COMPARING POLICE AND HOSPITAL E-SCOOTER CASUALTY DATASETS

A REVIEW OF THE UNDER-RECORDING OF E-SCOOTER CASUALTIES IN THE UK

PACTS
Parliamentary Advisory Council for Transport Safety

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Prepared by
Margaret Winchcomb
Deputy Executive Director

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About PACTS

The Parliamentary Advisory Council for Transport Safety (PACTS) was formed in 1982 by parliamentarians and experts from a range of disciplines who had amended what became the Transport Act 1981 which made seat belt wearing compulsory in Great Britain.

Our vision is for a transport system free from death and life-changing injury, in which all users feel safe.

PACTS is the only NGO which combines all the following:

- addresses transport safety (road, rail and air) across the UK;
- focuses on parliament, Government and stakeholders;
- has a wide membership base across the modes and the public, private and third sectors;
- believes strongly in evidence-based policy;
- has no commercial or sectional interests.

It provides the secretariat to the All-Party Parliamentary Group for Transport Safety.

PACTS has over 100 member organisations from across the modes and the public, private and third sectors. We welcome new members.

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Foreword

Since 2020 we have seen a rapid rise in the number of e-scooters using UK roads. Spurred on by the COVID-19 pandemic, the UK Government decided, in July 2020, to permit e-scooter trial rental schemes in England and it is estimated that there are over 23,000 rental e-scooters for hire. However, this is dwarfed by the estimated 1 million which are privately owned and used. Unlike the rental e-scooters, these are unregulated in terms of power and speed. Whilst micromobility is to be encouraged as a sustainable mode of transport, safety of e-scooters is paramount but increasingly over recent years we have seen more deaths and injuries. This report by PACTS, and funded by The Road Safety Trust, uses data collected by the police and by hospitals to provide a better understanding of the number of people injured, both riders (and occasionally passengers) of e-scooters, and other road users.

By looking in-depth at hospital records it is possible to form a picture of the pattern of injuries sustained by these groups and this will inform the important process of construction and use regulation including wheel size, permitted power and speed, should the Government legalise the use of the privately owned as well as the rental vehicles.

Early indications from this project are showing worrying trends in injuries to the head, face and spine. The importance of this work will add to the body of knowledge about the similarities and differences between bicycle and e-scooter injuries and will, in time, be utilised to design appropriate protective equipment such as helmets.

The work of PACTS in this field has also shone a light on the number of people injured. This has been done by using data matching techniques used by the Department for Transport and others to estimate the true numbers of casualties arising from collisions on our roads. e-scooters are classed as vehicles and, as such, collisions where there are injured parties should be reported to the police. The growth in use of e-scooters has outstripped the ability of the official police reporting system to be able to record accurately these injuries and collisions, so the official police data is often lacking. However, this is about to change in late 2023 early 2024 when the new records will include micromobility. Injured road users often seek medical help and attend Emergency Departments of hospitals. It is here that there is a rich seam of information where known numbers of casualties outstrip those recorded by the police. By matching these two sets of data on a list of variables present in each, PACTS has been able to provide estimates of the scale of the problem and indicate that hitherto less than a quarter of injured e-scooter users have been captured using only police-recorded data.

This report is an important addition to the body of knowledge about e-scooter use and provides a baseline from which the upcoming changes to police recording of collisions involving micromobility users can be assessed and continued to be matched with hospital records to inform regulation and road safety interventions.

Heather Ward, UCL

Executive Summary

Background

e-scooters are a relatively new mode of transport in Great Britain. Their prevalence has increased notably since July 2020 when the UK Government decided to permit e-scooter rental trial schemes in England. About 23,000 operator-owned e-scooters are available for use in around 25 areas in England. The schemes are due to run until May 2024.[1] Despite it being illegal to use a private e-scooter on roads or in other public places, over 1 million are estimated to be in use.[2]

It is important to record the involvement of e-scooters in collisions because they carry a risk of harm to the person being transported (the hazard of using an e-scooter) and a risk of harm to other road users (the danger posed by using an e-scooter). To understand the level of hazard or danger, the number of people killed or injured each year, along with details about the severity of their injuries and the type of collision, are collected and analysed. The official data for road traffic casualties are based on police records.

To date, when encountering a collision involving an e-scooter, officers have noted the new form of transport through the use of the free-text incident description in the police recording systems. Since 2021 the Department for Transport's national statistics, which are based on these records, has been using these data to publish details of casualties injured in collisions involving e-scooters.

However, when comparing the official data with the number of people presenting at hospital with an injury from a road traffic collision there are discrepancies. It has long been recognised and accepted that the official data underestimate the actual number of road traffic collision casualties. Studies have been carried out to understand the extent and nature of under-recording. These show that it is those who are slightly injured and those travelling within vehicles who are least likely to appear in the official data.

Scope of this project

Taking a snapshot in time, over the months of October and November 2021, police and hospital datasets have been matched to estimate a level of under-recording.

Police records, in the form of STATS19 data, have been made available to PACTS. PACTS has built on contacts made through previous research funded by The Road Safety Trust to obtain anonymised injury data of e-scooter casualties collected by medical professionals. This is made up of those most seriously injured, as recorded by the Trauma Audit Research Network (TARN), as well as patients with varying severities of injury as recorded at twenty emergency departments in Great Britain. Operators and local authorities record

[1] E-scooter trials: guidance for users - GOV.UK (www.gov.uk)

[2] An estimated 2% (1,091,823 people) of adults, equivalent to one million people aged 16+, owned an e-scooter in England as of June 2022. This figure is from the Technology Tracker: Wave 9 Report prepared for the Department for Transport November 2022

various incidents involving rental trial e-scooters. These records are supplied to the Department for Transport (DfT) on a monthly basis in the form of situation reports.[3] Although not publicly available, some copies have been shared with PACTS and provide additional insights into e-scooter casualties.

Conclusions and recommendations

This study found that the official data of e-scooter casualties under-report numbers of e-scooter casualties recorded by hospitals. Just over a quarter of those who were most seriously injured were recorded by the police. Fewer than 10% of casualties with any level of injury presenting to emergency departments were recorded. Patients presenting with injuries to the head, face and spine were more likely to be recorded by the police than other injuries, regardless of the severity of their injuries. Across the three datasets used in this study nearly 10% of casualties were under the age of seventeen.

Improvements in the recording of e-scooter casualties will involve input from various different stakeholders. Within 2021 free-text was relied on for identifying e-scooter involvement in both police and hospital data. Updated police recording systems will be launched later this year, through CRaSH (Collision Reporting and Sharing), and in 2024, in STATS19. There needs to be increased public awareness that e-scooters are motor vehicles and therefore that collisions should be reported to the police.

Within hospital data, means of unique labelling through free text could be agreed. Successful methods have been employed by the Trauma Audit Research Network (TARN).

Casualty data from commercially run operations are important for informing the broader understanding of safety. However, the value of the data is dependent on methods of collecting being consistent, using methods already established to build other datasets. This is not currently the case.

PACTS recommends the DfT should:

1. Increase the opportunities for casualty data to be collected
2. Improve the means of recording e-scooter casualties using the rental e-scooter schemes
3. Require all injury collisions, regardless of whether or not they include a third party, be reported to the police

[3] A copy of a blank situation report is available in Appendix A of this report

1. Introduction

The purpose of this report is to present findings from a study investigating the extent of under-recording of injury collisions involving e-scooters in late 2021.

e-scooter use has become prevalent on UK roads since 2020 when Government regulated e-scooter rental trials opened. The use of these operator-managed e-scooters is being measured and the first 18 months of use have been evaluated in a report published by the Department for Transport (DfT) at the end of 2022.[4] Simultaneously, despite being illegal to use on public roads and in public spaces, private e-scooter use has increased significantly. The current estimate is that over 1 million could be in use, based on survey results from the Transport Technology Tracker prepared for the DfT.[5]

The extent of use is evident from records of casualty data, where it is available. Recording casualty numbers, the nature and severity of their injuries, is important to provide insights into the safety of the vehicles for riders and other road users. Statistics published by the DfT are based on well-established data collection by the police. Hospitals also collect data relating to traffic casualties. Differences in these datasets are well known but it is the extent of under-recording and differences between modes and over time which are important. Significant under-recording of casualties provides a distorted understanding of the risk of injury and therefore reduces the motivation to improve safety.

With the emergence of this new mode of transport, methods need to be established to record the involvement of these vehicles in collisions. PACTS has sought to collate hospital data of e-scooter casualties from Great Britain and match them with police records. The hospital data included those most seriously injured (available for England and Wales) and emergency department presentations (from England, Wales and Scotland) over an eight-week period in late 2021. Records of rental trial e-scooter use as reported in monthly situations reports produced by local authorities for the DfT give further insights. These have been used to estimate the under-recording.

Data collected for each casualty have been matched between the sources using a number of characteristics which are readily comparable. An analysis of the matched samples includes consideration of the level of recording for different types of casualty, the nature and severity of their injuries.

PACTS has previously carried out research funded by The Road Safety Trust to collate casualty data for Great Britain and Northern Ireland for 2021, and for all fatalities involving e-scooters since 2019. This revealed an indication of under-recording when comparing

[4] National evaluation of e-scooter trials (publishing.service.gov.uk)
[5] Technology Tracker: Wave 9 Report prepared for the Department for Transport November 2022 Ipsos report (publishing.service.gov.uk).

social media, mainstream media and police records (STATS19) with hospital data. For example, in 2020, at King's College Hospital, London, 196 patients presented to the emergency department with injuries incurred in an incident involving an e-scooter. That year 484 casualties were recorded by the police across Great Britain.

The Road Safety Trust funded this project to extend PACTS previous work. The aim of this study is to identify whether the level of under-recording of e-scooter casualties in Great Britain is in line with our previous estimates of under-recording or is significantly different. This report sets out the findings.

2. Background

Counting road traffic casualties matters

Data of reported road casualties are important because they are used to:

- develop and monitor road safety policy at the local, national and international levels to save lives and reduce injury on the roads,
- develop and evaluate legislative changes,
- target road safety publicity, road and vehicle engineering measures, and
- inform public health issues related to road safety.

The recording of road traffic casualties is well established. Across Great Britain, police forces provide data which are collected and analysed by the DfT. Across Great Britain and Northern Ireland casualties, especially those with the most serious injuries, are recorded by hospitals. Ad hoc studies are carried out for specific research projects which enable more targeted data to be collected (although these usually involve small datasets). Since the introduction of rental e-scooter trials in England, reports of incidents involving rental e-scooters have been collected by operators and/or local authorities and issued to the DfT in the form of monthly situation reports.

Police records of road traffic casualties from official data

Official data of reported road casualties are based on information about road casualties collected by the police and processed by the DfT. If someone driving or riding a motor vehicle is involved in a collision where someone else is injured, they have a duty to stop and report the incident to the police within 24 hours.[6]

Annual road casualty statistics are published twice each year by the DfT as provisional results in May and final detailed statistics in September. The first road accident statistics were collected in 1909. The current system, STATS19 (named after the code number for the form that the police complete) introduced in 1949, was first reviewed in 1979 and has been reviewed periodically thereafter.[7] STATS19 collects information on the collision circumstances, the vehicle or vehicles involved, the driver or drivers involved and the casualties. The severity of a casualty's injuries (defined as 'slight', 'serious' or 'fatal') is determined by the police officers using their own judgement.

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[6] Road Traffic Act 1988, Section 170

[7] Accident Statistics form stats19.pdf (publishing.service.gov.uk)

Since 2012 more accurate methods for recording injury severity have been available. CRaSH (Collision Reporting and Sharing) and COPA (Case Overview Preparation Application) involve the police officer recording the casualty's most serious injury from a pre-defined list. Injuries are then automatically converted to a severity level. These injury-based severity reporting systems allow faster and more accurate recording and sharing of records.[8] Over half of the forces in Great Britain now use this freely available system.

The police complete returns for injury collisions which they attend or that become known to them through a third-party report. The STATS19 system includes all collisions involving a road vehicle, including pedal cycles, and resulting in a personal injury. Collisions that involve pedestrians are included, as are collisions that involve stationary vehicles. The scope of STATS19 excludes collisions which occur away from the public highway, therefore injuries on footways which are not adjacent to a road or in public parks or pedestrianised areas would not be captured.

Since the early 1980s, the DfT has reviewed STATS19 approximately every five years to ensure the relevance of the information collected. In 2021 recommendations were published for modifications to the data that STATS19 collects.[9] This means that from 2024 a new category for "personal powered transporter device" will be included. The intention is for this to include, but not be exclusive to, e-scooters. Therefore, with increasing permutations and combinations of micro-mobility vehicles in use, completion with free text will be needed to identify the specific type of vehicle involved.

STATS19 data from across police forces in Great Britain for the end of 2021 were made available to PACTS by the DfT for use in this study.

Hospitals also record road traffic casualties along with details of their injuries

Data about road traffic casualties are collected through medical care in a number of different ways: ambulance service data, emergency department data (including the Emergency Care Data Set (ECDS)), hospital inpatient data (for example Health Episode Statistics (HES) in England), and from specialised databases such as the Trauma Audit Research Network (TARN). In addition, there may be specific studies which collect data proactively with additional datasets being sought.

For this study, individual casualty data were required to match between datasets. Despite the support from clinicians working to obtain this information from individual hospitals, accessing this level of detail from health service datasets proved too administratively difficult. Coding used in hospital record systems, for example, the Emergency Care Data Set (ECDS), does not match that used to record

[8] Guide to severity adjustments for reported road casualties Great Britain - GOV.UK (www.gov.uk)
[9] STATS19 review - final report (publishing.service.gov.uk)

road traffic casualties in STATS19. Checks between the systems are not routinely made, therefore introducing inconsistency between the datasets.

For this study, two hospital datasets were made available, one as output from a specific study while the other as part of a national database.

The Trainee Emergency Research Network (TERN) attempted to 'quantify the prevalence and nature of injuries sustained by individuals involved in accidents associated with e-scooters' through a specific project, the Study of E-scooter impact upon EDs in the United Kingdom (SEED-UK).[10,11] 20 emergency departments across the United Kingdom were recruited. At each emergency department, all patients presenting with an injury associated with an e-scooter collision were identified prospectively by emergency department clinicians. These patients were recorded regardless of their relationship to the e-scooter (rider, pedestrian etc.) and regardless of the severity of their injury. It was carried out over the months of October to December 2021.

TARN is the national clinical audit for traumatic injury and collects patient data of those most seriously injured. When a patient is recorded on the TARN database it means they have sustained injuries resulting in hospital admission of over three days, critical care admission, death and/or a transfer to a tertiary or specialist centre in one of 220 hospitals across England, Wales, Northern Ireland and Republic of Ireland. For use in this retrospective study, prospectively collected TARN data from across England and Wales for October to November 2021 was made available to PACTS.

Situation reports record some injuries involving rental trial e-scooters

The e-scooter rental trials in England are being evaluated by the DfT with the primary aim to "build robust evidence about the safety, benefits, public perceptions and wider impacts of e-scooters to inform legal changes that may be necessary after the trial period ends".[12] Information is being collected including details of "safety outcomes for e-scooter users and what influences this, and the interaction with, and effect on, other road users".

An evaluation of the first 18 months of the government-backed rental trial e-scooter schemes was published at the end of 2022. In this evaluation results from surveys of samples of riders and other road users gave an indication of the likelihood of an injury but did not attempt to provide a measure of all injuries. Instead, police data were relied on to provide a dataset of all casualties.

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[10] SEED-UK ⋆ TERN Research

[11] TERN TERN, Multicentre prospective observational study to evaluate healthcare impacts of e-scooters on emergency departments, Emergency Medicine Journal Published Online First: 13 September 2023. doi: 10.1136/emermed-2022-212974

[12] E-scooter trials: guidance for local authorities and rental operators - GOV.UK (www.gov.uk)

However, there is a means to record various incidents involving rental e-scooters. Local authorities, with data provided by operators, complete monthly situation reports which are provided to the DfT. One local authority, Transport for London, publishes details of serious and fatal injury incidents on their website every four weeks during the trials.[13] The West of England Combined Authority has used data from operators to inform their analysis of the rental trials in their area.[14]

Despite receiving reports from all trial areas, the DfT consider situation reports more as a narrative rather than an objective means of measuring safety outcomes. Therefore, the reports predominantly capture data relating to non-injury-related incidents, for example, anti-social behaviour and damage to property involving rental e-scooters. Where injuries are recorded the extent of detail included varies relative to the severity of the injury. The proforma provided by the DfT notes that "where slight injuries were sustained by the rider and no other persons or vehicles were involved in the incident, a simple count will suffice".[15] There are free-text cells available for a description of the incident and injuries received.

Situation reports are not readily available from local authorities, operators or the DfT. For the purpose of this project, four local authorities running e-scooter rental trials provided copies of their reports for the months of October and November 2021 to PACTS. These data have been used anonymously.

[13] TfL's e-scooter rental trial headline metrics are published every four weeks, Electric scooter rental trial - Transport for London (tfl.gov.uk)
[14] K Chatterjee, J Parkin, T Bozovic, J Flower, West of England E-scooter Trial Evaluation (westofengland-ca.gov.uk) May 2023
[15] A copy of an e-scooters situation report (Sit-Rep) proforma is included in Appendix B

3. Evidence base

It is well known that road casualties are under-reported

It is recognised that police statistics have their limitations but that they provide the best available database for understanding the number of road casualties in Great Britain. When comparing police and medical records there will be discrepancies for various different reasons including:

- the police are not informed that a collision where someone is injured has occurred, yet that person presents as a patient at a hospital;
- the police are informed of a collision but do not record it because it falls outside the criteria for recording collisions or insufficient data is provided, yet that person presents as a patient at a hospital;
- the police record a collision and resulting injury, but the severity or nature of that injury is recorded differently when the person is treated as a patient at hospital;
- the police record a collision and resulting injury, including details of the modes of transport used and nature of the collision while the hospital data contain no reference to a road traffic collision.

Appreciating that these differences exist and measuring the divergences between different types of records is important for understanding the extent of under-recording and differences between modes and over time. A number of reviews and studies have been made to assess how well the police statistics capture casualty numbers, including those involved in e-scooter collisions.[16] Comparison is made with hospital data by matching casualties between databases. The results show variation between the rates of recording with the type of road user, severity of injury and hospital location. This means that each is recognised as an influencing factor.

In their annual review in 2008, the DfT found that the total number of serious injuries relating to collisions on roads was estimated at 220,000 compared with 26,000 recorded in the police STATS19 statistics (in other words around 12% of casualties were recorded by police).[17] Three more recent studies by the DfT match STATS19 with data from the Trauma Audit and Research Network (TARN) in England and Wales and Hospital Episode Statistics (HES) in England. In 2021 the DfT published a study using data collected over 19 years linking HES to STATS19 data.[18] For all severities of injury to all road users the study found 41% of HES records were linked to

[16] DfT Official Statistics, Serious e-scooter casualties: comparing police and hospital data, May 2023
[17] R Alldritt, Oral evidence to the Transport Select Committee, Update on road safety - UK statistics authority, 4th November 2009
[18] RAS4101: Hospital admissions data on road casualties

STATS19.[19] In the case of those who are most severely injured, studies published in 2022 and 2023 found that 43% of TARN records for all road users and 33% of TARN records for e-scooter casualties were linked to STATS19.[20,21]

Under-recording differs between types of road user

Different road user groups vary in their likelihood of reporting a collision in which they were injured. Counter to common assumptions, vehicle occupants are less likely to report collisions than vulnerable road users.[22] As most journeys are made by people driving vehicles, vehicle occupants form the greatest number of casualties. However, because of their mode of transport, they are, proportionally, the least severely injured and, therefore, are less likely to attend a hospital.

Single-vehicle collisions, of any mode, are least likely to be recorded. Pedal cyclists are more likely than vehicle occupants to be injured in these types of collisions.[23] It should be noted that police are not legally required to be informed when only the driver or rider is injured.

Under-recording differs between severity of injury

There are differences between the likelihood that different types of injuries are reported by the police. Police are more likely to underestimate than overestimate severity, and they are more likely to do this for vulnerable road users (including pedal cyclists) than for vehicle occupants. This means that, in STATS19 records, vulnerable road users are recorded as being less severely injured than in fact they were. The level of under-recording has been found to be greater for slightly injured casualties and vehicle occupants. Overall, casualties matched with police records were more likely to be seriously injured and more likely to be treated as inpatients than those attending hospital.[24] The use of CRaSH with its injury-based reporting is intended to contribute to clearer recording of severely injured casualties by the police.

A recent study of e-scooter casualties in England, based on police and TARN datasets, found that 33% of e-scooter casualties recorded in the TARN dataset linked to STATS19 records.[25] The study concluded that, for the most seriously injured in e-scooter collisions, trends in police and hospital data were broadly similar since the start of 2020.

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[19] DfT, Linking Police and Hospital data on Road Accidents in England: 1999 to 2009 results, February 2021
[20] DfT Official Statistics, Linking STATS19 and TARN:an initial feasibility study, Published 23 February 2022
[21] DfT Official Statistics, Serious e-scooter casualties: comparing police and hospital data, May 2023
[22] H Ward, R Lyons, R Thoreau, DfT Road Safety Research Report No 69, Under-reporting of road casualties – Phase 1, June 2009
[23] H Simpson, TRL Report 173, Comparison of hospital and police casualty data: a national study, 1996
[24] H Simpson, TRL Report 173, Comparison of hospital and police casualty data: a national study, 1996
[25] DfT Official Statistics, Serious e-scooter casualties: comparing police and hospital data, May 2023

Under-recording differs between hospital location

The administration of hospital datasets can vary considerably across Great Britain. In a study of emergency department data collected in the early 2000s around 50% of the total number of serious casualties recorded in two hospitals in free-standing towns were recorded by STATS19 statistics.[26] Conversely, a study of data from a central London emergency department found that over 70% of all known casualties were reported to the police.[27]

[26] H Ward, R Lyons, R Thoreau, DfT Road Safety Research Report No 69, Under-reporting of road casualties – Phase 1, June 2009

[27] H Ward and S Robertson (UCL), T Lester and A Pedler (TRL Limited), TRL report Reporting of Road Traffic Accidents in London: Matching Police STATS19 Data with Hospital Accident and Emergency Department Data, PR/T/069/2002, November 2002

4. Datasets and methodology

e-scooters are defined in the UK as a motor vehicle. Therefore Section 170 of the Road Traffic Act (1988) applies to e-scooters. This means that if an e-scooter rider is involved in a collision where someone else is injured then the rider has a duty to stop and report the incident to the police within 24 hours.[28] Police record details of road traffic collisions on STATS19 forms.[29] These records are then collected and ultimately form the basis for national statistics and published records.

Medical professionals also collect data about road traffic casualties contributing to nationwide datasets, including TARN's records of those most seriously injured, and hospital emergency department records.

Scope of this study

For the purposes of this study, to coincide with the period of time for which hospital data is available and the locations of the participating hospitals, STATS19 data have been analysed between 1 October and 30 November 2021. Coincidentally, this time period overlapped with the highest demand for rental e-scooters, with 1.7 million trips made across all trials.[30]

Clinical datasets were selected where they had sufficient information to link individuals to STATS19 records and where the distinction between an e-scooter and other forms of scooter is sufficiently robust.

Police records of e-scooter casualties

During late 2021 there was no specific category for recording e-scooters as a motor vehicle within a STATS19 form. Therefore, identification for this study has been dependent on the recording officer using an identifiable term in the free-text incident description. The extent of detail provided in this description and consistency between records varies between police forces and is influenced by the prevalence of e-scooter use as well as the level of priority put on recording road traffic collisions by the force.

Since September 2021 official data of reported road casualties for Great Britain has included casualties injured in collisions involving e-scooters.[31] These are gathered from free-text input included in records provided by police forces on the standardised STATS19 reporting system. This identification may or may not include the type of e-scooter (rental or privately owned). In England, collisions involving e-scooters could include a legal rental trial e-scooter or an illegally ridden private e-scooter.

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[28] Road Traffic Act 1988, Section 170

[29] Accident Statistics – Sample stats19.pdf (publishing.service.gov.uk)

[30] Operator data tables from National evaluation of e-scooter trials report - GOV.UK (www.gov.uk)

[31] Reported road casualties Great Britain: e-Scooter factsheet 2020 - GOV.UK (www.gov.uk), Reported road casualties Great Britain: e-Scooter factsheet 2021 - GOV.UK (www.gov.uk)

In 2021, police forces recorded sufficient information to differentiate between rental and private e-scooter involvement recorded in e-scooter collisions across six of the approximately 30 areas where e-scooter rental trials were underway. The records of the 300 casualties within just these six areas show slightly more casualties were involved in a collision with a rental e-scooter than with a private e-scooter.[32]

For a better understanding of the type of e-scooter involved in collisions across England, the DfT has since expanded its analysis. Data from 2022 include an examination of the location of the collision.[33] If the collision occurred outside a geo-fenced rental trial e-scooter area then a rental e-scooter could not have been involved. This showed that of the 1,492 casualties involved in a collision with an e-scooter, 579 occurred outside a rental trial area. Within rental trial areas, outside London, between 14% and 43% of the casualties may have been injured in a collision involving a rental e-scooter.

Within the period of time studied for this project, October and November 2021, 219 e-scooter casualties were recorded across the whole of Great Britain. 113 were estimated to be within rental trial areas, based on highway authority boundaries.

Emergency department records of e-scooter casualties

Hospital datasets collect a range of key details, many of which inform those who treat casualties rather than gathering information to inform those working to prevent injuries. To understand more about e-scooter-related casualties a number of retrospective hospital-based studies have been conducted. However, the majority of these focus on specific types of injury rather than on all patients presenting with an e-scooter-related injury.

To better gain an understanding of all types of e-scooter-related injuries a prospective observational study was conducted.[34] The Trainee Emergency Research Network (TERN) carried out research over two months and included 20 different emergency departments across the UK (there are over 150 emergency service hospitals in England).[35] The study was intended to identify all patients involved in a collision with an e-scooter presenting to each emergency department, some were located within rental trial areas. Patients were included regardless of the severity of their injury or where the e-scooter collision occurred.

At each emergency department records were maintained for four weeks. A bespoke case report was used, capturing data relevant for comparing with STATS19 data (collision date, age and gender of casualty, their relationship to the e-scooter and location on the public

[32] National Evaluation of E-scooter Trials Technical Report, Table 13, DfT, Dec 2022

[33] Reported road casualties Great Britain: e-Scooter factsheet 2022 - GOV.UK (www.gov.uk)

[34] TERN TERN, Multicentre prospective observational study to evaluate healthcare impacts of e-scooters on emergency departments, Emergency Medicine Journal Published Online First: 13 September 2023. doi: 10.1136/emermed-2022-212974

[35] Data were collected from hospitals in England, Wales and Scotland. No data were returned from hospitals in Northern Ireland

highway) as well as extensive medical data (location of treatment centre, type of imaging received, specific location of injury, injury severity using the Abbreviated Injury Scale (AIS) and treatment received).

Between 1 October and 30 November 2021, 250 entries were recorded and 243 were identified as individual casualties within the scope of this study.

TARN records of e-scooter casualties

TARN's data collection is robust as it is well-established and well-embedded into trauma centres and trauma units in England and Wales. It is the national clinical audit for traumatic injury and collects a wider range of patient data for those most seriously injured.

Since 2020, TARN has distinguished those casualties most seriously injured in collisions involving e-scooters from other road casualties. These data have been used in two recent studies.

The first is a comparison of e-scooter and bicycle-related trauma casualties across England and Wales in the year 2021.[36] This found that e-scooter users were more likely to be admitted to a major trauma centre or critical care unit than bicycle users. No analysis was made of other road users injured in either e-scooter or bicycle collisions.

The second study linked police and TARN data to estimate the level of reporting to police for more seriously injured e-scooter user casualties in relation to bicycles and motorcycles.[37] Using data across 2020 to 2022, it found that around 33% of the 428 e-scooter casualties were linked to a STATS19 record, compared to 26% of the 6,785 pedal cyclists and 56% of the 5,996 motorcyclists.

Both studies found there were at least eight times more bicycle than e-scooter casualties recorded. This reflects the relative ownership and use of the modes of transport. Further detailed statistics to understand the number of trips and distance travelled by e-scooters are needed to directly compare rates of injury with other modes of transport. If records of casualties were more robustly collected with the rental schemes, rates of injury would be more readily available for that type of e-scooter. While the use of private e-scooters is illegal, it is difficult to obtain travel data.

Prospectively collected TARN data from across England and Wales between 1 October and 30 November 2021 was made available to PACTS under project reference 230201. 57 entries were recorded by TARN as involving an e-scooter and 54 individual casualties were identified as within the scope of this study.

[36] Clough RA, Platt E, Cole E, et al. Major trauma among E-Scooter and bicycle users: a nationwide cohort study (Inj Prev 2023;29:121–125) 2023.
[37] Serious e-scooter casualties: comparing police and hospital data - GOV.UK (www.gov.uk), 24 May 2023

	STATS19 1 Oct-30 Nov 2021	SEED-UK 1 Oct-30 Nov 2021	TARN 1 Oct-30 Nov 2021
casualties in collisions involving e-scooters	219	243	54
casualties injured in a single-vehicle collision involving e-scooters and no other vehicle (injury is by falling from the e-scooter or hitting a physical object)	22	189	34
casualties injured in a collision with at least one other vehicle (including another e-scooter) (1)	197	34	18
casualties in collisions involving e-scooters who were e-scooter users, including passengers (2)	206	229	53
casualties in collisions involving e-scooters who were other vulnerable road users (2)	13	12	1
casualties in collisions involving e-scooters who were pedestrians	0	10	1
fatalities from collisions involving e-scooters	1	0	0
seriously injured casualties	56	21	54
slightly injured casualties	162	204	0
casualty suffering serious injury was another road user	3	2	1
casualty suffering serious injury was a pedestrian	0	2	1

Table 1: e-scooter casualties recorded from 1 October to 30 November 2021

Sources: (1) DfT STATS19 data for Great Britain, made available to PACTS by the DfT and analysed by project partner Road Safety Analysis (with adjustments made to account for police injury-based reporting), (2) The Trainee Emergency Research Network (TERN) Study of E-scooter impact upon Emergency Departments (EDs) in the United Kingdom (SEED-UK) with casualties recorded at 20 emergency departments across the UK, (3) TARN at the University of Manchester, under project reference 230201 recorded across England and Wales.

Notes relating to Table 1

(1) In some cases the mechanism for injury was not recorded

(2) In some cases the type of road user was not recorded

The proportions of numbers of casualties differ between the datasets, be that considering how they were injured, who was injured or how severely they were injured.

Similar numbers of casualties injured in collisions involving e-scooters have been recorded by the police and SEED-UK for October and November 2021. However, the proportion of casualties injured in single-vehicle collisions and recorded by the police is far less than the proportion recorded at 20 emergency departments across Great Britain as being injured in single-vehicle collisions. No pedestrian injuries were recorded by the police while around 4% of those who presented to an emergency department were injured pedestrians. Despite a greater proportion of casualties recorded by the police having been injured in a collision between an e-scooter and another vehicle, none of the casualties were recorded as having been travelling using a vehicle other than an e-scooter. Around 25% of casualties recorded by police were seriously injured while less than 10% of casualties recorded as presenting to emergency departments were seriously injured.

Methodology

The ability to match a casualty between datasets relies on a sufficient number of variables being recorded using similar methods between the datasets. In this study, the variables which were used for matching were: date of collision, age of casualty, gender of casualty, geographic location, road user type in relation to the e-scooter, type of e-scooter, severity of injury and location of collision on the road. The methods of recording these variables differed between datasets. Therefore, tolerance levels were applied as listed in Appendix B. The variables made available for this study to enable matching between the datasets are listed in Table 2.

Dataset	STATS19	SEED-UK	TARN	Situation reports (6)
Variables used for matching				
Date of collision	Yes	Yes	Yes (5)	Yes
Age of casualty	Yes	Yes	Yes	No
Gender of casualty	Yes	Yes	Yes	No
Geographic location	Yes	Yes	No	Yes
Road user type in relation to the e-scooter	Yes	Yes	Yes	
Type of e-scooter	No (2)	Yes	No	Yes
Severity of injury (1)	Yes	Yes	Yes	Yes
Location of injury	No (3)	Yes	Yes	No
Location of collision relative to the road	Yes	Yes	No	Yes
Additional variables				
Mechanism of collision	Yes	Yes	Yes	Yes (7)
Helmet wearing	No (4)	Yes	Yes	No
Intoxication (by alcohol and/or drugs)	Yes	Yes	Yes	No
Date of arrival at hospital	No	Yes	Yes	No
Number of injuries	No	Yes	Yes	No
Location of injuries	No	Yes	Yes	No
Description of injuries by type and severity	Yes	Yes	Yes	No
Interventions received	No	Yes	Yes	No

Table 2: Variables for matching between datasets

Notes relating to Table 2

(1) The differentiation between severity of injury varies between datasets, for example, STATS19 uses three categories and SEED-UK five. There is further discussion of this in chapter 4.

(2) The type of e-scooter was not defined in the STATS19 dataset provided for this study. However, differentiation between rental and private e-scooters is possible and, where it has been included in the STATS19 dataset by using free-text entries, has been employed in casualty analysis, notably the National Evaluation of e-scooter trials technical report (publishing.service.gov.uk) .

(3) Official data (STATS19) only provides details of the location of injury on a casualty when injury-based recording, such as CRaSH or COPA, has been used and the classification of severity applies to a specific part of the body.

(4) Within STATS19 there is an automated means for collecting data on pedal cyclists wearing helmets. Use of helmets for other modes needs to be included in free text format.
(5) Due to the nature of the injuries sustained by casualties recorded by TARN the date and time of arrival at hospital was used as a proxy for the date of the collision as this was considered to be within reasonable tolerances.
(6) Situation reports primarily capture data relating to non-injury related incidents involving predominantly rental e-scooters, i.e., anti-social behaviour and damage to property. Where slight injuries are sustained by an e-scooter rider a count per data period rather than full log is provided. When this method is used, it is not possible to match between other datasets.
(7) The mechanism of collision relies on free-text being completed. The variation between the descriptions given in situation reports makes matching with other datasets difficult.

5. Linkage between police, emergency department and TARN records

Linking casualty records between official data, those collected by police, and hospital data gives an indication of the level of reporting and types of road traffic casualties included in national statistics. This study focused on linking casualties injured in a collision involving an e-scooter over a two-month period at the end of 2021.

It is well known that hospital data include greater numbers of casualties than police records. In this study, the level of under-recording relative to the severity of injuries is of interest.

Limitations to matching between datasets

Linking between databases was limited in different ways and therefore the results should be treated with some caution.

As detailed in Section 4, where variables are missing or inaccurate in the datasets it is more difficult to link casualty records. This was particularly evident when attempting to match STATS19 and situation reports. For linkage to SEED-UK data, as collected from emergency departments, the relatively large number of variables coinciding with STATS19 particularly aided matching to patients presenting some days after a collision. This was possible because of PACTS involvement in that study in its infancy. Influence on which data would be collected had been possible. Matching STATS19 to TARN dataset was limited as neither the date of the collision nor the location of the hospital was recorded.

Another limitation is the scope of each dataset. STATS19 covers Great Britain but is limited to incidents which occur within the public highway. Inclusion in the SEED-UK study was offered to emergency departments across the whole of the UK. However, participating emergency departments were all located within England, Wales and Scotland and numbered 20 in total (there are over 150 emergency service hospitals in England). TARN records care given to the most seriously injured in England and Wales but, for this study, the locations where that care was given were not available.

The datasets used for this study are small in size with a focus on a two-month time period for analysis. It was therefore not possible to track trends over time. Greater confidence could be drawn from the results if larger datasets were available, as has been studied by the DfT using TARN data.[38]

Linkages made between datasets

Where linkages have been possible it was found that fewer than half of e-scooter casualties were recorded in the official data, as reported to the police and recorded in STATS19. Casualties with any level of injury, presenting to emergency departments across the

[38] Serious e-scooter casualties: comparing police and hospital data - GOV.UK (www.gov.uk), 24 May 2023

UK and recorded in the SEED-UK study, are less likely to be recorded by the police than those who are more seriously injured, as recorded by TARN.[39] This is consistent with other studies which show that overall casualties matched with police records were more likely to be seriously injured and more likely to be treated as inpatients than those attending hospital.

Across age groups, there were different levels of reporting between the two hospital datasets. Emergency department presentations were less likely to be reported to the police by casualties under 20 years old and between 30-39 years. There was little difference in the level of reporting by other age groups. The most seriously injured were most likely to be recorded by the police when they were younger, up to the age of 29. The recent DfT study of over two years of data found a similar, although less marked, trend.

Patients presenting at hospitals with injuries to the head, face and spine were more likely to be recorded by the police than other injuries, regardless of the severity of their injuries.

The proportion of patients who had been injured in a collision involving no motor vehicle and were matched to official records was less than 5%. The proportion of patients who had been injured in a collision which did involve another motor vehicle and were matched to official records was 30%. This reflects the relatively low proportion of casualties recorded in official data as having been injured in a single-vehicle collision (a fall or collision with a stationary object). Of the casualties recorded by police, around 20% are injured in a single-vehicle collision. [40] Almost 80% of patients presenting to emergency departments and recorded in the SEED-UK study had been injured in a single-vehicle collision.

[39] TERN TERN, Multicentre prospective observational study to evaluate healthcare impacts of e-scooters on emergency departments, Emergency Medicine Journal Published Online First: 13 September 2023. doi: 10.1136/emermed-2022-212974

[40] Reported road casualties Great Britain: e-Scooter factsheet 2020 - GOV.UK (www.gov.uk), Reported road casualties Great Britain: e-Scooter factsheet 2021 - GOV.UK (www.gov.uk), Reported road casualties Great Britain: e-Scooter factsheet 2022 - GOV.UK (www.gov.uk)

Dataset	SEED-UK		TARN	
Number of casualties within scope of this study	243		54	
Records matched to STATS19	21		14	
Classification	**Matched casualty by classification**	**Total number of casualties within that classification**	**Matched casualty by classification**	**Total number of casualties within that classification**
Rider	18	229	14	53
age under 20	3	45	4	8
age 20 to 29	11	110	7	19
age 30 to 39	1	42	2	12
age 40 to 49	3	22	1	9
age 50 to 59	2	16	0	3
age 60+	1	8	0	3
gender - female	8	80	0	7
gender - male	13	163	14	47
Injury to head	7	45	7	19
Injury to face	3	54	6	12
Injury to torso	1	18	2	10
Injury to limb	13	172	10	38
Injury to spine	1	4	3	4
Fall or collision with an object	8	189	3	34
Collision with a vehicle (including another e-scooter)	10	34	11	18

Table 3: Proportions of SEED-UK and TARN records linked to STATS19 during October and November 2021

Sources: (1) DfT STATS19 data (made available to PACTS by the DfT and analysed by project partner Road Safety Analysis), (2) The Trainee Emergency Research Network (TERN) Study of E-scooter impact upon EDs in the United Kingdom (SEED-UK), (3) TARN at the University of Manchester (under project reference 230201), (4) four of a possible 31 local authorities' situation reports

6. Discussion

The emergence of each new mode of transport brings benefits as well as risk of injury. Any new mode impacts the safety of users and others, and by analysing the use of a new mode, the level of hazard and danger is better understood. Details of road traffic casualties collected by the police form official data which give insights into the number of casualties, who the casualties are, how they were injured and what injuries they suffer. Hospital data provide further details of these injuries including their severity and type. The better the ability to capture these data for a new mode, the better the understanding of its relative hazard to users and danger to others.

Collecting e-scooter casualty data

e-scooters have been on the streets of the UK for a number of years with use increasing significantly from 2020 following the introduction of regulated rental trials. e-scooters are classified as motor vehicles and therefore riders have an obligation to report to the police collisions where someone else is injured. The means for the police to record the involvement of an e-scooter in a collision is still evolving. However, since the start of 2020, the use of free-text incident descriptions has enabled the Department for Transport to publish details of casualties reported to the police.

Simultaneously, hospital dataset records have been developing to capture and distinguish between the increasing array of scooters in use including two-wheeled standing e-scooters, four-wheeled mobility scooters and two-wheeled seated (generally petrol-powered) scooters. Although this is not universal across datasets, coding to record details of road traffic casualties and the vehicles involved in collisions has been demonstrated to be possible in large-scale data collection.

Improving the collection of e-scooter casualty data

Evaluation suggests that official data underestimates the actual number of road traffic collision casualties. That does not preclude the need to improve the means of data collection and, with the arrival of e-scooters, the DfT, police forces, hospitals and local authorities have taken action to do so.

Avon and Somerset Police work in an area with the most used e-scooter rental trial in England. There the West of England Combined Authority is working in partnership with Bath & North-East Somerset Council, Bristol City Council and South Gloucestershire Council, led by the police, to improve the recording of e-scooters involved in collisions across the region. This includes informing members of the public through websites and face-to-face education as well as issuing an operational order for officers to consistently record incidents involving e-scooters.

Both Merseyside and Avon and Somerset Police forces contributed casualty data to the Government evaluation of the e-scooter rental trials. Data from only six of the 30 trial areas were analysed.[41] This may be, in part, due to road traffic casualties being a priority for the

[41] National evaluation of e-scooter trials report - GOV.UK (www.gov.uk)

forces. A study of the relative under-recording of any road traffic casualties between forces would give a greater understanding of the relative levels of under-recording across Great Britain.

To help collate collision data in Liverpool a collaboration and partnership has been set up involving Liverpool City Region Combined Authority, Liverpool City Council, the e-scooter operator, Merseyside Police, Public Health, Liverpool University Hospitals NHS Foundation Trust, Alder Hey Childrens Hospital NHS Foundation Trust and Merseyside & Cheshire Trauma Network. This includes increasing public awareness of the legal status of e-scooters (for example within this trial area rental e-scooters are not available for use by under 18-year-olds) and improving the means for recording casualties both by the police and within hospitals.

Where distinction between vehicles is not possible spurious results can result. At University Hospital Southampton data were collected for 2021 and found 753 patients linked to the code including e-scooter, 425 with head injuries. However, the clinical codes for injury to an e-scooter rider were the same as those for those using electric wheelchairs and mobility scooters. By removing casualties injured away from the highway, including references to home or residential institution, 189 casualties were identified as casualties involving an electric wheelchair, mobility scooter or e-scooter. That is in comparison to 203 injured in collisions involving bicycles, 83 with head injuries and 149 injured in collisions involving motorcycles all in the year 2021.

Updated methods for collection of official e-scooter casualty data

From 2022, STATS19 has included a vehicle category entitled 'powered personal transporter device'. However, it will take until 2024 for changes in all IT systems to take effect. When it is implemented, pedal cycles, electric motorcycles and mobility scooters will still have their own categories, but all other new electric-powered technology, including e-scooters, will fall under the 'powered personal transporter device' category.[42] The decision has been taken that the category should not be too specific to allow for future technological developments. Further details which are readily identifiable on site and can be recorded as free-text, for example, the number of wheels and whether the vehicle has a seat.

From November 2023 the 29 forces which use CraSH (Collision Reporting and Sharing) will have access to a pre-determined list of options below the 'powered personal transporter device' category. This will include means to distinguish between rented and privately owned e-scooters as well as other forms of new mobility.

The introduction of these new official means of recording e-scooter involvement in a collision may result in an increase in the number of officially recorded casualties. This could be assessed with a review of under-recording relative to hospital data.

Situation reports provide narrative rather than casualty data

With the onset of the Covid-19 pandemic, the Government introduced e-scooter rental trials at short notice (the period of response to the consultation in June 2020 was two weeks).[43] From their launch in July 2020, operators and local authorities began to complete a

[42] STATS19 review - final recommendations report, publishing.service.gov.uk, 2021
[43] E-scooter rental trials: outcome and summary of responses - GOV.UK (www.gov.uk)

pre-agreed proforma to provide the DfT with monthly insights into incidents involving rental e-scooters. Although the forms include some capacity for recording casualties injured in collisions these proforma differ from STATS19 forms in both layout and content. They are not completed by trained police officers but rely on details provided by e-scooter users or members of the public. The data does not have to be recorded within a certain time after an incident has occurred. There are concerns that the severity of injuries may be exaggerated by some users to increase the likelihood of compensation from operators. There is an incentive for operators to know about collisions which result in damage to their fleet so repairs can be made. The motivation to record collisions will be impacted by the terms of the contract made between each local authority and their operators. This is not currently harmonised across England.

As e-scooters are defined as motor vehicles, rental e-scooter riders should report collisions where a third party is injured to the police. However, the way in which operators convey this information to users and other road users differs. This will have an influence on reporting levels. The DfT's evaluation report found that only 35% of residents involved in a collision reported the incident to the police.[44] The report did not include data on the percentage of e-scooter riders reporting collisions.

In some trial areas, local authorities have informed PACTS that the lack of detailed injury data involving rental e-scooters is limiting their ability to understand the impact of the rental trials e-scooters, and private e-scooters, in their area. Hospitals are being reverted to for their insights. However, as described above, this is not straightforward if distinct coding for e-scooters is not available.

Where collaborations have been made, possibly through specific contractual agreements between local authorities and operators, more robust casualty data have been obtained. This predominantly relates to the more serious injuries.[45]

In the event of a collision, there are means for members of the public to distinguish between rental trial operator-run e-scooters and private e-scooters. Since April 2022 the DfT has encouraged operators to make the unique identification number of each rental e-scooter clearly visible. Rental e-scooters also carry distinct insignia. This distinction is only of benefit when reporting an injury if the police or hospital have a method for recording different types of e-scooters involved in collisions.

It is a concern that a number of children are being injured while riding an e-scooters

Across the three datasets used in this study 46 out of 566 casualties were under the age of 17. A study of the most seriously injured road traffic casualties in 2021 found that 14% of e-scooter riders were under the age of 17.[46] In comparison fewer than 9% of injured

[44] National evaluation of e-scooter trials report - GOV.UK (www.gov.uk)
[45] D.M.S. Bodansky, M.W. Gach, M. Grant, M. Solari, N. Nebhani, H. Crouch-Smith, M. Campbell, J. Banks, G. Cheung, Legalisation of e-scooters in the UK: the injury rate and pattern is similar to those of bicycles in an inner city metropolitan area, Public Health, Volume 206, 2022,Pages 15-19, ISSN 0033-3506, https://doi.org/10.1016/j.puhe.2022.02.016
[46] Clough RA, Platt E, Cole E, et al. Major trauma among E-Scooter and bicycle users: a nationwide cohort study (Inj Prev 2023;29:121–125) 2023

bicycle riders were under this age. In this study about ten times as many bicycle riders were injured in the year than e-scooter riders. This reflected the relative usage of the two modes of transport.

Data provided to this project from Manchester Children's Hospital included 14 patients injured in collisions involving e-scooters in 2021, all under the age of sixteen. For the same period, 40 patients under the age of 16 were treated for injuries sustained in collisions involving bicycles. Considering the comparative usage of the two modes of transport across the whole population, the relatively high number of child casualties injured in collisions involving e-scooters is a concern. Similarly, Alder Hey Children's Hospital Liverpool treated 36 patients under the age of 16 injured in collisions involving e-scooters in 2021. One of these patients was a pedestrian.

Comparing private and rental e-scooter use

There is currently insufficient evidence to determine whether different e-scooters are more or less likely to be involved in injury collisions. Their involvement could be due to the rate of use, the safety of the e-scooter construction, the rider's behaviour or another cause. Incidents involving private e-scooters are suspected to be more under-reported than rental e-scooters because they are currently illegal to use in a public place, meaning the rider is liable for a fine and points on their licence if caught. This study has not been able to substantiate this assumption.

Identifying the proportions of casualties reported to have been injured in collisions involving different types of e-scooters can help compare the safety of regulated rental e-scooters with (currently unregulated) private e-scooters. Within this study and the Government evaluation of the rental trials, there have been a limited number of casualties where the distinction between the type of e-scooter has been made.

Where it has been possible to make the distinction within the SEED-UK study, about twice as many casualties injured in a collision involving a rental e-scooter (38%) were recorded as a private e-scooter (20%). 40% of the casualties were injured in a collision where the type of e-scooter was not known. Of the 21 casualties matched between STATS19 and SEED-UK, four involved private e-scooters, six rental and 11 were unknown.

The Government evaluation of the rental trials identified, across six of thirty trial areas for the year 2021, 129 casualties injured in collisions involving rental e-scooters and 123 casualties injured in collisions involving private e-scooters. An additional 48 were injured in collisions involving an unknown type of e-scooter.

7. Conclusions

This study, investigating the extent of under-recording of injury collisions involving e-scooters in late 2021, finds that between 9% and 26% of e-scooter casualties recorded by hospitals are reported in official data. This study found that casualties with any level of injury presenting to emergency departments were less likely to be recorded by the police than those who were more seriously injured.

Linkage between datasets

In October and November 2021, 9% of casualties injured in collisions involving e-scooters and recorded by 20 emergency departments across Great Britain were recorded in the official data. 26% of the most seriously injured casualties across England and Wales were recorded in the official data. This is consistent with other studies of e-scooter and other road traffic casualties which show that overall casualties matched with police records were more likely to be seriously injured and more likely to be treated as inpatients than those attending hospital.

It has not been possible in this study, with the data available, to compare e-scooters under-recording with other transport modes for the year 2021. Others have done so for bicycles and motorcycles. They found that about a quarter of the most seriously injured bicycle casualties matched, just over half of motorcycle casualties matched and about a third of e-scooter casualties matched.[47,48]

It should be noted that there is still a comparatively small number of e-scooter casualties relative to people injured in collisions involving other modes. There are also limited means of identifying specific types of injury from official data. This means that it is difficult to meaningfully identify whether casualties with different types of injury are more or less likely to be under-reported. This study has shown that casualties with injuries to the head and face are more likely to be matched between datasets. Of concern, and as identified by other studies, is the higher rate of severe head injuries to e-scooter riders relative to bicyclists or motorcyclists.

The involvement of another vehicle in a collision, or lack of, impacts the level of under-recording. In this study, casualties who had been injured in a collision involving another motor vehicle and presented to an emergency department were six times more likely to be recorded in STATS19 than those injured in a single-vehicle collision (a fall or collision with a stationary object). The proportion of e-scooter riders involved in single-vehicle collisions and included in police records is around 20%. However, single-vehicle collisions were the cause of most of the injuries linked to casualties recorded in hospital datasets.

A possible reason for the difference between police and hospital records of single-vehicle collisions in particular is the remit of the Road Traffic Act 1988. Within the UK, drivers or riders of motor vehicles involved in a collision have a duty to stop and report the incident to

[47] DfT Official Statistics, Serious e-scooter casualties: comparing police and hospital data, May 2023

[48] Clough RA, Platt E, Cole E, et al. Major trauma among E-Scooter and bicycle users: a nationwide cohort study (Inj Prev 2023;29:121–125) 2023

the police within 24 hours only when someone other than the rider or driver is injured.[49] In other countries, for example, Germany, collisions involving an injury to any party should be reported. Wider reporting of single-vehicle collisions is important because the hazard a form of transport poses is linked to the nature and severity of injuries to riders involved in single-vehicle collisions.

Another possible reason for under-recording is the extent to which e-scooters are not seen as motor vehicles, such that riders and road users do not understand the legal requirements to report injury collisions. Riders of rental e-scooters are informed in their terms of use that those e-scooters are classified as motor vehicles. Private e-scooters are not all sold with this qualification made explicit. They should be sold informing customers that they are illegal to use on public roads and in public spaces. Surveys have been carried out into the public's awareness of e-scooters and have included gathering the public's understanding of the vehicles' legal status and found that a small proportion, 10%, knew all the rules around e-scooter usage.[50] Widening the questions posed to include reporting of collisions would be beneficial.

Identifying the involvement of e-scooters in collisions

The lack of a clear method for recording the involvement of e-scooters when recording casualties both by police and in hospitals limits the ability to understand their impact on the safety of riders and other road users. Comparable variables recording details of individual casualties are necessary to match records between datasets. This has been shown to be possible between TARN and STATS19 datasets. The situation reports recording incidents involving operator-managed rental e-scooters have very limited variables for matching with STATS19 data.

However, the rental trials could serve as an excellent source of detailed information on the safety of e-scooters and have been extended to May 2026. With their inbuilt data recorders the number of journeys made, and the distance of each journey, can be captured to generate a rate of injury for riders and other road users. With a number of operators running both e-scooter and bicycle (often e-bicycle) rental schemes, some even car rental, there is the potential to collect robust data providing a clearer comparison between the safety of transport modes.

The situation reports prepared for the DfT about e-scooter use have not provided casualty recording. There are means for addressing this through improving the means of collecting incident data and the format in which it is collected. eCall systems have been compulsory in new models of cars since 2018. e-scooter operators are already using similar commercial incident detection systems

[49] Road Traffic Act 1988, Section 170

[50] Technology Tracker: Wave 8 Report prepared for the Department for Transport December 2021

which provide data in real-time. When hiring a rental e-scooter, riders are informed in terms of use that rental e-scooters are classified as motor vehicles. Their responsibilities as users of motor vehicles should be made explicit in these terms.

Once a notification of an incident is made, the way in which details are recorded could aid cross-reference with official data sets. Guidance to operators and local authorities about the use of situation reports could be updated so data collection more closely aligns with the official data, STATS19. For example, matching the options for persons involved in the collision on the situation report with the casualty class in STATS19. In at least two local authorities, collaborations have been built between the police, operators and hospitals. These well-established lines of communication between parties generate greater understanding of casualty numbers as well as the need for addressing excessive levels of under reporting.

As new modes of transport are introduced, and existing ones evolve, it is important that reporting mechanisms are improved. This could be as straightforward as the introduction of a unique code for motor vehicles which can be readily embedded into NHS and police data systems. Two-wheeled standing e-scooters, four-wheeled mobility scooters and two-wheeled seated (generally petrol-powered) scooters may be readily identifiable to a police officer at the scene of a collision. However, the common use of the word ‘scooter’ to encompass these very different vehicles leads to confusion when data is processed. A unique code, as with a designated vehicle type, would aid further analysis. Recent collisions show that the word ‘bicycle’ would benefit from similar coding to differentiate pedal cycles from Electric Assist Pedal Cycle (EAPC) and evolving electric-powered bicycles.

Mobility choice is changing with technological development and incentives from other policy areas. As new modes become available it is essential that methods for measuring their hazard to riders and danger to other road users are consistent and robust. Safety must be adequately understood.

8. Recommendations

Based on the evidence gathered for this report, PACTS makes the following recommendations to address the under-recording of e-scooter casualties.

PACTS recommends the DfT should:

1. Increase the opportunities for casualty data to be collected
    - issue clear information to the public about the obligations of reporting road traffic collisions to the police, including those involving illegally used private e-scooters on public roads and public places
    - work with the Home Office as it prioritises roads policing through the implementation of the Strategic Policing Requirement including dissemination of the value gained from road traffic casualty data collection
    - work with the Department for Health and Social Care to extend coding which is relevant to road traffic casualties from STATS19 to hospital record systems, for example, the Emergency Care Data Set (ECDS), therefore bringing consistency between datasets
    - support the greater use and development of the CRaSH digital recording system with its responsiveness to new transport modes and ready means of reporting casualty data

2. Improve the means of recording e-scooter casualties using the rental e-scooter schemes
    - update guidance to operators and local authorities about the use of situation reports so data collection more closely aligns with STATS19, for example matching the options for persons involved in the collision on the situation report with the casualty class in STATS19
    - publish findings from the situation reports which have been collected since July 2020
    - prioritise harmonisation of casualty recording across local authorities in future legislation to enable consistent measuring of safety outcomes for riders and other road users

3. Require all injury collisions, regardless of whether they include a third party, to be reported to the police
    - Single-vehicle collisions involving micromobility modes are more likely to result in injury than those involving vehicles
    - as different policy areas promote the use of micromobility data of reported casualties are important because they are used to develop and evaluate legislative changes, target road safety publicity, road and vehicle engineering measures, and identify public health issues related to road safety

Appendix A – Situation Report proforma

E-scooters Situation Report (Sit-Rep)						Government protective marking: OFFICIAL May contain commercially sensitive information when complete
Trial Number: (Select from list)		**Local area completing the Sit-rep report:**		Update for the Period: (mmm/yy)		

Trial Progress Update: **Positive & Negative Press Reports or Key messages (See Guidance tab for more information)**

Rider-only incidents: **Total incidents for the period**						
Where slight injuries were sustained by the rider and no other persons or vehicles were involved in the incident, a simple count will suffice.					**Total slight rider-only injuries this reporting period**	
	Rider only	N/A	N/A	Rider only injury	Slight injury	

Other incident reports: **The table below should only be completed for incidents resulting in damage, injury, sanction, or police enforcement. One entry per incident please**

Date first reported (dd/mm/yy)	Date of incident (dd/mm/yy)	Person reporting the incident (Select from list)	E-scooter involved (Select from list)	Persons involved (Select from list)	Incident environment (Select from list)	Incident type (Select from list)	Incident Outcome (Select from list)	Injuries sustained (Select from list)	Incident description	Emergency Service Incident number (if known)

Appendix B – Variables and tolerance levels used for matching

The following information was used to match hospital data with police records

- **Date of the collision**: allow the data recorded at the hospital to be one day after the collision date recorded in STATS19
- **Age of casualty**: allow a difference of one or three years (three years for adults only)
- **Gender of casualty**: defined as male, female or missing
- **Relationship to the e-scooter**: rider (or recorded as driver), passenger, pedestrian, pedal cyclist, other, unknown.
  Casualty severity: The police scale in STATS19 is 'Slight- Serious-Fatal'. Classification of injury severity using the CRaSH reporting system includes differentiation between levels of serious injury (less serious, moderately serious and very serious) as well as including categories for slight injuries and killed. [51] The SEED-UK study uses the abbreviated injury scale [AIS] (AIS 1 for minor injury, to AIS 5 for a critical injury) which was first published in 1971 and is internationally recognised. The maximum AIS score assigned to the casualty [the MAIS] is used to indicate overall severity. For this project, the scales have been overlaid as follows. Tolerance allows severity to vary by one category:

Abbreviated injury scale	AIS 1	AIS 2	AIS 3	AIS 4 or AIS 5
AIS Injury severity definition	Minor	Moderate	Serious	Severe or Critical
CRaSH definition of injury severity	Slight	Serious	Serious	Serious
DfT STATS19 definition of injury severity	Slight	Less serious	Moderately serious	Very serious

Table B1: Coding of the severity of injury matched between datasets

- **Location**: matching using location is very limited in this study. STATS19 data include the collision location local authority name. The location of each hospital included in the SEED-UK survey is provided. STATS data were then processed to include an additional indication of proximity to an Emergency Department. A list of hospitals with Major Trauma Centres or Trauma Units is available, but the location where each casualty was treated is not listed.

[51] Guide to severity adjustments for reported road casualties Great Britain - GOV.UK (www.gov.uk)

Matching involved considering the means of transport to hospital, as available in SEED-UK, and noting that TARN data is more likely to include patients who have travelled further. Use of catchment areas, defined in terms of local authority areas, from which hospitals would expect to receive road accident casualties could have been used. However, medical professionals confirmed that these would still have their limitations due to some injuries becoming apparent sometime after the collision when the casualty is in a new location. This is more likely for minor injuries. Patient postcode data would be most reliable but would require significant data protection methods to be employed. It has therefore not been used in this study.

Parliamentary Advisory Council for Transport Safety (PACTS)
Buckingham Court
78 Buckingham Gate
Westminster
London
SW1E 6PE

admin@pacts.org.uk
(+44) 7928 050 742
www.pacts.org.uk
@PACTS