Increased helmet use in alpine sports fails to reduce risk of traumatic brain injury

June 14 2018

Head injury is the leading cause of death and catastrophic injury among skiers and snowboarders and accounts for three to 15 percent of winter sports-related injuries. Helmet use is increasingly encouraged at ski resorts, however, there have been little data collected on the degree to which ski helmet use prevents traumatic brain injury (TBI) and other types of head injury (OTHI). A new study published in *Wilderness & Environmental Medicine* confirms that helmets are generally effective in protecting skiers and snowboarders from head injuries, but questions their effect in reducing traumatic brain injury, especially concussion.

Ski helmets are designed to protect the head from penetration and to deform upon impact to absorb impact energy and reduce head acceleration. "Sport helmet effectiveness in preventing TBI has been repeatedly questioned. This study assesses the effect of helmet use on the risk of TBI and OTHI in alpine sports," explained Nicolas Bailly, Ph.D., of the Laboratoire de recherche en imagerie et orthopédie, Centre de recherche de l'HSCM, Montréal, Québec, Canada, who led the study.

In France, a growing awareness of head injuries and improvements in the comfort and weight of helmets have resulted in a significant increase in child helmet use to 97 percent in 2014 and an increase in adult helmet use from nine percent in 2005 to 59 percent in 2014.

Investigators assessed the effect of helmet use in 30 French ski resorts between 2012 and 2014. Interviews were also conducted on the slopes with people without injuries. Two sets of cases (1,425 participants with

TBI and 1,386 with OTHI) were compared with two sets of controls (2,145 participants without injury and 40,288 with an injury to another part of the body).

Using participants without injury as control, investigators found that helmet wearers were less likely to sustain any head injury. Using participants with an injury to another part of the body as control, the risk of OTHI was lower among helmet wearers. However, no significant reduction was found in the risk of TBI.

These case control studies led to several key findings:

- Non-helmet-wearing participants were more likely to sustain injuries (TBI, OTHI, and injuries to other body parts) than helmet-wearing participants.
- When involved in a traumatic event, non-helmet-wearing participants had a greater risk of sustaining OTHI. However, the effect of helmet use on the risk of TBI (and concussion) was not significant.
- Participants with low skill levels, those aged less than 16 and over 50 years, and snowboarders, were at higher risk of head injury. Collisions and accidents in a snow park were more likely to induce head injury than other traumatic incidents.

"The reduced risk of non-head injury in helmet wearers was surprising because the helmet does not protect other parts of the body," commented Dr. Bailly. "This result suggests that helmet users take less risk than those who do not use helmets. This contradicts the 'risk compensation theory,' which implies that the perception of being protected by the helmet might lead people to take more risks. This study also poses important questions to the scientific community and to helmet manufacturers about how helmets can be improved to better protect from concussion."

More information: Nicolas Bailly et al. Effect of Helmet Use on Traumatic Brain Injuries and Other Head Injuries in Alpine Sport, *Wilderness & Environmental Medicine* (2018). DOI: 10.1016/j.wem.2017.11.007