E-bike Death Review

A review of e-bike rider deaths in Ontario and recommendations for e-bike regulations

February 2025

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Executive Summary

In 2021, the Ottawa Fatal Collision Review Committee, a collaborative group with membership including police service professionals, city road safety professionals, public health officials and the regional coroner's office recognized an increasing number of deaths involving micro mobility vehicles, described as 'electric bikes' (e-bikes). An expert panel was assembled, to review these index deaths.

During the initial collision reviews, it was noted that the vehicles involved were electric powered, had pedals at the time of sale and were described and sold as an electric bike based on commercial websites as well as by the police officers investigating the deaths. For this reason, during this review, these micro mobility vehicles will be referred to as "e-bikes."

Five index deaths were reviewed by the expert panel. All index deaths involved vehicles which had been modified, in a manner believed to increase their speed beyond design specifications, but without modification of the safety elements (steering, brakes, tires) which would support a higher speed motorized vehicle. One was driven in a bicycle lane at a higher speed than a typical pedal bicycle could achieve, while others were driven amongst registered motorized vehicles on public roads. None of the e-bikes involved in the deaths resembled a pedal driven bicycle.

Detailed investigation of these deaths identified two common themes: (1) the vehicles were described as e-bikes yet resembled a motorcycle *(Figure 5)* or a Vespa like scooter/moped *(Figure 4)* and could not be used as a pedal assisted bicycle, (2) drivers who were operating this type of e-bike had previously lost their motor vehicle driver's licence. Three of the drivers had suspended driver's licences at the time of the crash, the remaining two had prior licence suspensions but an active licence at the time the crash occurred. These suspensions were related to driving infractions; driving under the influence of alcohol or substances; for medical reasons; or a combination of these reasons. The drivers appeared to be using their e-bike as a substitute for a registered, licensed vehicle.

While the focus of this review was the challenges and risks associated with e-bike related deaths; research relating to e-bikes also recognizes the benefits of power assisted bicycles, e.g. a power-assisted bicycle or e-bike are considered zero emissions vehicles. E-bikes are 18 times more efficient than a sports utility vehicle (SUV) (Dave, 2010). Benefits of e-bikes beyond reducing emissions helping to improve air quality in cities, include reduced traffic congestion, reduced transportation and parking costs while allowing for an alternative mode of transportation for low-income families (Dave, 2010). There are also significant health benefits for people who use e-bikes, including: increasing a person's ability to ride further, reducing barriers to cycling for those with physical limitations and helping to increase oxygen intake and improve overall fitness and health (Riiser *et al.,* 2022).

In Canada, the classification of power-assisted bicycles has historically been defined by the federal government. This was a classification of exclusion, making these vehicles unregulated. On February 4th, 2021, the definition of a power-assisted bicycle (often referred to in general terms as an ‘e-bike’), formerly located in subsection 2(1) of the Federal Motor Vehicle Safety Regulations was repealed (Environmental Registry of Ontario, 2024).

A provincial review of e-bike related deaths was proposed by the Office of the Chief Coroner, with injury prevention and community stakeholders, to examine if recommendations to prevent further deaths were possible. However, due to the lack of standard definitions of e-bikes and the lack of consistent data relating to injuries and deaths involving e-bikes this was not feasible. The first step towards effective recommendations is the need for standard categorization of the different types of e-bikes.

Based upon this review of the initial five e-bike related deaths, and the available provincial data, the expert panel provided seven recommendations aimed towards the prevention of e-bike deaths in Ontario. They address the definition of an e-bike, the importance of data collection to understand and evaluate morbidity and mortality related to e-bike use, and the apparent use of certain classes of e-bike as a modified, unlicensed motor vehicle. It is the panel’s hope that these recommendations will inform enhanced public safety on roads in Ontario and other jurisdictions.

Committee Members

Chair: **Dr. Louise McNaughton-Filion**	Regional Supervising Coroner – Ottawa Office of the Chief Coroner/Ontario Forensic Pathology Service
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Steve Brown	Research Associate, Traffic Injury Research Foundation
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Introduction

In response to growing concerns about e-bike related fatalities the Ottawa Fatal Collision Review Committee, which reviews motor vehicle deaths on a regular basis, assembled a panel of experts in 2021, which included law enforcement representatives, road safety officials, community representatives, public health representatives, injury prevention experts and a representative from the regional coroner's office. The purposes of this collaborative approach, were to gain a better understanding of e-bike related fatalities, identify common patterns, and elucidate factors contributing to these tragic incidents. Meetings, discussions, and correspondence with participants were held between November 2021 and November 2024, individually and in groups.

In the context of the global surge in e-bike usage, this review examined the varied regulatory frameworks across different regions. In Canada, multiple jurisdictions have explored amendments to their e-bike definition. As of April 5, 2024, British Columbia introduced a new light e-bike class which defines a lower power-assisted maximum speed (25 km/h) and operator age (14+) (British Columbia, Motor Vehicle Act, Motor Assisted Cycle (E-bike Regulation B.C. Reg. 64/2024)). In Ontario, the Ministry of Transportation introduced the *Safer Roads and Communities Act, 2024*, which received Royal Assent on November 19, 2024 and creates regulation-making powers under the *Highway Traffic Act* allowing e-bikes to be categorized into distinct classes, with each class having prescribed operator and vehicle safety requirements (Safer Roads and Communities Act, 2024). As of July 30, 2024, Quebec prohibited the operation on public roads of two or three-wheeled motor vehicles, with or without pedals, that have the appearance of a motorcycle or moped, and do not bear a national safety mark within the meaning of *the Motor Vehicle Safety Act* (or the compliance label prescribed by that Act) (Government of Quebec, 2024).

The growing popularity of scooter and motorcycle style e-bikes poses a significant classification challenge, with some e-bikes sold as one classification at the time of purchase with post purchase modification to exceed manufacturer top-speeds. Blurring of the lines between e-bike categories makes regulations and enforcement challenging. This review emphasizes the urgent need for clear and consistent definitions and categories of e-bikes to understand and address safety concerns and ensure regulatory compliance.

The interplay between regulations, infrastructure, and user behavior is central to the discourse on e-bike safety. This review examines research and data primarily from the European Union (EU) and the United States of America (USA), providing perspectives on e-bike safety, emphasizing the need for enhanced surveillance mechanisms to inform interventions and policy formulation.

In addition, the report examines complexities associated with modifying e-bike speeds, emphasizing the dangers linked to unauthorized changes and the importance of oversight systems to mitigate potential hazards. Amidst the backdrop of evolving regulatory landscapes and technological progress, the report calls for proactive steps to address regulatory shortcomings and strengthen enforcement initiatives to enhance public safety. This review of e-bike safety in

Ontario represents a collaborative endeavor focused on navigating regulatory intricacies, strengthening evidence-based insights, and promoting a culture of safety for e-bike riders and other road users. Through coordinated efforts, stakeholders can navigate the evolving e-bike landscape, developing safer roads and sustainable mobility solutions within Ontario and beyond.

Literature Review

Overview of e-bikes

Over the last decade, e-bikes have become increasingly popular with roughly 300 million e-bikes currently in use around the world (Casey & Wigginton, 2019). The popularity of e-bikes has been spurred by several factors, including: an increased focus on reducing emissions related to personal transportation, the health benefits of regular physical activity, and the reduction of barriers to cycling for those with physical limitations (Casey & Wigginton, 2019).

The definition of an e-bike varies considerably between different countries and regional jurisdictions. This lack of consistency in definition makes it difficult to compare e-bike related data and policies across jurisdictions. Despite this challenge, the different approaches that other jurisdictions have taken to defining e-bikes and regulating their use can help to inform Ontario policy approaches.

E-bike sales and usage are dominated globally by China, which accounts for roughly 93% of global e-bike sales (Fishman & Cherry, 2015). The vast majority of e-bikes in China are controlled via a throttle and closely resemble a scooter or moped style similar to *Figure 1*. Current regulations of e-bikes in China limit their weight to less than 55 kg and a top speed of 25 km/h (Yu, 2024). However, these e-bikes are easily modified to exceed this speed and enforcement of these restrictions is uncommon.

Figure 1 - Moped style e-bike (image taken from Made-in-China, 2025)

EU regulations for e-bikes establish distinct categories based on electric power and speed capabilities. Under EU regulations, electric-powered bicycles that reach assisted speeds between 25-45 km/h are classified as mopeds. This categorization requires additional licencing and is subject to heightened regulatory oversight. In contrast, e-bikes capable of speeds below 25 km/h are governed by standard bicycle regulations and are exempt from supplementary oversight (Engwe.com, 2025).

Low powered e-bikes with pedal assist similar to *Figure 2*, are central to the EU regulations. Pedal assist e-bikes provide electric assistance only when the rider is actively pedaling, which sets them apart from other e-bike models. This feature fosters a symbiotic relationship between human effort and electric propulsion. Pedal assist e-bikes typically adjust their level of assistance based on the rider's pedaling cadence or power, dynamically adapting to the user's exertion level.

The adaptability of pedal assist e-bikes allows riders to tailor their riding experience to various conditions. Buttons placed on the handlebars enable users to adjust the level of electric assistance, switching between different 'assistance modes' to suit their needs. For example, riders can opt for increased support when climbing hills, transporting extra cargo, or facing challenging weather like strong headwinds.

This user-controlled feature boosts the versatility of pedal assist e-bikes and can provide a more intuitive and personalized riding experience. By enabling riders to define their e-bike's performance in real-time, the biking controls comply with EU legal requirements.

Figure 2 – Low powered pedal assist e-bike with buttons to control electrical assistance on the handlebars

The USA dominates the North American e-bike market, accounting for approximately 98.74% of the sales (Mordor Intelligence Market Research Company, no date). Unlike the EU, where e-bike regulations are harmonized across EU members, each North American country has its own regulatory framework, though there are some similarities. In the USA, e-bikes available for sale are subject to federal regulation, while their usage is governed by state and local jurisdictions (Consumer Product Safety Commission, 2024). US Federal regulations classify e-bikes as low-speed, 2-3 wheeled vehicles with a maximum assisted speed of 32 km/h (or 20 mph) and a motor power not exceeding 750 watts. Additionally, state-level regulations, widely adopted across 38 states as of July 2023, further subclassify e-bikes to determine where they can be ridden (e.g. class 3 e-bikes may be restricted from low-speed areas, like multi-use lanes, for safety reasons) (RAEVbikes, 2023).

The Canadian Context

In Canada, the classification of power-assisted bicycles has historically been defined by the federal government. This was a classification of exclusion, therefore these vehicles are unregulated. As of February 4th 2021, the definition of a power-assisted bicycle (often referred to in general terms as an 'e-bike'), formerly located in subsection 2(1) of the Federal Motor Vehicle Safety Regulations was repealed (Government of Canada, 2018). Thus, the definition of 'e-bike' and their regulation in Ontario continues to be under review.

Since repeal of subsection 2(1) in 2021, there has been no change to Ontario's e-bike definition as the repealed federal definition continues to apply as the reference to subsection 2(1) remains within the Highway Traffic Act (HTA), 2024. Currently in Ontario, e-bikes are defined within section 1 of the HTA) with additional requirements prescribed within the Ontario Regulation 369/09, Power-Assisted Bicycles (Highway Traffic Act, O.Reg 369/09, 2024). This current definition continues to reference the repealed federal power-assisted bicycle definition . E-bikes are currently permitted to operate on-road and must follow the same rules as bicycles with some additional requirements including:

- A minimum operating age of at least 16, mandatory helmet use, a maximum assisted speed of 32 km/h and a maximum weight of 120 kg (264 lbs), and operable pedals.

- Similar to bicycles, a driver's licence, vehicle registration, licence plates, or insurance are not required to operate an e-bike.

Altering specifications (e.g. eliminating pedals), would reclassify the e-bikes as an illegal motor vehicle. Riders must comply with age restrictions, barring individuals under 16 from riding all e-bike classes on public roads and requiring riders 16 and over to wear an approved bicycle or motorcycle helmet and follow the same rules of the road as other cyclists (Ministry of Transportation, 2024). Despite these strict regulations, the proliferation of scooter and motorcycle-style e-bikes has been significant. These models, although promoted as e-bikes, often deviate from the established definition: exceeding weight, and power limits, featuring non-functional pedals, and enabling speeds beyond the mandated top speed.

In spite of the current provincial regulations, e-bikes, which do not comply with safety standards applicable to vehicles designed for use on public roads in Canada, continue to be imported and sold (Kolo Scooter v Canada, 2023). Scooter style e-bikes similar to those pictured *(Figure 4 & 6),* and motorcycle style e-bikes similar to those pictured *(Figure 5, 7 & 8)*, function more closely to an electric moped or limited speed motorcycle but are commonly sold as e-bikes in Ontario.

Speed of scooter style and motorcycle style e-bike is controlled exclusively via a throttle system, and footrests are provided. It is important to recognize that although they are marketed and sold as e-bikes, many models do not meet the existing definition of e-bikes in Ontario. These models frequently exceed the 120 kg weight limit, the 500-watt electric motor power output limit, include pedals which are non-functional and easily removable, often allowing the rider to exceed the 32 km/h assisted speed limit, without the need for modification. If modification for increased speeds is desired, it is commonly advertised by the retailer or easily done via online tutorials (Electronic Lab, 2023).

Separate from scooter and motorcycle style e-bikes are bicycle style e-bikes. Bicycle style e-bikes closely resemble traditional bicycles with the addition of an integrated electric motor and battery. They provide electric assistance to the rider through either a hub-drive or mid-drive motor. These motors are activated via either a throttle or sensor which provides electric assistance only when the rider is actively pedaling. E-bike sub-types are illustrated in *(Figure 3).* Pedal assist e-bikes fall within the US Class 1 e-bike definition and are similar to the EU pedal assist e-bike definition with the exception of the assisted speed of 32 km/h in contrast to 25 km/h in the EU regulation.

Different styles of e-bikes

Example Image and Type/Style	Typical Top Speed	Typical Power	Typical Braking System	Typical Weight
 **Pedal assist** e-bikes enhance riders' pedaling efforts with an integrated electric motor system. The motor automatically boosts power when the rider starts pedaling, easing the challenge of hills, headwinds, or long distances. These e-bikes typically feature lightweight frames and offer multiple levels of pedal assistance, allowing riders to choose their preferred boost intensity.	32km/h	250W to 750W	Hydraulic or mechanical disc brakes	22-28 kg
 **Throttle assist** e-bikes offer a boost of power at the rider's command with a simple twist or push of the throttle, similar to a scooter or motorcycle. Unlike pedal assist e-bikes, these bikes can propel riders forward without pedaling, making them ideal for those who want an effortless ride or need an extra push on demand. Throttle assist e-bikes typically feature robust motors and can reach higher speeds quickly.	32 to 45 km/h	250W to 750W	Hydraulic or mechanical disc brakes	18-32 kg
 **Cargo** e-bikes are designed to carry heavy loads. They feature sturdy frames and often come with extended rear racks or front cargo boxes. The electric assist motor helps manage the extra weight, making them ideal for transporting goods or children. These bikes are popular among delivery services and families.	45 km/h	500W to 1000W	Hydraulic disc brakes	27-40 kg
 **Commuter** e-bikes are designed with the commuter in mind, the frame is typically made from lightweight materials, such as aluminum or carbon fibre and a suspension system to absorb bumps and shocks and the tires are typically suited to road/pavement riding.	24 to 32 km/h	250W to 750W	hydraulic or mechanical disc brakes	16-23 kg
 **Scooter style** e-bikes are similar in visual design to mopeds. They typically combine pedals and a relatively low-powered electric assist motor system.	45 km/h	250W to 750W	hydraulic or mechanical disc brakes	23-52 kg
 **Motorbike style** e-bikes are similar in visual design to motorcycles designed for performance. They may have reinforced shocks and adjustable brake systems and while many can reach speeds of 60-80 km/h, some high-performance e-bike motorcycles can reach speeds of 160 km/h in race settings.	Up to 160 km/h	Up to 2000W	Hydraulic disc brakes	68-136 kg

Figure 3 Based on a review of various sources, including news articles and online articles.

As shown, *(Figure 3)*, the difference in physical characteristics between different types of e-bikes is often in excess of 100 kg. In spite of this and the ability for some e-bikes to be modified to exceed 32 km/h of assisted speed, many jurisdictions across Ontario govern e-bikes by the same rule of the road as traditional bicycles. This results in heavier and faster e-bikes, sharing bicycle infrastructure and multi-use paths with much slower path users. This has resulted in conflicts between e-bike riders and other path users (e.g. e-bike riders using sidewalks, interacting with slower moving pedestrians), however due in part to the e-bike definition at the time this review was conducted, there was limited data and reporting of the types of e-bikes involved in these conflicts (Gitelman, Korchatov, Carmel, 2022).

As all types of e-bikes continue to gain popularity in Ontario, the need to accurately define what is classified as an e-bike is imperative, allowing for the accurate tracking and reporting of incidents and conflicts involving e-bike riders (e.g. at signalized intersections, the proportion/number of e-bikes crossing on a red signal, e-bike collisions with vulnerable road users on bike paths, sidewalks and roadways). In turn, this should provide policy makers with accurate data to make informed decisions regarding e-bike safety in Ontario.

E-bike Safety

E-bike data are difficult to compare across jurisdictions given the differences in e-bike definition. Differences in the traffic laws, infrastructure, and driver/riding behaviors across jurisdictions further complicates the direct comparison of e-bike safety data. Despite this, e-bike safety data from other jurisdictions with similar characteristics can, when taken in the local context, be a valuable resource to aid in making informed decisions regarding e-bike regulation in Ontario. The EU and USA e-bike regulations are most similar to those in Ontario, and therefore traffic safety studies from these areas are most relevant and should assist in developing regulations in Ontario.

A review by Cherry and MacArthur (2019), examined studies relating to e-bike safety from the EU and USA. They found that USA collision and injury databases across many jurisdictions grouped all powered 2 wheeled vehicles together as e-bikes. This did not permit comparisons between e-bike types or classes. Taking this into consideration, a 2016 study examined collision and injury data across all e-bike types. This study reported an approximate injury rate of 1.4 injuries per 1000 e-bikes, compared to 10 injuries per year per 1000 traditional bicycles (DiMaggio *et al.,* 2016). A cross-sectional study from 2017-2022 that examined data from the USA in relation to injuries sustained when using e-bikes and e-scooters showed an increase of injuries from 8,566 in 2017 to 56,847 injuries in 2022 (Fernandez *et al.,* 2024).

Cherry and MacArthur (2019) recognized the challenge with direct comparisons between e-bikes and traditional bicycles; as e-bike riders often use their e-bikes more often, for longer trips, and are more likely to ride in an urban setting with other road users. Traditional bicycle riders are more likely to use mountain bikes on trails or on bike paths for recreation, thus the environment of use may be different.

In addition, Cherry and MacArthur (2019), review of European studies found that an e-bike type was more likely to be captured in injury and collision reporting, versus traditional bicycles, in part because of the relatively high e-bike usage in many European countries. They found, in contrast to the DiMaggio study, that e-bikes were associated with an increased risk of crashing, particularly when dismounting the e-bike and in older populations (DiMaggio *et al*., 2016). Taking into account the controlled factor of kilometers ridden, there were no differences in crash risk between e-bikes and traditional bicycles (Schepers Wolt & Fishman*,* 2018).

E-bike Speed Modification

With the rising popularity of e-bikes, driven by technological progress and regulatory shifts, the importance of e-bike safety is heightened. While Ontario's regulations specify a maximum assisted speed of 32 km/h, limited post-retail oversight provides opportunity for exploitation. Modifications are made that surpass legal limits, such as adjusting motor settings or removing speed limiters, increasing the likelihood of collisions, and jeopardizing public safety.

Many trails and sidewalks do not have posted and/or enforced speed limits. E-bikes can operate at potentially dangerous speeds within pathways that are frequented by pedestrians. The higher speeds increase the risk of collisions by reducing the rider's ability to quickly respond to unexpected obstacles, worsening the potential injuries on impact.

According to Fiore, Fellows and Henner (2020), the easing of e-bike restrictions in wilderness areas, including US national parks, has enabled greater accessibility to remote locations through the use of e-bikes. Nevertheless, the widespread adoption of these vehicles, combined with the possibility of hazardous modifications, underscores the importance of comprehensive regulatory structures.

Consequences of e-bike modification extend beyond individual safety concerns to urban planning and public infrastructure. As e-bikes continue to be a more popular form of transportation, particularly in crowded areas, ensuring their safe incorporation into existing transportation systems is crucial. Consideration for dedicated bike lanes, appropriate signage, and public education initiatives that inform both riders and pedestrians about safely sharing the travelled surfaces are of great importance. Without clear regulations and monitoring systems, enforcement is increasingly challenging.

The *Motor Vehicle Safety Act (1993)* is federal legislation which regulates the manufacture of vehicles in Canada that are shipped across provincial borders and the importation of vehicles into Canada. The Act also regulates the alteration of certified (regulated) vehicles prior to initial retail sale of vehicles included in the definition of manufacture (Motor Vehicle Safety Act, 1993). Power-assisted bicycles are considered restricted-use vehicles (with a speed less than 32 km/h) and are thus not regulated. Therefore, any modifications of a power-assisted bicycle prior to initial retail sale are not regulated by federal law, and modifications made to vehicles after they are presented for registration by the province fall out of scope of the Act (Motor Vehicle Safety Regulations, 2021). After sale modifications of e-bikes of any definition in the province do not fall under federal legislation; any modifications would fall under provincial or municipal jurisdiction.

Case Studies

E-bike Fatalities - Cases Identified for Review

The Ottawa Fatal Collision Review Committee is a committee which collaboratively reviews local serious motor vehicle collisions with a lens of safety within weeks of their occurrence, to inform potential development of recommendations to prevent further deaths. Committee membership includes police services, municipal traffic services, public health, and the Office of the Chief Coroner.

As part of the committee collision evaluation, over the period of 2020 to 2021, the Ottawa Fatal Collision Review Committee recognized a number of e-bike/motor vehicle collision related deaths. The committee recognized that e-bikes were not considered to be vehicles and therefore unless the death was associated with a collision with a motor vehicle, e-bike related deaths may not be subject to investigation by traffic collision experts.

For the purposes of the review the expert panel examined five deaths including those not associated with collision with a motor vehicle. Case summaries were prepared to provide an understanding of the circumstances of each death. Further information is included in Appendix B.

Case One:

A male in his 60’s died from multiple trauma sustained in a collision with a car. He was struck by a car traveling at approximately 70 km/h as he was turning left at an intersection. His helmet came off during the collision and death occurred on arrival at the hospital. Video captured the events of the collision revealing his travel, crossing three lanes of traffic, turning left without any stop or delay despite a red left turning light.

He had a history of alcohol and substance use. The deceased had no driver’s licence and had prior convictions for driving under the influence (DUI) and driving with a suspended licence. His e-bike had been modified to increase speed and was not fitted with pedals. On mechanical assessment of the vehicle, it was determined the e-bike had misaligned brakes and minimal tire tread.

His death resulted from multiple traumatic injuries and alcohol and cocaine were present in his blood.

Issues identified: Traffic violations, Insurance, Licensing, E-bike modification, Impaired driving.

E-bike involved: Motorino XPh

Weight: 70kg

Figure 4 – Picture taken from Motorino.ca.

Case Two

A man in his 50's died due to multiple trauma sustained in a single e-bike collision. The man was riding an e-bike in daytime hours on good road conditions while wearing a helmet. He lost control at an intersection, jumped the curb, and struck a light standard. He died secondary to injuries suffered in the collision a number of weeks later despite intensive medical care. He had a history of benzodiazepine and opioid use for chronic pain disorder.

The deceased person had no driver's licence at the time of the collision. The e-bike had been modified. His death resulted from multiple trauma and etizolam, tetrahydrocannabinol (THC), and very high levels of fentanyl were present in his blood.

Issues identified: Insurance, Licensing, E-bike modification, Impaired driving.

E-bike Involved: Daymak EM2

Weight: 160kg at the tow yard,
113.39kg as per manufacturer

Figure 5 – Photo credit daymak.com.

Case Three

A man in his 50’s died due to multiple trauma sustained in a collision with a car. The man was riding an e-bike during the daytime in a bicycle lane on an urban road when he was struck by a car turning into a parking lot. He was wearing a helmet and travelling at approximately 43 km/h. He died at the collision site.

His driver’s licence was suspended over 10 years prior relating to sleep apnea. The e-bike had been modified for greater speeds and was not fitted with pedals. His death resulted from multiple trauma and THC was present in his blood.

Issues identified: Insurance, Licensing, E-bike modification.

E-bike involved: Berini Dolce Vita

Weight: 157kg as per manufacturer

Figure 6 – Picture taken from yelp.com.

Case Four

A man in his 30’s died due to multiple trauma sustained in an e-bike collision with a sport utility vehicle (SUV). The man was riding an e-bike during the daytime on a residential city street when he collided with the rear passenger side of an SUV. The man was wearing a helmet and travelling at approximately 70 km/h at the time of the collision which caused his death. He had no known medical problems.

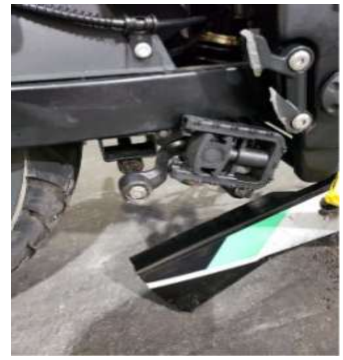
The deceased had his G-class driver’s licence at the time of the collision. He had multiple previous licence suspensions, the majority for unpaid fines. He had previous traffic violations which included three collisions due to failure to yield, impaired driving, speeding, and improper turn. The deceased person had stated on Facebook that he could achieve 180 km/h on his e-bike. The sales website for the e-bike stated they could modify the bike to travel up to 90 km/h. The e-bike had been modified for greater speeds and had no chain on the sprocket or pedals.

His death resulted from multiple trauma and fentanyl, cocaine metabolites, etizolam, and ethanol were present in his blood.

Issues identified: E-bike modification, Impaired driving.

E-bike involved: E-Global Cobra

Weight: 170kg at the tow yard, 120kg as per manufacturer



E-Global Cobra with pedals folded in for storage.

Figure 7 – Pictures taken from Google.

Case Five

A man in his 50’s died due to complications from injuries sustained in an e-bike collision. The man was riding an e-bike during daytime hours on a residential city street travelling at a low speed while wearing a helmet. He swerved to avoid a collision with a pedestrian and crashed, resulting in musculoskeletal injuries. He died a few weeks later from complications of injuries sustained during the collision.

The deceased person had multiple previous traffic violations including speeding and prior suspensions related to unpaid fines. His driver’s licence was medically suspended after the initial collision. The e-bike had been modified. No toxicologic testing was completed.

Issues identified: E-bike modification, Insurance, Licensing.

E-bike involved: EMMO Knight EM1 E-bike.

Weight: 115kg as per manufacturer

Figure 8 – Picture taken from Facebook.

Findings and discussion

After review of the index deaths, a subcommittee was formed, to access all available e-bike mortality and morbidity data relevant to Ontario. This subcommittee consisted of representatives from injury prevention organizations, public health officials and provincial government officials.

Table 1 summarizes the key findings of these data, based on 25 e-bike collision deaths identified in Ontario between 2012-2021. Please see Appendix B and C for more details.

Table 1

Reported E-Bike Fatalities in Ontario: 2012-2021

	Percent of deaths
Gender	
Male	96%
Female	4%
Age	
>= 45 years	76%
25 – 44 years	24%
< 25 years	0%
Time of year	
Winter	20%
Spring	28%
Summer	32%
Autumn	20%
Helmet worn	
Yes	60%
No	8%
Unknown	32%
Toxicology	
No toxicology performed	48%
Toxicology performed: Drug present	69%
Alcohol present	31%
Roadway	
Public	88%
Private	4%
Unknown	8%
Driver licence status	
Unknown	44%
When known cancelled or never licenced	21%
suspended	29%
active licence	50%

(Traffic Injury Research Foundation, 2024)

A summary of these data showed, deaths identified as related to e-bikes, all involved the operator of the e-bike. A high proportion of the deceased persons were males over the age of 45. Deaths occurred year-round with nearly all deaths occurring on a public roadway. Almost half of these deaths did not have toxicology testing performed, however of those that were tested, drug and alcohol use was significant. In more than half of the deaths, the driver's licence status was not recorded, when this information was obtained, 50% of the drivers had either a suspended licence, a cancelled licence or were never licenced. Information regarding e-bike modification was not captured as a data point in these information sources.

In comparison, of the five fatalities identified by the Ottawa Fatal Collision Review Committee, three operators had suspended licences, the remaining two had an active licence but prior suspensions. Four of five were found to have intoxicants present (substances or alcohol, or both) and believed by investigators to be demonstrating behaviour consistent with impairment at the time of the collision. The five fatalities reviewed involved e-bikes which had been modified, most often allowing speeds greater than those for which the e-bike had been originally designed.

Provincial morbidity (illness) data relating to e-bike injuries are limited. Only one of eleven trauma centers in Ontario was specifically tracking e-bike injuries at the time of this review (please see Appendix C).

There was limited information available/accessible regarding e-bike related injuries or deaths within existing datasets in Ontario and Canada. In traffic collision datasets, e-bike related incidents were grouped with traditional bicycles under the pedestrian category. In administrative health data, they may be coded as pedestrian or motorcycle incidents depending on several factors, including jurisdictional practice. Narrative-based systems including the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) (Public Health Agency of Canada, 2018) and the National Fatality Database (Traffic Industry Research Foundation, 2024) appear to specifically identify e-bike related injuries and deaths, but the range of e-bike designs introduces uncertainty regarding the specific types involved in each injury event.

Consistent and robust standardized reporting are required to adequately understand e-bike related injuries and deaths. It is essential to specify the type of e-bike involved, such as bicycles with power assist, cargo bikes, or moped-style bikes, in order to gain insights as to whether there are different risks and harms associated with each e-bike design. Currently there is no data related to the ownership of the e-bikes. Recording such data would allow for future research and studies into the benefits and risks of rideshare programs compared to ownership of e-bikes.

Overall, standardized data reporting on e-bike usage and safety will be the key to shaping evidence-driven policies to enhance e-bike rider safety. Reliable consistent data can aid in surveillance, prioritize interventions, and effectively improve road safety for e-bikes of all descriptions, riders as well as other road users.

Lessons Learned

Moving forward, it is clear that more needs to be done to accurately capture data related to e-bike deaths, injuries and collisions involving e-bikes. At the time of this review, e-bike collisions, injuries, and fatalities were not captured as distinct incidents in existing datasets. These reporting issues and potential solutions are presented in (*Figure 9)*.

Figure 9 **Standardized reporting issues**

1) ***Comprehensive and standardized definition of e-bikes.***
   a) Establish a precise and universally recognized definition of e-bikes, encompassing the diverse range of types and designs, including power-assisted bicycles, cargo bikes, and moped-style variants.
   b) A unified conceptualization ensures that incidents involving e-bikes can be accurately identified and reported.
2) ***Distinguish privately owned and rideshare e-bikes.***
   a) Data reporting should differentiate between privately owned e-bikes and those used in rideshare programs.
   b) Understanding the ownership context may assist policy development, enforcement, and targeted interventions.
3) ***Establish in collision reporting if an e-bike is involved and the type involved.***
   a) Establish a precise and universally recognized definition of e-bikes, encompassing the diverse range of types and designs, including power-assisted bicycles, cargo bikes, and moped-style variants. This unified conceptualization should assist in accurately identifying and reporting incidents involving e-bikes, removing ambiguity.
4) ***Standardization of reporting in narrative datasets.***
   a) Existing datasets appear to lack consistent reporting practices for e-bike injuries and fatalities.
   b) Standardizing reporting in narrative datasets (such as trauma registries, National Fatality Database, and CHIRPP) is necessary to support case identification.
   c) Clear guidelines will guide data collection, ensuring accurate and comprehensive standardized reporting.
5) ***Coding of e-bikes as an external cause.***
   a) Emergency department and hospitalization data should explicitly code e-bikes as an external cause to enable longitudinal monitoring at the population-level, providing insights into trends and risk factors.

Beyond recognition of the importance of defined, consistent, robust and accessible collection of data regarding e-bike morbidity and mortality, it is of significant importance to recognize and respond to the risk of certain e-bikes being modified in a way that could substantially impact rider safety.

Standardized definitions of different e-bikes should lead to improved public safety announcements, engagement and enforcement measures which can prevent further deaths and injuries.

Committee Recommendations

This review generated seven recommendations. The government and non-government institutions and individuals who participated and consulted in this review were instrumental in the development of these recommendations. They were informed through their diversity of opinions, all of which were very important and contributed to the report and recommendations. The recommendations will be distributed to identified organizations and agencies that may be in a position to affect implementation.

Similar to recommendations generated through coroner's inquests, the recommendations made by the expert panel are not legally binding, and there is no obligation for agencies and organizations to implement or respond to them. However, it has been our experience that recommendations provided by the OCC are carefully considered by those receiving them.

Organizations and agencies are requested to respond back to the Office of the Chief Coroner regarding the status of implementation of recommendations within six months of distribution. All reports and recommendations will be distributed electronically, and responses received will be part of the public record and available upon request.

Through increased discussion and recognition of the current issues surrounding e-bike use and e-bike related deaths, the panel is optimistic that innovative initiatives will be promoted and developed in a collaborative manner throughout the province.

Recommendations

To the Ministry of Transportation of Ontario

E-bike Definition

1. The Ministry of Transportation of Ontario should provide a revised clear definition of an e-bike as a pedal assisted bicycle with the following requirements:

a) Two or Three wheels,
b) Primary source of propulsion through human power (pedaling),
c) An electric motor with a continuous rated output power not exceeding 500 watts
d) Pedals must be used by rider to set or keep the vehicle in motion,
e) Propulsion assistance cannot increase travel speed beyond 32 km/h,
f) Presence of handlebars for steering and an adjustable seat,
g) Weight of no more than 55 kg,

Within the definition there should be consideration given to specialized e-bikes, such as cargo bikes, family bikes and recumbent bikes.

E-bike Classification

2. The Ministry of Transportation of Ontario should consider a separate classification approach for all low-speed electric motorcycle type and “Vespa like” scooter type vehicles. The Ministry may consider reviewing the classification approach for mopeds and similar motor vehicle classes with these electric mobility vehicles in mind:

a) Motorcycle and scooter type e-vehicles should not be classified as e-bikes or power assisted bicycles.
b) Consideration should be given to regulating these types of vehicles and requiring licensing and insurance.
c) Scooter type e-vehicles and motorcycle type e-vehicles may require different regulations, licensing, and insurance due to their different structure and possible uses.

Reporting

3. The MVCR (Motor Vehicle Collision Report) currently in use for motor vehicle collisions in Ontario, should be revised to:

a) Include a category for e-bike (with the definition provided in Recommendation #1) with the same criteria for mandatory reporting as motor vehicle collisions (e.g., requiring medical attention or damage of $2,000 or more).

b) Ensure capture of other motorcycle or “Vespa like” scooter type electric vehicles in the MVCR as motor vehicles with identification of vehicle type to enable reporting of crash rates.

Recommendation to the Office of the Chief Coroner for Ontario

4. The Office of the Chief Coroner should develop an approach to information collection during the investigation of deaths involving (1) e-bikes (2) electric motorcycle type and (3) scooter type vehicles (as per the definitions in Recommendations #1 and #2).

Recommendations to the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) – Public Health Agency of Canada (PHAC), the National Ambulatory Care Reporting System; Discharge Abstract Database (NACRS; DAD) – Canadian Institute for Health Information (CIHI) and Ontario Trauma Centers

5. CHIRPP (PHAC), NACRS & DAD (CIHI), and Ontario Trauma Centers should work collaboratively to ensure health data collection defines and systematically captures data regarding injuries and deaths related to e-bikes and low speed e-vehicles, specifically in their injury and fatality data (e.g., inclusion of vehicle-specific ICD codes or other mechanism).

Recommendations to Parachute, Public Health Ontario (PHO), Traffic Injury Research Foundation (TIRF) and the Ontario Ministry of Transportation (MTO)

6. Parachute, PHO, TIRF and MTO should develop an approach for regular analysis and synthesis of injury and fatality data related to e-bike and electric motorcycle and scooter type vehicles. Synthesis and analysis should inform creation of knowledge products for appropriate audiences.

Recommendations to the Ministry of Transportation, Association of Municipalities Ontario (AMO)

7. The Ministry of Transportation and AMO should work together to develop and implement measures to support effective enforcement of a safe speed limit for all e-bikes and low speed e-vehicles.

Conclusion

The increasing availability of micro mobility options, such as e-bikes, in urban areas presents both advantages and disadvantages for transportation and road safety. These alternative modes of transport provide greater convenience and accessibility, however there are potential associated unique safety concerns, specifically those arising from modification of e-bike speed.

Clear e-bike definitions and collection of consistent and robust data regarding e-bike related morbidity and mortality will inform understanding of injury events and inform recommendations to prevent further deaths and support evaluation of the effectiveness of implemented recommendations.

Given the size and increasing frequency of e-bike use, it is important to address unauthorized speed modifications to support safety. The importance of oversight in the time after consumer purchase has been recognized as a concern as post purchase modifications allow e-bike travel dangerously exceeding legal speed limits. High speeds in areas with pedestrian traffic support the need for comprehensive regulatory measures and enforcement.

Addressing the challenges posed by e-bike speed modification requires a multifaceted approach. Collaborative efforts, innovative solutions, and community engagement are necessary for creating a safer environment for all road users. It is important to strike a balance between promoting innovation and accessibility, while recognizing the importance of public safety.

In this rapidly evolving landscape, continued research, evaluation, and adaptation of strategies are necessary to effectively address emerging safety challenges. By taking proactive measures and stakeholders working collaboratively, e-bikes can be a sustainable, safe, pleasant and efficient mode of transportation. Ultimately, by prioritizing safety and sustainability, the potential of micro mobility can be leveraged to create more inclusive spaces for everyone.

Appendix A

Coroners Act, R.S.O. 1990, c. C.37

Coroner's investigation

15 (1) Where a coroner is informed that there is in his or her jurisdiction the body of a person and that there is reason to believe that the person died in any of the circumstances mentioned in section 10, the coroner shall issue a warrant to take possession of the body and shall examine the body and make such investigation as, in the opinion of the coroner, is necessary in the public interest to enable the coroner,

(a) to determine the answers to the questions set out in subsection 31 (1);
(b) to determine whether or not an inquest is necessary; and
(c) to collect and analyze information about the death in order to prevent further deaths. 2009, c. 15, s. 7 (1); 2018, c. 3, Sched. 6, s. 5.

Expert assistance

15 (4) Subject to the approval of the Chief Coroner, a coroner may obtain assistance or retain expert services for all or any part of his or her investigation or inquest. R.S.O. 1990, c. C.37, s. 15 (4).

Appendix B

E-bike Injury Data Sub-Group Update (Data review in Appendix C was 2012-2020)

Traffic Injury Research Foundation

Known E-Bike Fatalities in Ontario: 2012-2021

Age category	Sex	Crash period	Crash season	Time of crash	Road type	# of vehs	Pos	Ejected	Helmet worn	Alcohol positive	Surv driv cond	Drug positive	Cannabis positive	Driver lic susp
45-64	M	2012-2016	Summer	1500-1759	Other public	2	Driv	Fully ejected	Yes	Yes	Distract	No	0	
65+	M	2012-2016	Summer	Unk	Unk	1	Driv	Unk	Unk	Not tested	N/A	Not tested	Not tested	
25-44	M	2012-2016	Spring	2100-2359	Other public	2	Driv	Fully ejected	Yes	0	Normal	Yes	Yes	Unk
65+	M	2012-2016	Spring	Unk	Unk	1	Driv	Fully ejected	Unk	Not tested	N/A	Not tested	Not tested	Unk
65+	M	2012-2016	Winter	1500-1759	Other public	3	Driv	Fully ejected	Yes	0	Distracted	No	0	No
65+	M	2012-2016	Winter	1500-1759	Other public	2	Driv	Not ejected	No	0	Normal	Yes	0	Unk
45-64	M	2017-2021	Fall	1800-2059	Priv prop	2	Driv	Unk	Yes	0	Normal	Yes	Yes	Unk
45-64	M	2017-2021	Fall	Unk	Other public	1	Driv	Not ejected	Unk	0	N/A	Yes	0	Unk
45-64	M	2017-2021	Fall	Unk	Other public	1	Driv	Unk	Unk	Not tested	N/A	Not tested	Not tested	Unk
25-44	M	2017-2021	Summer	0-259	Other public	2	Driv	Fully ejected	Yes	0	Other	No	No	Unk
45-64	M	2017-2021	Winter	Unk	Other public	1	Driv	Fully ejected	Unk	Not tested	N/A	Not tested	Not tested	
65+	M	2017-2021	Summer	1500-1759	Other public	2	Driv	Not ejected	Yes	0	Normal	No	No	No
45-64	M	2017-2021	Spring	900-1159	Other public	2	Driv	Fully ejected	Yes	Not tested	Normal	Not tested	Not tested	No
65+	M	2017-2021	Fall	600-859	Other public	2	Driv	Fully ejected	Yes	Not tested	Normal	Not tested	Not tested	No
45-64	M	2017-2021	Spring	600-859	Other public	2	Driv	Fully ejected	Yes	0	Distracted	Yes	Yes	Yes
25-44	M	2017-2021	Summer	Unk	Other public	1	Driv	Unk	Unk	Not tested	N/A	Not tested	Not tested	Unk
45-64	M	2017-2021	Spring	1500-1759	Other public	1	Driv	Fully ejected	Yes	0	N/A	Yes	Yes	Yes
45-64	M	2017-2021	Winter	600-859	Other public	2	Driv	Fully ejected	Yes	Not tested	Normal	Not tested	Not tested	No
45-64	M	2017-2021	Winter	2100-2359	Other public	2	Driv	Unk	Unk	Yes	Unk	Yes	Yes	No
45-64	M	2017-2021	Summer	1800-2059	Other public	2	Driv	Fully ejected	Yes	Yes	Normal	Yes	No	Yes
25-44	F	2017-2021	Fall	1800-2059	Other public	2	Driv	Fully ejected	Yes	Not tested	Normal	Not tested	Not tested	No
25-44	M	2017-2021	Summer	2100-2359	Other public	2	Driv	Fully ejected	Yes	Yes	Normal	Yes	No	Yes
45-64	M	2017-2021	Summer	900-1159	Other public	1	Driv	Fully ejected	Unk	Not tested	Unk	Not tested	Not tested	Unk
65+	M	2017-2021	Spring	1800-2059	Other public	1	Driv	Fully ejected	No	Not tested	Unk	Not tested	Not tested	Unk
25-44	M	2017-2021	Spring	900-1159	Other public	1	Driv	Fully ejected	Yes	Not tested	Unk	Not tested	Not tested	Unk

Source: Traffic Injury Research Foundation, National Fatality Database, 2024

The knowledge source for safe driving

1

Additional descriptive information with respect to the 25 fatally injured operators is that one or more individuals:

- Were struck hit by a car door;
- Were distracted;
- Had a history of drug abuse;
- Refused medical treatment at the scene of the crash and died a few days later;
- Had the speed regulator on the e-bike disabled;
- Were driving at an estimated 70 km/h;
- Had multiple driver's license suspensions;
- Struck a pedestrian; and,
- Were victims of a hit & run.

Appendix C

E-bike Injury Data Sub-Group Update
Submitted on: September 12, 2022

Sub-group participants

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Stephanie Cowle, Parachute
Pamela Fuselli, Parachute
Gord Keen, Ontario Provincial Police
Brent Moloughney, Ottawa Public Health
Robyn Robertson, Traffic Injury Research Foundation
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Sub-group consultants

Jerome Brideau, Ontario Ministry of Transportation
David McRae, Ontario Ministry of Transportation

Summary of key findings

Mortality data indicate 17 e-bike collision fatalities in Ontario from 2012-2020. Most decedents were male and aged 45+. All were the operator of the e-bike. Most incidents took place on public roads and involved ejection from the e-bike. More than half occurred in off-season months (October to February). In cases with toxicology results (53%), positive tests for drugs were prominent. Driver's licence status was known for six cases (35%), and in two of these the e-bike operator had a suspended licence.

Morbidity data on e-bike injuries are extremely limited. One of 11 trauma centers in Ontario are distinctly tracking e-bike injuries at this time. At this center, there were four trauma cases in the period from 2020-2022. All injured persons were adult males and 3 of the 4 were aged 36+. The incidents resulted primarily in upper body and head injuries.

387 e-bike injury cases in Canada were identified from CHIRPP data for 2011-2022. Trend analysis shows a significant annual increase since 2011. Most incidents involved males and the most frequently injured age group was 50-64 years. Almost all (94%) were the operator of the e-bike. 65% of cases were traffic incidents. Most riders were wearing a helmet at the time of injury. The incidents resulted in injuries to the upper and lower extremities, head, face and neck, and trunk and spine.

There are significant challenges in data collection and case identification in existing datasets. Consequently, available data on e-bike injuries and deaths in Ontario and Canada are limited. Solutions to address surveillance challenges on e-bike injuries and deaths are needed to guide policy and decision-making.

Background

The sub-group met two times between June and September 2022. The purpose of the sub-group was to review e-bike morbidity/mortality data sources, coordinate data compilation, and provide proposals for data collection.

While the Death Review was focused on Ottawa deaths, the scope of the search was expanded to the Province of Ontario due to the limited nature of the Ottawa associated data.

The following activities were completed:

- Data extraction and analysis from the National Fatality Database by Traffic Injury Research Foundation (TIRF)
- Data request sent to Ontario trauma centers.
- Meeting with the Centre for Surveillance and Applied Research at the Public Health Agency of Canada (PHAC)
- Data extraction and analysis from the CHIRPP electronic database by PHAC
- Exploration of Acute Care Enhanced Surveillance database (KFLA Public Health)
- Targeted literature search

Detailed findings

National Fatality Database (TIRF)

Fatality data were pulled using common data variables. Data were shared directly with Dre. Louise McNaughton-Filion due to small cell size, to protect confidentiality. An overview of the findings is described below.

17 reports of e-bike fatalities between 2012-2020 were found. Comparative analysis resulted in the following findings:

- 16 of 17 cases were male.
- All were drivers of the e-bike.
- 14 of 17 cases involved someone aged 45+.
- 9 of 17 crashes occurred in the period from October-February. Exact time of crash is unknown, so lighting conditions could not be determined.
- Helmet use data were available for 10 cases. 9 of 10 were wearing helmets.
- Toxicology results were available for 9 cases. 3 of 9 tested positive for alcohol and 7 of 9 tested positive for drugs (4 for cannabis).
- There was a fairly even number of single and multi-vehicle crashes.
- In most cases, the victim was ejected from the vehicle.
- Most incidents occurred on public roadways (1 was on private property).
- Driver licence status was known for 6 cases. 2 of the 6 victims had a suspended drivers licence at the time of the crash.

- 2 victims declined medical treatment at scene then died a few days later.

Provincial Trauma Data

Administrative health data sets, such as the National Ambulatory Care Reporting System; Discharge Abstract Database (NACRS; DAD), do not distinctly capture e-bike injuries. Trauma centres track additional information in their trauma registries, including some narrative information.

A request on data holdings went to the following institutions through the trauma Injury Prevention Leads: The Ottawa Hospital, CHEO, Windsor Regional Hospital, St. Michael's Hospital, Sick Kids, Sunnybrook Health Sciences Centre, Hamilton Health Sciences, Health Sciences North (Sudbury), Thunder Bay Regional, Kingston General Hospital, and London Health Sciences Centre. The responses received are documented below.

Institution Available e-Bike Data Additional Notes

- **CHEO** Confirmed not collecting any data.
- **The Ottawa Hospital** Confirmed not collecting any data.
- **Windsor**
    - Fiscal 2020/2021: 1 case
    - Fiscal 2021/2022: 3 cases
- **St. Michael's** None provided Currently have a researcher doing a study on novel transport injuries (including e-bike) using CHIRPP data and the trauma registry. Status of this research has been requested.
- **Sick Kids** None provided "We are collecting data on mechanism of injury, and this includes e-bikes but no active projects or studies on the go about this."
- **Sunnybrook** Confirmed not collecting any data.
- **Hamilton** Confirmed not collecting any data.
- **HSN (Sudbury)** Confirmed not collecting any data.
- **Thunder Bay** Confirmed not collecting any data.
- **Kingston** Confirmed not collecting any data.
- **London** Confirmed not collecting any data.

Canadian Hospitals Injury Reporting and Prevention Program Electronic Database (e-CHIRPP)

Staff from the PHAC Centre for Surveillance and Applied Research extracted cases from the CHIRPP database using a text search of narrative fields. Data for 2011 through 2021, and partial data for 2022, were included in the search. CHIRPP is a sampling from a small number of adult hospitals, and so the findings are not population-level; the actual number of cases in Canada are reasonably expected to be higher. Full data findings were shared directly with Dre. Louise McNaughton-Filion as they are unpublished. An overview of the findings is described below.

387 e-bike injury cases were identified (2011-2022):

- 65% of injured persons were male.
- All incidents happened outdoors and most (65%) were traffic incidents (referring to any incident happening on a public highway).
- In 96% of cases, the injured person was the operator of the e-bike, versus 4% cases where a passenger was injured.
- Where helmet use was reported, 73% of e-bike riders were wearing a helmet.
- Substance use was reported in 8% of cases.
- 13% of incidents resulted in injuries requiring hospital admission.
- Frequency of e-bike injuries by age group is highest for 50-64-year-olds, followed by 40-49, 30-39 and 65+.
- Injuries to upper and lower extremities were most common (32% and 31% of cases), followed by head, face and neck (excluding cervical spine), and trunk and spine.
- An overall increasing annual trend since 2011 was identified.

Acute Care Enhanced Surveillance (ACES) Database

ACES provides real-time epidemiological surveillance for Ontario, monitoring records from acute care hospitals. The database was not sensitive enough to identify specific e-bike injuries.

Targeted Literature Search

Recent case series of injuries seen at hospitals, including trauma centres, have been published from other countries indicating that compared to conventional bicycles, e-bike users tend to be older and have more serious injuries. Note that these studies do not control for extent of exposure, but rather compare patients who are seen at hospital (i.e., they don’t assess risk of getting injured, but rather characteristics of those sufficiently injured to require visit to hospital). Focus here is on studies from Europe and North America published since 2020:

- United States 2000-2017; a descriptive and comparative analysis of e-bikes, powered scooters and pedal cycles found e-bike injuries: were more likely to be internal and require hospitalization; were more than three times more likely to involve a collision with a

pedestrian; are increasing dramatically, particularly among older individuals. (Inj Prev. 2020 Dec; 26(6). doi: 10.1136/injuryprev-2019-043418)
- Zurich 2009-2018; patients with e-bike incidents were almost 14 years older and had a higher incidence of moderate traumatic brain injuries than patients with bicycle incidents, in spite of the fact that e-bike riders were nearly twice as likely to wear a helmet as compared to bicycle riders. The rate of pelvic injuries in e-bike incidents was twice as high compared with bicycle incidents, whereas the rate of upper extremity injuries was higher following bicycle incidents. (J Clin Med. 2021 Jul 29;10(15). doi:10.3390/jcm10153359)
- Switzerland 2017-2018; e-bikers compared to conventional bicyclists were older, sustained more severe injuries (particularly chest trauma) and were more likely to be hospitalized (Patient Saf Surg. 2022 Mar 5;16. doi:10.1186/s13037-022-00318-9.)
- Netherlands 2007-2017; Independent risk factors for multi-trauma were a higher age, two-sided trauma, e-bike incidents and cerebral hemorrhage. (Eur J Trauma Emerg Surg. 2020;46(2). doi:10.1007/s00068-018-1033-5.)

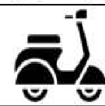
Data Challenges

Coding practices. Currently, e-bike collisions, injuries and fatalities are not captured as distinct. events across all existing datasets. In some traffic collision datasets, these incidents are grouped under the pedestrian category. In administrative health data, they may be coded as pedestrian or motorcycle incidents, depending on several factors, including jurisdictional practice. Currently, it is possible to identify e-bike injury and fatality cases in narrative-based systems such as CHIRPP and the National Fatality Database. However, there is some uncertainty about the e-bike types involved in these searches, as there is a wide range of e-bike types and designs.

Data needs. Standardized reporting in e-bike injuries is needed to guide policy, implementation, and enforcement. Data needs include:
- Establish in collision reporting if an e-bike is involved and the type of e-bike involved (e.g., bicycle with power assist, cargo bike, moped-style bike)
- Distinction between privately owned and rideshare devices.
- Standardization of reporting in narrative datasets (such as trauma registries, National Fatality Database, CHIRPP) to support case identification.
- Coding of e-bikes as an external cause in emergency department and hospitalization data to enable longitudinal, population-level monitoring.
- Promising practices from other jurisdictions should be considered. Examples include data collection and reporting strategies implemented on e-scooter injuries in Kelowna, BC and Calgary, AB.

Appendix D

Micromobility Collision Coding Reference Chart

Vehicle	Device Type	Description	Example	Collision Coding Standards	
				'Vehicle Type' Field	**'Body Style' Field** (New free text values)
E-Bike (Power-Assisted Bicycle) Max. 32 km/h Max. 120 kg Max. 500 W	Pedal Assist	Traditional bicycle design and must be pedalled to engage battery power.		E-Bike (Code 37)	**PA** *(denotes 'pedal assist')*
	Throttle Propelled	Traditional bicycle design and can be propelled without pedalling.		E-Bike (Code 37)	**TP** *(denotes 'throttle propelled')*
	Moped Style	Moped design with a seat, pedals, step-through frame, and a platform footrest.		E-Bike (Code 37)	**MP** *(denotes 'moped')*
	Motorcycle Style	Motorcycle design with a straddled seat and pedals.		E-Bike (Code 37)	**MC** *(denotes 'motorcycle')*
Cargo E-Bike (Pilot Project) Max. 32 km/h Min. 55 kg Max. 1000 W Max. 4.0 m (L) x 1.3 m (W) x 2.2 m (H)	Personal Cargo E-Bike	E-bike equipped with pedals and a platform or box used to carry large items.		E-Bike (Code 37)	**PC** *(denotes 'personal cargo')*
	Commercial Cargo E-Bike	E-bike with pedals, a platform or box owned by a commercial entity and used for commercial purposes (e.g., Purolator, FedEx).		E-Bike (Code 37)	**CC** *(denotes 'commercial cargo')*
E-Scooter (Pilot Project) Max. 24 km/h Max. 45 kg Max. 500 W	Personal E-Scooter	Kick-style electric scooter used for personal mobility.		E-Scooter (Code 38)	**PS** *(denotes 'personal scooter')*
	Shared (Rental) E-Scooter	Kick-style electric scooter device from a local shared mobility provider.		E-Scooter (Code 38)	**SS** *(denotes 'shared scooter')*

Ontario Ministry of Transportation

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