Institution: University of Essex

Unit of Assessment: 4 – Psychology, Psychiatry and Neuroscience

Title of case study: Newly developed mobile traffic collision reporting improves road safety data, increasing the efficiency of UK police services

Period when the underpinning research was undertaken: January 2016 - June 2019

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Jonathan Rolison	Senior Lecturer	January 2016 - present

Period when the claimed impact occurred: April 2016 - December 2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact

Each year in the UK, road accidents account for over 150,000 casualties including nearly 30,000 people killed or seriously injured. Essex research revealed systematic cognitive bias and inefficiencies in police officers' recording of road traffic accidents that undermines the reliability of accident statistics used to inform road safety policy. To avoid these biases, **Essex research has transformed the reporting of road traffic accidents** via the **development and evaluation of a mobile app** reporting system used by police officers at the incident scene. The new reporting practices provided to police forces in November 2018, are already in use by 24 of the 45 police forces in England, Wales, and Scotland. Essex research has **i**mproved the **reliability** of collision data, and **reduced police costs** associated with incident reporting and data processing that informs the Department for Transport and Transport Scotland **road safety policies**.

2. Underpinning research

Understanding factors contributing to road traffic accidents is fundamental to development of government road safety policy. Research conducted at the University of Essex revealed important limitations to the procedures and structure of report forms in use by police officers to record road traffic accidents. The research identified three major limitations that undermine the reliability of accident and collisions data. These relate to unreliable recollection of an incident when completing record forms at a later time point, biased judgment including use of age or gender stereotypes, and variable subjective interpretation of the contributory factors listed on standard police incident report forms leading to misclassification of cause.

Key Research Insights

Younger and older drivers are often described to pose a markedly greater crash risk than drivers in other age ranges, fuelling negative stereotypes of younger and older drivers. However, Essex research has revealed that younger and older drivers' crash risks have been overestimated in previous reports [**R1, R2**], indicating that the views of police officers who report on road collisions may be discordant with the actual risks posed by some road users.

In a project funded by the EPSRC [**G1**], Essex research investigated the perceived causes of specific accident scenarios provided by experienced collision reporting police officers in the UK and compared these with official collision records [**R3**]. Police officers' perceptions of the causes of accident scenario collisions approximated some of the factors (e.g., driving too fast for the road

conditions) reported to contribute to collisions in the official records. However, for other factors, such as driver distraction, **discrepancies between police officers' responses and official records were revealed, indicating either under-reporting of some contributing factors in the official records (e.g., mobile phone use) or exaggerated beliefs about the dangers of such factors by police officers.**

When a police officer attends a road collision, they must undertake several cognitively demanding tasks simultaneously (attending to injured persons, collecting witness statements, detaining persons under arrest, managing traffic). Established UK reporting practice involved a handwritten report, known as STATS19 including a description of the factors judged to have contributed to the collision, often completed or keyed in at the police station some time later. **Essex research revealed that such delay in completing the report impairs the reliability of the recorded data [R3, R4]. Even after a brief passage of time, police officers' perceptions of collision causation influenced their memory recall for the factors contributing to collisions. Police officers were poorer at recalling factors (e.g., exceeding the speed limit) that mismatched the age (e.g., older adult) of the driver in their views of typical collision causation, revealing systematic age bias in police officers' memory recall for incident details.**

Other discrepancies in police officers' reporting of collisions may result from **misunderstanding of the meaning of contributory factors** due to how they are categorised in the incident report (STATS19). In a study of police officers across the UK [**G2, R5**], Rolison investigated officers' perceptions of how contributory factors should be labelled and categorised in the collision report. **Misclassifying a contributory factor such as mobile phone use as driver impairment, rather than as driver distraction, can cause inconsistent reporting or under-reporting of contributory factors.** Hierarchical clustering analysis was used to identify the optimal structure of the incident report, minimising discord with police officers' perceptions, and in turn, reducing misunderstanding of the meaning of individual contributory factors. **The findings also provided a proof of concept for how statistical cluster analysis can inform understanding of the temporal sequence of multiple contributing factors.**

Rolison was awarded a Department for Transport research innovation grant [**G2, R6**] to **develop and evaluate a prototype mobile reporting app to be used by police officers at the incident scene.** The app was proposed to replace reliance on notetaking and delayed recording so as to avoid unreliable recollection. An improved structure for data recording yields more **accurate insight into collision causation**. Evidence for the ease of use of the device and potential improvements in efficiencies were provided by focus group interviews with police officers experienced in road accident reporting [**R6**].

3. References to the research [available from HEI on request]

Research Quality: The research has been funded by competitively awarded research grants and published in peer reviewed international journals with good impact factors (IF). In Web of Science, *American Journal of Epidemiology* is ranked 23 of 193 (Q1) in the Public, Environmental, and Occupational Health category; *Accident Analysis and Prevention* is ranked 5 of 108 (Q1) in the Social Sciences: Interdisciplinary category; and *Journal of Safety Research* is ranked 12 of 108 (Q1) in the Public, Environmental, and Occupational Health category. R3 is currently the most downloaded article in the journal since publication in 2018, cited 51 times according to Web of Science.

R1 Rolison, J.J., & Moutari, S. (2018). Risk-exposure density and mileage bias in crash risk for older drivers. *American Journal of Epidemiology*, *187*, 53-59. DOI: 10.1093/aje/kwx220. IF = 4.53.
R2 Regev, S., Rolison, J. J., & Moutari, S. (2018). Crash risk by driver age, gender, and time of

day using a new exposure methodology. *Journal of Safety Research, 66,* 131-140. DOI:10.1016/j.jsr.2018.07.002. IF = 2.86.

R3 Rolison, J. J., Regev, S., Moutari, S. & Feeney, A. (2018). What are the factors that contribute to road accidents? An assessment of law enforcement views, ordinary drivers' opinions, and road accident records. *Accident Analysis and Prevention, 115,* 11-24. DOI: 10.1016/j.aap.2018.02.025. IF = 3.66.

R4 Regev, S., Rolison, J. J., Feeney, A., & Moutari, S. (2017). Driver distraction is an under-reported cause of road accidents: An examination of discrepancy between police officers' views and road accident reports. *Proceedings of the IFSTTAR*. Paris, March 2017.

R5 Rolison, J. (2020). Identifying the causes of road traffic collisions: Using police officers' expertise to improve the reporting of contributory factors data. *Accident Analysis and Prevention. 135,* 105390-105390. DOI: 10.1016/j.aap.2019.105390. IF = 3.66.

R6 Rolison, J. J., & Moutari, S. (27th April 2016). *The development of a new road accident reporting system*. A report provided to the UK Department for Transport. URL: https://doi.org/10.17605/OSF.IO/GQWAH

4. Details of the impact

Summary. Research at Essex identified systematic bias and inefficiencies in police officers' reporting [**R3-R5**] that undermines the reliability of road traffic accident statistics. Essex researchers proposed, developed, and evaluated a prototype for a mobile (at the incident scene) reporting device to improve reliability and eliminate bias [**G2, R6**]. **The Department for Transport (DfT) recognised the importance of 'on the scene' reporting and adopted the mobile reporting prototype. Essex research has transformed the reporting of national road traffic accident statistics, substantially reduced police costs associated with incident reporting, and changed the approach and policies of the Department for Transport and later, Transport Scotland, in an area of high societal cost.**

Essex Research Developed a Mobile Reporting App That Transformed the Reporting of National Accident Statistics

The app: Funded by the DfT [**G2, R6**], Rolison developed a fully functioning prototype mobile accident reporting app to replace handwritten police reports and desktop computer keying. The app uses an intuitive modular style to build an incident report (accident context, vehicle, casualties, contributory factors) and a google maps tool to identify the precise location of an incident [**R6**]. The mobile feature reduces time spent reporting road accidents by police officers and reduces resource required for data processing for statistical use by the DfT. Data input at the incident scene removes reliance on memory and recollection that in turn reduces the likelihood of bias [**R3, R4**]. In particular, the development of the 'contributory factors' modules engaged police officers in the iterative development of meaningful factors and developed a branching logic component to record the order in which contributory factors occurred. This reveals the causal sequence of events that underlie accident causation and identifies the initiating factor in a manner not previously possible from standard reporting forms [**R5, R6**].

Presentation to the Department for Transport: The report on this work provided to the DfT [**R6**] included a user manual for a functioning prototype of an Android app with recommendations for its implementation to replace existing handwritten forms. Rolison was invited to present his research

and the prototype device to the DfT Standing Committee on Road Accident Statistics (SCRAS) on 16th November 2016 [**S1**]. The DfT confirms: "*You also presented your research to us at the Standing Committee on Road Accident Statistics (SCRAS), a body which oversees road safety policies and practices. Since then you have presented to the analysts working on the STATS19 review on the Contributing Factors and how they could be modified going forward. Your findings improved our confidence in the Contributing Factors.*" [**S2**].

Adoption by the Department for Transport: Insights from Rolison's research [**R3-R5**] and his presentation of the proof of concept for a mobile reporting app [**R6**] were pivotal to the DfT's decision to commission a new mobile reporting system based on the prototype. The DfT testify [**S2**]: "*Your mobile accident reporting app demonstrated the feasibility of a mobile version of the CRaSH system*" (a PC desktop software package developed for the DfT to key incident notes at the police station). They go on to state that: "*the DfT then decided to contract CIVICA to produce a fully functioning app to be used nationally for road accident reporting to replace current practices.*" [**S2**]. In doing so, **the DfT invested in changes to their practices for collision reporting as a consequence of Essex research.**

CIVICA were contracted by the DfT to develop CRaSH 7, with mobile functionality and full user support for on-the-scene reporting. During development, the DfT encouraged CIVICA to seek expert advice from Rolison and he provided CIVICA with his prototype device, user manual, and the research [**R6**], which underpinned this on 3rd November 2017. The resulting, "*CRaSH Version 7's mobile functionality enables officers to record all essential details of a traffic collision at the scene of the incident.*" [**S3**]. Moreover, "*Phone and video evidence can be collected at the scene by officers via the app and valuable metadata, like time and place, is added, providing a more data-rich, accurate view of where, why and how collisions occur.*" [**S3**]. This reduces the reliance on handwritten notes and memory recall by the reporting officer, which Rolison's research has shown to introduce biases and inaccuracies, thus ensuring more accurate recording of data at the scene.

The New Mobile Reporting System Provided by the DfT to Police Forces: The new system for collision and casualty data collection, the mobile Collision Reporting and Sharing System (CRaSH 7) was provided by the DfT to Police forces in November 2018. The DfT stated in their 2019 annual report [**S4**]: "*All existing users (of CRaSH desktop) have migrated to CRaSH 7. Police Scotland and a number of Welsh forces are planning to go live with the system in 2019*" [**S4**, paragraph 4.30, p. 54]. Transport Scotland confirms that Police Scotland have been using the system since July 2019 [**S5,** p.3]. CIVICA confirm that CRaSH 7: "*is already supporting 24 UK police forces to improve road safety and save lives across the country*" [**S6**] representing **more than half of all 45 UK police forces**. The DfT is committed to the continued rollout and use of CRaSH 7 stating in their annual report [**S4**, p.54]*: "We will continue encouraging more forces to use this system and following the Stats 19 review ensure that CRaSH is updated accordingly for those already using the system".* Action 67 of the DfT's two-year action is to: "*Encourage more Police Forces to adopt CRaSH 7"* [**S4**, p.69].

Use Of CRaSH 7 For Road Collision Reporting Improves Reliability of Data that Informs Road Safety Policy

By enabling more accurate roadside reporting for police officers, the new mobile functionality of CRaSH 7 helps to provide a clearer picture of where road collisions occur and why. CIVICA state: "*the application will share statistical collision data with Highways England, DfT, police and local authorities, helping them work together to make safety improvements to the road network*" adding

"*By improving the quality of data captured, CRaSH 7 highlights collision hotspots across the road network and informs more effective spending on road network improvements, ultimately helping to save lives*" [**S7**]. A **testimonial from the DfT emphasizes the important consequences** of the introduction of this new reporting system: "*in time this should also improve the reliability of road accident data. **Road accident data are used by us to inform national road safety policies and campaigns. Thus, improvements to the reliability of road accident data have profound and far reaching effects on society***" [**S2**]. Road Safety Minister Jesse Norman said: "*This technology ensures police officers can record accurate information about crashes – ensuring they spend less time on paperwork and more time preventing crime. This data will also help local authorities identify issues and act more quickly to improve road safety.*" [**S7**].

CRaSH 7 Has Resulted in Cost Savings to Police Forces Using it in The UK, National Transport Bodies, the DfT, and Transport Scotland. CRaSH provides: "*Significant cost savings for police forces and national transport bodies with more efficient processes driven by digitisation, mobile capability and automation.*" [**S3**]. CIVICA state that the existing version of CRaSH '*already resulted in cost savings in the region of £7.5 million per year for the agencies that rely on the system*' adding *"with the new enhancements [CRaSH 7 is] expected to deliver further incident reporting savings"* [**S7**]. These cost savings are partly attributable to time savings among police officers in completing paperwork and incident reports. Additional incident reporting savings from CRaSH 7 are confirmed in a **testimonial from the DfT** which states: **"*Our new accident reporting practices are reducing costs as police officers spend less time completing paper-based forms that are later transferred to computer records, improving the efficiency of reporting practices and ease of use"* [**S2**].

5. Sources to corroborate the impact

S1a, b SCRAS Agenda dated 16.11.2016 and email invitation to attend SCRAS 1st November 2016 from Head of Road Safety Statistics, Statistics, Travel and Safety, Department for Transport

S2 Testimonial provided by Head of Analysis – Road Casualty Investigation Project, Department for Transport. Dated 29.04.2019

S3 CIVICA Digital. Collision reporting and sharing system: Make collision reporting a more efficient, accurate and cost-effective process with Civica Digital's CRaSH. Accessed: 16.02.2021

S4 Department for Transport (2019). *The Road Safety Statement 2019. A Lifetime of Road Safety.* Department for Transport, July 2019.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/817695/road-safety-statement-2019.pdf

S5 Transport Scotland (2019). *Key Reported Road Casualties, Scotland.*

S6 CIVICA Digital. Civica crowned award-winning cloud leader. Accessed: 16.02.2021

S7 CIVICA Digital. Collision Reporting and Sharing System (CRaSH) will reduce police workloads and improve road safety. Accessed: 16.02.2021