
</tr>
<tr>
<td>Helmet</td>
<td>1.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Gloves</td>
<td>6.4</td>
<td>10.8</td>
</tr>
<tr>
<td>Pads</td>
<td>5.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Goggles</td>
<td>3.7</td>
<td>-1.6</td>
</tr>
</tbody>
</table>
Project 5: Targeted ATV Education Program

• Aims:
  – To develop and evaluate educational materials for use in general community based ATV injury prevention
  – To develop and evaluate more targeted educational strategies for use in populations at high risk for ATV injury
  – To explore innovative message delivery strategies for ATV injury prevention for children and adolescents

EMSC Targeted Issues Grant # H34MC08514-01-00: Development and Evaluation of Targeted ATV Education Strategies for Rural Children, 9/1/07-8/31/11)
Primary Activities

• Education tailored for specific target groups
• Use of expanded technologies for education delivery including video/DVD, movie theatre trailers
• Serial qualitative and quantitative evaluation of materials
Movie Theatre Project

- Conducted during summer 2009 in a single rural community
- Phased use of brochures, lobby art, preview PSAs throughout summer with surveys by trained student volunteers
- More patrons recalled ATV PSA (75%) than soda ad (75% vs. 58%, p<0.001)
- Patrons who saw PSA more likely to endorse ATV safety message than those who did not (90% vs. 75%, p<0.001)

Graham et al, MS in progress
Lessons Learned: Education

- Pragmatic approach of risk reduction
- Credible spokespersons
- Non-traditional venues
- Tailored messaging
“A Trip Unplanned”
Arkansas Game and Fish Hunter’s Education Course Outreach Efforts
2008

Number of attendees

- 0
- 1-10
- 11-50
- 51-329
Process Evaluation

- Coalitions
- Partnerships
  - Cooperative Extension/4-H
  - Game and Fish Commission
  - Children’s Safety Network
- Unplanned opportunities
- Unanticipated challenges
Do laws work for ATV safety?

- Early study compared states with
  - No laws, laws governing equipment only, laws governing driver behavior
  - States with no laws had injury rates twice as high as those with laws
    Helmkamp, AJPH 2001

- Several studies of single states indicate a trend toward increased helmet use in jurisdictions with helmet laws
ATV Laws 2011

Compliance with AAP guidelines for ATV use

- **Follows ALL AAP guidelines**
- **Follows SOME AAP guidelines**
- **Follows NO AAP guidelines**

*includes Hawaii public land
**includes Alaska

Training or License Requirement for ATV use

- **Other age requirement**
- **Training required with other land**
- **<16 training required**
- **Training required for use on**
- **<18 training required**
- **No training required**

*includes Alaska & Hawaii
ATV law effectiveness, 2012

- Review of new wave of laws requiring helmets and training are effective
- In states with helmet laws:
  - Death rates consistently lower except among the elderly
  - Death rates 23% lower overall
- Training regulations had no clear relationship to death rates

Engineering: How well do ATVs really work?

- Limited research on real-world performance of ATVs with adult or child riders
- One study measured rider-ATV fit for children ages 6-11 (N=8) and those 12-15 (N=11) on youth and adult ATVs using SVIA standards
  - Older youth fit better on adult ATVs than youth models
  - Younger children did not fit either youth or adult models
  - Overall conclusion is that aged based guidelines are not enough and size metrics should be considered

Bernard et al, Accident Analysis and Prevention, 2010
Engineering: how well do helmets work?

- Little study of protective gear or helmet effectiveness
  - reduction of 42% for mortality; 62% reduction in any head injury reported in a single study in 1990 (Rodgers, Accident Anal Prev)

- Follow up study conducted of ATV riders of all ages admitted to trauma centers

- Unhelmeted riders:
  - 62% increased risk for any TBI
  - 3 times more likely to sustain severe TBI
  - more than twice as likely to die in hospital

  Bowman et al, Injury Prevention, January 2009
Helmet use?

• Studies show variable but low helmet use—10-50% overall

• Preliminary study to prepare for a large scale helmet intervention
  – Focus groups of ATV riders (adult and youth)
  – Helmet wearers and non wearers
  – Presumed barriers and facilitators explored
  – Cost, comfort, and style less factors than lack of perceived risk
Do as they say, not as they advertise

When it comes to marketing ATVs, manufacturers emphasize thrills and ruggedness — not the extensive hazard warnings that come with the machines. Advertising images seem to contradict cautions against climbing steep hills, making jumps, performing stunts and riding over rough terrain. Disclaimers, if present, are usually fleeting or in small print.

**ON THE WEB SITE:** The steep incline and boulders suggest the rider can tackle the most rugged terrain.

**ON THE WEB SITE:** A child is shown turning sharply enough to kick up dirt on what looks like a 25-degree hillside.

**ON THE WEB SITE:** A model is shown in midair with the text: "Hold on for all you're worth." No visible disclaimer.

**IN THE OWNER'S MANUAL:** "Use extra caution when turning on any hill. Avoid crossing the side of a steep hill. ... Never operate this vehicle on hills steeper than 25 degrees."

**IN THE OWNER'S MANUAL:** "Never attempt stunts, such as wheelies or jumps. ... The faster you go, the more likely you are to destroy your head and internal organs, and skip the wheelies, jumps, stunts and any other showboating."

**IN THE OWNER'S MANUAL:** "Never operate ... on hills too steep for the vehicle or for your abilities. ... Do not operate on excessively rough, slippery or loose terrain until you have learned and practiced the skills necessary."

**SAFETY** Operator Safety

**WARNING**

**POTENTIAL HAZARD:** Improperly crossing hills and turning on hills.

**WHAT CAN HAPPEN:** Improperly crossing or turning as hills could cause loss of control or overturn.

**HOW TO AVOID THE HAZARD:** Never attempt to turn the ATV around on any hill until you've mastered the turning technique (on level ground) as described in the owner's manual. See page 80. Use extra caution when turning on any hill.

**WHAT A**

**WHAT A**

**WHAT A**

**WHAT A**

**WHAT A**

**WHAT A**

**Declined to respond to multiple requests for comment.** — Susan Goldsmith
Engineering projects

• Co-investigators at UAMS, ACH, University of AR, UA Cooperative Extension, private engineering firm

• Use advanced computer simulation technology to simulate performance of ATVs under differing conditions

• Potential applications
  – Education (short term)
  – Improved ATV and helmet design
Engineering Research
Simulation Factorial Study

ATV Speed 10mph  
Slope 30 degrees  
Slope length 2m

<table>
<thead>
<tr>
<th>Run</th>
<th>Factor 1 A: Speed mph</th>
<th>Factor 2 B: Slope Deg</th>
<th>Factor 3 C: Slope L</th>
<th>Response 1 Head Impact Vel mph</th>
</tr>
</thead>
<tbody>
<tr>
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Simulation videos

• Animation added to computer simulations to use in educational interventions
• Status: draft form for suggestions and edits
Planned Studies (pending funding)

• Engineering next steps
  – Tire and road surface characterization
  – Grip strength testing
  – Multiple passengers

• Educational intervention
  – Simulation impact

• Helmet and TBI studies
  – TBI characterization
  – Helmet strength requirements
  – Other helmet design issues/barriers (visual field, comfort, etc)
Building an ATV research program

- Ongoing epidemiologic studies
  - Actively monitor available data and trends
- Push field toward intervention rather than just descriptive studies
  - Policy
  - Innovative educational tools (video, simulations)
- Explore engineering approaches
  - Continue current studies
  - Collaboration (Engineering Institute, CPSC?)
Key Messages

• Use an age-appropriate ATV
• Wear a helmet
• Get training
• No passengers
Bottom line on evidence

- Risk perception mismatch requires careful messaging
- Helmets work but we can’t assume people will use
- Training can be effective but requires study of behavior change, not just knowledge
- Engineering studies are a potentially important way to understand how ATVs work with child riders
- Regulations requiring helmet use may be effective, but enforcement is key
- Entering a new era of youth models without clear data
Roles for Public Health Professionals

• Don’t ignore ATVs in primary care
• Engage in the (sometimes heated!) discussion about standards and messages
• Share available resources widely
• Promote and participate in research
• Support evidence-based policies
• Don’t give up!
Resources

• Injury Prevention Center at ACH

• Cooperative Extension Service/4-H

• Children’s Safety Network
  – http://www.childrenssafetynetwork.org/

• Consumer Product Safety Commission:
  – http://www.atvsafety.gov/

• ATV Safety Institute
  – http://www.atvsafety.org/asi.cfm
Questions?