

Inclusive and safe active mobility

JE Rod^{1,2,3}MD

Physical activity is considered the “best buy” in public health practice to prevent non-communicable diseases. This perspective overshadows the importance of avoiding injuries due to physical activity in vulnerable populations.¹⁻³ Non-communicable conditions are considered the third most common cause of mortality in people aged 5–19 years.⁴ However, injuries are the second most important global cause of mortality in this age group, with road injuries being the most frequent type of injury.⁴

In their study, Chia et al.⁵ found that the majority (39%) of non-motorised active mobility device (AMD) injury in Singapore occurs in public spaces (playgrounds, sports facilities and roads). This is in line with previous research in the US⁶ and Australia.³ Not only does AMD injury occurs more frequently in public space, but this location could be associated with higher injury severity. In an earlier study, Rod et al. discussed that injuries from wheeled recreational devices occurring in public spaces were associated with higher injury severity than those occurring in other locations.³ This highlights the importance of assertive governance for promoting safe active mobility.

A failure to deliver road safety initiatives to prevent AMD injuries might offset some of the projected gains of active mobility.^{1,2} However, evidence supports that the health gains of active mobility offset the health burden from traffic incidents due to physical activity.⁷ I believe this perspective is accurate, yet the idea that the benefits of active mobility outweigh the health risk associated with traffic incidents is not a solid argument to justify the relatively low attention given to safe active mobility. In addition, there might be unmeasured health outcomes from traffic incidents suggesting the “true” burden of traffic incidents due to active mobility might be underestimated.

One example of a hidden health burden from traffic incidents is pedestrian falls, which have not been traditionally considered a traffic injury despite representing approximately 90% of pedestrian incidents.⁸

Moreover, very few studies of pedestrian injury define what a pedestrian is.² Authors need to explain what they mean by a pedestrian, as this does not necessarily imply walking. Some jurisdictions like Singapore and the state of Queensland in Australia consider wheeled recreational device users and other wheeled vehicle users a pedestrian.⁴ The trauma incidence of such users might not be included in studies quantifying the burden of traffic incidents, given that its primary injury mechanism is a fall. This is evidenced in the findings presented by Chia et al.⁵ There are also long-term and psychological health outcomes that could not be quantified as traffic incidents but are indirect consequences of road injuries. For instance, the need for rehabilitation, long-term care, post-traumatic stress syndrome,⁴ anxiety and fear of injury, and re-injury. The psychological spectrum from higher perceived risk to anxiety and post-traumatic stress disorder might lead to decreased active mobility participation.⁹

The issues discussed above highlight the importance of examining the epidemiology of AMDs at present, especially considering the scarcity of research conducted in Asian communities. However, there are reasons to believe AMD injury could be a bigger problem in the future:

- More people are living in urban areas.
- There is an increasing worldwide push to move to sustainable and active modes of transport.
- There is a growing variability for commercially available AMDs and motorised wheeled recreational devices.
- There is an increasing number of wearable devices that compete for road users’ attention such as smart phones, smart watches and smart glasses.

The interaction of these factors might lead AMDs to have a higher risk of traffic injury in the future. An opposite perspective emerges from the safety in numbers effect, suggesting that the more participants in active mobility there are, the lower the risk of injury to each

¹ Centre for Accident Research and Road Safety Queensland, Queensland University of Technology, Brisbane, Australia

² Centre for Future Mobility, Queensland University of Technology, Brisbane, Australia

³ Departamento de Salud Pública, Universidad del Norte, Barranquilla, Colombia

Correspondence: Dr Javier E Rodriguez, Centre for Accident Research and Road Safety Queensland, K Block, Kelvin Grove Campus, Queensland University of Technology, 130 Victoria Park Rd, Queensland 4039, Australia.

Email: javieremilio.rodriguezzabala@hdr.qut.edu.au

This article was first published online on 9 September 2022 at annals.edu.sg

participant. The current evidence suggests this is the case.¹⁰ However, most of the research conducted on the safety in numbers effect is focused on the occurrence of pedestrian and bicycle crashes/collisions. This implies that the validity of the safety in numbers effect on other mechanisms of road injury, such as falls, needs to be studied. The literature discussing pedestrian falls suggests that falls might be more likely in areas with high volumes of vulnerable road users.¹¹ In addition, among vulnerable road users, not every user is equal in the level of vulnerability. The interaction of the above factors might also be particularly challenging for children using recreational devices and older adults.²⁻⁴ In the first group, vulnerabilities arise from the lack of cognitive and motor experience to cope with the traffic system. In the case of older adults, this is related to the mental and motor decline associated with biological ageing.

Road safety prevention strategies aimed at the “vulnerable of the vulnerable” also have the potential to give a high return on the invested capital. In the case of children, every injury prevented brings a triple dividend: their health now, their health in the future and the health of the next generation.¹ Moreover, Chia et al.⁵ found that the most common type of injuries from AMD are fractures, and the more common anatomical locations of injury are the head and the forearm. These injuries are critical long-term contributors to worse health outcomes in the paediatric population and their transition to adulthood. For instance, forearm fractures have been associated with poor long-term bone mass and strength. Similarly, facial wounds are associated with long-term psychological stress in children due to social stigma.³ Furthermore, head trauma is the leading cause of mortality and disability in children, and AMD accounts for more than 10% of patients attending emergency departments with head trauma.³ Moreover, up to 30% of patients with head trauma due to skateboard riding end up with hemiplegia, deafness or facial palsy.³ The other 70% have an increased risk of intellectual disability, premature mortality, low education and the need for welfare reciprocity later in life, even due to mild concussions to the head. In the case of older adults, pedestrian falls are an essential contributor to fall presentations (the most common form of injury in older adults) to the emergency department,² and older adults suffer worse health outcomes from a pedestrian fall and vehicle collisions.¹

The world is experiencing geopolitical and economic challenges that require governments to deliver effective prevention strategies under tight budgets. This highlights the need for cost-effective interventions that could simultaneously impact highly vulnerable populations at

multiple levels. Impact-absorbing surfaces could play this multidimensional preventive role in future mobility. They can potentially reduce both the incidence and harm from injuries to various vulnerable road users.³ Simultaneously tackling the incidence and associated harms would prevent the direct physical health burden of the injuries and the potential long-term mental health consequences, including the development of fear and anxiety of performing physical activity in the public space. This would also foster a more inclusive and safe traffic environment where those more vulnerable to severe trauma are less likely to be inequitably affected by active mobility.

Having presented my current academic perspective on the issue, I would like to provide insights from my personal experience. I have more than 10 years of experience commuting with AMDs and electrical mobility devices in Colombia, Germany and Australia (Fig. 1). I firmly believe that active commuting and car-lite cities are one of the best public health investments a government can make for its citizens. However, the fear of a severe injury is a behavioural barrier for me to engage in these activities more often. It is also one of the most common reasons I receive from my family, friends and colleagues across the above-mentioned countries to not engage in active



Fig. 1. Cross-national active mobility devices and electrical mobility devices used by the author. (A) Mountain bike commuting in Barranquilla, Colombia. (B) Road bike commuting in Brisbane, Australia. (C) City bike commuting in Mainz, Germany. (D) Road bike commuting in Barranquilla, Colombia. (E) Dual motor all-terrain wheel electric longboard commuting in Brisbane, Australia. (F) Polyurethane wheels electric longboard commuting in Brisbane, Australia.

mobility. In this sense, my academic and personal intuition suggests that safe active mobility promotes health through 2 pathways. The first pathway is the direct health gains associated with safe active mobility; the second pathway relates to the perception of security that arises from safe active mobility infrastructure, reducing behavioural barriers to using AMDs. Considering these pathways when designing interventions that promote active mobility could reduce the probability of children and older adults being inequitably affected. Thus, promoting inclusive and safe active mobility requires interdisciplinary risk analysis research that includes both objective (epidemiological) and subjective (psychological) aspects of risk.

REFERENCES

1. Rod JE, Oviedo-Trespalacios O, Senserrick T, et al. Older adult pedestrian trauma: A systematic review, meta-analysis, and GRADE assessment of injury health outcomes from an aggregate study sample of 1 million pedestrians. *Accid Anal Prev* 2021;152:105970.
2. Rod JE, King M, Senserrick T, et al. Health implications of age and gender injury patterns of non-vehicle pedestrian trauma. *J Transp Health* 2021;22:101130.
3. Rod JE, Oviedo-Trespalacios O, King M. A retrospective registry analysis of the transport-related health burden of wheeled recreational devices in Queensland, Australia. *Aust N Z J Public Health* 2021;46:208-15.
4. Liu L, Villavicencio F, Yeung D, et al. National, regional, and global causes of mortality in 5–19-year-olds from 2000 to 2019: a systematic analysis. *Lancet Glob Health* 2022;10:e337-47.
5. Chia AZH, Chong SL, Ganapathy S. Non-motorised active mobility device use by children in Singapore: Injury patterns and risk factors for severe injury. *Ann Acad Med Singap* 2022; 51:531-9.
6. Tuckel P, Milczarski W, Silverman D. Changing incidence and nature of injuries caused by falls from skateboards in the United States. *Clin Pediatr (Phila)* 2019;58:417-27.
7. Mueller N, Rojas-Rueda D, Cole-Hunter T, et al. Health impact assessment of active transportation: a systematic review. *Prev Med* 2015;76:103-14.
8. Methorst R, Schepers P, Christie N, et al. ‘Pedestrian falls’ as necessary addition to the current definition of traffic crashes for improved public health policies. *J TranspHealth* 2017;6:10-2.
9. Tjong VK, Murnaghan ML, Nyhof-Young JM, et al. A qualitative investigation of the decision to return to sport after anterior cruciate ligament reconstruction: to play or not to play. *Am J Sports Med* 2014;42:336-42.
10. Elvik R, Goel R. Safety-in-numbers: An updated meta-analysis of estimates. *Accid Anal Prev* 2019;129:136-47.
11. Schepers P, den Brinker B, Methorst R, et al. Pedestrian falls: A review of the literature and future research directions. *J Safety Res* 2017;62:227-34.