

## Assessment of Self-reported Cycling Injuries in Ireland: Analysis of Single Cyclist Collisions

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### I. INTRODUCTION

Due to the numerous health and environmental benefits associated with cycling, it has been encouraged in Ireland and in many other countries in recent years. As a mode of transport to/from work school or college, the government had set a targeted increase in modal share from less than 2% in 2009 to 10% by 2020 [1]. Cycling has increased in popularity, and as of 2016 it was at roughly 3% of the modal share [2]. However, the modal share of minor injuries for cyclists in national data increased from 4% to 11% between 2009 and 2015, and their modal share for serious injuries increased from 2% to 19% [3]. Though national data is the most complete and useful source of road traffic collision data in Ireland, there are issues with the level of detail with which collisions may be coded. Injury information is limited to three categories of overall injury severity; minor, serious and fatal. National data is comprised only of those cases which have been reported to the Police, and cyclist collisions involving injuries have been shown to be particularly under-reported compared to other collision types, both in Ireland and internationally [4-5].

In 2018, a collision survey was distributed to cyclists in Ireland and an analysis of the preliminary survey responses was performed [6]. After completion of dissemination a total of 3,904 respondents had taken the survey, and after data cleaning there were a total of 1,428 collisions from 1,349 respondents. The majority of collisions entered into the survey were between cyclists and motorised vehicles (58%), the next most common collision type were single cyclist collisions (26%), i.e., involvement of another road user, followed by collisions with other cyclists (8%) or pedestrians (8%). Preliminary findings indicated that single cyclist collisions are the least likely of all collision types to be reported in national data, and they comprise a large share of the collisions [6], this was also the case after dissemination was completed: only 4% of injurious single cyclist collisions were reported compared to 39% of those with motorised vehicles. Therefore, in this paper we analyse the contributory factors and injury outcomes for single cyclist collisions.

### II. METHODS

The survey responses were analysed to assess contributory factors for Single Cyclist Collisions (SCCs) and these cases were compared to cyclist collisions involving Motorised Vehicles (MVCs). Injury severities are coded using the definitions used in Irish national data [3]; *serious injuries* are those for which the person is detained in hospital as an *in-patient*, or where any of the following occur: fractures, concussion, internal injuries, crushing, severe cuts and lacerations or severe general shock requiring medical treatment, and *minor injuries* are defined as injury of a minor character such as a sprain or a bruise.

### III. RESULTS

#### **Contributory Factors**

The most frequent collision partners reported for SCCs in the self-reported survey are kerbs (21%) and tram lines (20%), followed by potholes (9%), drains/manholes (7%), road markings (5%), and walls/gates (4%). Nearly all (94%) reported MVCs (79% cars, 3% buses, 6% Jeeps, 8% vans, 2% goods vehicles, 1% two-wheelers) occurred in an urban environment (defined by speed limits 60km/h or less), compared to 82% of SCCs. The majority of MVCs were in either moderate or heavy traffic conditions (68%), compared to only 38% of SCCs. Thirty percent of SCCs occur on bending roads compared to only 10% of MVCs, and SCCs occur more commonly (14%) on roads with a downhill gradient, compared to 7% for MVCs. Inclement weather (wind/wet/snow or ice) was reported in 39% of SCCs compared to only 14% of MVCs. Further, 26% of SCCs occurred in wet weather, and 7% in snowy/icy weather. SCCs are more likely to occur in locations unfamiliar to the cyclist (11%) compared to 1% for MVCs. Females are more likely to be involved in SCCs (36% of cases) compared to MVCs (27% of cases), with an odds ratio of 1.5 (95%CI: 1.1-2.1).

#### **Injury Outcomes**

Surprisingly, in the survey results cyclists involved in SCCs are 2.8 times more likely to sustain an injury than those involved in MVCs (95%CI: 2.0–3.9), with 74% of cyclists involved in SCCs reporting an injury compared to 51% for MVCs. However, this may in part be due to recall bias, which may be affected by the length of time that has passed since the event, the occurrence or injury and whether or not another road user was involved. Though

respondents were directed to enter their most recent collision, those with injuries may be more memorable. The effect of recall bias may not be as strong for MVCs, as the inherent involvement of another road user may result in a more memorable experience, resulting in SCCs with relatively higher injury severities being reported. In Fig. 1 the distribution of injuries by collision type and severity is shown for SCCs and MVCs. The overall injury patterns and severities are similar for both collision types, in particular the head and upper/ lower extremities. However, SCCs are somewhat less likely to involve injuries to the torso or neck.

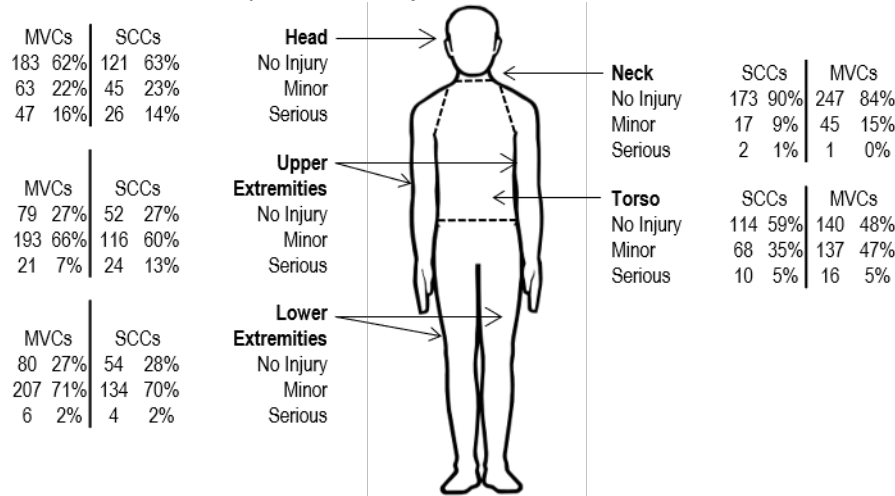


Fig. 1. Injury patterns for cyclist collisions with motorised vehicles, and for single cyclist collisions.

#### IV. DISCUSSION

The recent increase in cyclist injuries in Ireland indicates that efforts should be made to decrease their occurrence and severity. Priorities in cyclist injury prevention strategies have in the past focused on MVCs due to their apparent high frequency and severity in Police reported national data. In many countries overall cyclist fatalities have been decreasing in recent times, however, deaths due to single cyclist collisions have been found to be bucking the trend, and have been increasing in the Netherlands and Australia [7-8].

Single cyclist collisions were identified as the least likely to appear in national data, as only 4% were reported, similar to the rates seen internationally [9], and they comprise a large proportion of injuries. The results of this survey indicate that SCCs are more likely to occur in rural environments with higher posted speed limits, in lighter traffic conditions, on less linear roads, in inclement weather conditions, and in locations unfamiliar to the cyclist than for MVCs. Females are more likely to be involved in a SCC than in an MVC. The patterns of injuries sustained by cyclists involved in SCCs and MVCs are generally similar, apart from SCCs resulting in fewer injuries to the torso and neck. Although by definition self-reported survey data excludes fatalities, the results show that SCCs are both frequent and of similar severity to the injuries reported from MVCs. It is evident that future efforts should include a focus on injury prevention for SCCs.

#### V. ACKNOWLEDGEMENTS

The authors thank the Irish Road Safety Authority (RSA), which is funding this research as part of the 2017 RSA-Helena Winters Scholarship for Studies in Road Safety.

#### VI. REFERENCES

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