

AN EPIDEMIOLOGY PUBLICATION OF THE PUBLIC HEALTH DIVISION
OREGON DEPARTMENT OF HUMAN SERVICES

HEADS UP: PREVENTING HEAD INJURY IN TEEN SPORTS

Given the galloping obesity epidemic, we have gotten on our soapbox many times—yea, even in this very publication—about the importance of physical activity. But we also want to sound a note of caution about the importance of preventing injuries while being active. This issue of the *CD Summary* reviews data and prevention resources for sports-related injuries among high school students, with a particular focus on head injuries.

WHAT'S THE RISK?

A recent study from CDC documents that the most common sports-related injuries among high school students are sprain/strain, contusion, fracture, and concussion. More serious injuries (i.e. concussions and fractures) occurred more than twice as often in competitions compared to practices. Overall, the injury rate was 2.44 injuries per 1,000 practices or competitions; 9% of injuries were concussions—which yields an estimate of 300,000 sports-related head injuries in the US each year.¹ The highest proportion of concussions among all injuries was observed in girls' soccer, girls' basketball, boys' football, and boys' soccer.

Mild traumatic brain injury (MTBI), commonly known as concussion, is defined as the occurrence of injury to the head arising from blunt trauma or acceleration or deceleration forces with one or more of the following conditions attributable to the head injury: observed or

self-reported transient confusion, disorientation, or impaired consciousness; dysfunction of memory around the time of injury; or loss of consciousness lasting <30 minutes.

Many youth will not consider a head injury serious, and they may be embarrassed or not even realize that they experienced unconsciousness or memory impairment. Coaches and parents also may not consider a bump on the head a serious matter. However, the symptoms can be severe and up to 15% of MTBI patients experience persistent disabling conditions such as headache, pain, cognitive and/or memory problems, fatigue, changes in sleep patterns, mood changes and changes in vision or hearing. In addition, youth who have sustained an MTBI and return to play before healing has occurred are three times more likely to sustain another MTBI, which can cause longer-lasting damage, such as brain swelling, permanent brain damage, and (rarely) even death.⁷

OREGON DATA

Using the rates of injury generated in the CDC study and rates

of sports participation among Oregon high schoolers,^{2*} we estimate that at least 8,500 injuries, including 678 MTBIs, were experienced by Oregon student athletes in the 2004–2005 school year. The frequency of MTBI varied by sport (Table 1).

Table 1. Estimated MTBIs in Oregon, 2004-2005, by selected high school sports**

Sport	MTBI as % of injuries	Estimated concussions	Rate/1,000 exposures
Girls soccer	15%	96	0.35
Girls basketball	12%	86	0.24
Boys basketball	3%	28	0.07
Football	10%	348	0.44
Boys soccer	10%	72	0.23
Wrestling	5%	34	0.12
Softball	4%	13	0.05
Girls volleyball	3%	19	0.05
Boys baseball	2%	8	0.02

**Although these data are "pretty good," they have a variety of limitations that might interest the geeky, inner epidemiologist in all of us, such as: not all schools in Oregon reported athlete participation in sports, exposures in each sport were estimated using the same number of practice and competition sessions for each sport, and frequencies, percentages and rates were back calculated from national study estimates.

PREVENTION

Head injuries occur when a player hits another player or the ground, or strikes the head on an object such as a soccer ball. Mechanisms of injury vary by sport (Table 2).

Obviously sports which require tackling, bumping an object, or falling put the athlete at risk for MTBI. However, many physical factors can be modified, such as the lack of helmet use when appropriate, the presence of unpadded, fixed objects on the

Table 2. Most frequent mechanisms of sports-related MTBI by selected sport¹

Football		Boys Soccer		Girls Soccer		Girls Basketball	
Being tackled	36%	Heading the ball	41%	Heading the ball	37%	Defending	22%
Tackling	34%	Goaltending	21%	Defending	15%	Dribbling	19%
Blocking	15%	General play	11%	Chasing loose ball	12%	Rebounding	16%
Being blocked	14%	Slide tackle	5%	Goaltending	9%	Chasing loose ball	10%

*This is almost certainly an undercount of teens engaged in sports, since many teens engage in sports outside of organized school activities, which would not be included in the OSAA estimate.



If you need this material in an alternate format, call us at 971/673-1111.

If you would prefer to have your *CD Summary* delivered by e-mail, zap your request to cd.summary@state.or.us. Please include your full name and mailing address (not just your e-mail address), so that we can effectively purge you from our print mailing list, thus saving trees, taxpayer dollars, postal worker injuries, etc.

field (such as goal posts), and a slippery field surface.

Behavioral factors also play a role, particularly in ensuring that youth who have experienced an MTBI do not continue to play until their injury has healed. Youth may be embarrassed to admit to being injured, or to have memory loss or confusion. Parents and coaches may encourage this denial in the spirit of promoting competitiveness and toughness on the field.

Healthcare providers can play an important role in educating youth, parents, coaches and schools about the risks related to MTBI. In addition, providers can help encourage schools to put in place appropriate prevention measures and policies, and also help ensure that youth who have sustained an MTBI are identified and appropriately managed.

Some prevention measures and policies include ensuring appropriate use of protective gear for individuals and padding for fixed objects; using rules of play that reduce rough hits or falls along with increased penalties for violent and aggressive infractions of rules; skill training that reduces behaviors that contribute to head injury (e.g., appropriate blocking technique), and education on head injury. The American Academy of Pediatrics recommends

that adults who supervise soccer, particularly among younger children, minimize "heading" the ball.³

In the case of possible injury, the coach should remove the athlete from play. When symptoms of MTBI are present, coaches should inform parents that their child might have a concussion, and urge that the youth be evaluated by a healthcare provider. Coaches should require clearance from a healthcare provider before allowing youths who have sustained an MTBI to return to play.

RESOURCES

CDC created the HEADS UP program to provide a coordinated educational approach to preventing MTBI. HEADS UP can assist you in providing coaches, parents and youth with tools to identify symptoms of head injury and establish concrete screening guidelines and recommendations. It also provides educational materials about MTBI for youth and parents. HEADS UP materials can be found at http://www.cdc.gov/ncipc/pub-res/tbi_toolkit/toolkit.htm.

The Injury Prevention program at the Oregon State Public Health Division (Injury Prevention and Epidemiology Section, Oregon State Public Health Division, email: lisa.m.millet@state.or.us) and the Brain Injury Association of Oregon, (<http://www.biaoregon.org>, email: biaor@biaoregon.org) can help

you make these materials available.

CONCLUSIONS

Head injuries occur in school sports, and can have serious consequences. There is much that can be done to prevent these injuries. However, the physical activity that sports encourage is, on balance, a good thing, and being sedentary poses risks to long-term health that almost certainly exceed those of sports-related injury.

REFERENCES

1. CDC. Sports-related injuries among high school athletes—United States, 2005–2006 school year. *MMWR* 2006; 55:1037–40.
2. Oregon State Athletic Association Participant survey. Available at <http://www.osaa.org/surveys/nfhsparticipationsurvey.asp>.
3. American Academy of Pediatrics Committee on Sports Medicine and Fitness. Injuries in youth soccer: a subjective review. *Pediatrics* 2000; 105:659–61.
4. McCrea M, Hammeke T, Olsen G, Leo P, Guskiewicz K. Unreported concussion in high school football players: implications for prevention. *Clin J Sport Med* 2004; 14:13–7.
5. Guskiewicz K, Weaver N, Padua D, Garret W. Epidemiology of concussion in collegiate and high school football players. *Am J Sports Med* 2000; 28:643–50.
6. Van Kampen D, Lovel M, Parkini J, Collins M, Fu F. The "value added" of neurocognitive testing after sports-related concussion. *Am J Sports Med*. 2006 Oct;34(10):1630-5. Epub 2006 Jun 30.
7. CDC. Heads up: concussion in high school sports. Atlanta, GA: US Department of Health and Human Services:2005. Available at http://www.cdc.gov/ncipc/tbi/coaches_tool_kit.htm.