

## Wider view over bicycle accidents: Complementing and extending bicycle accident statistics in urban areas using surveys

Laura Ringel <sup>\*</sup>, Clemens Kielhauser <sup>#</sup>, Bryan T. Adey <sup>†</sup>

<sup>\*</sup> Fachstelle Verkehrssicherheit, Strasseninspektorat  
Tiefbauamt, Baudirektion Kanton Zürich,  
Walcheplatz 2, 8090 Zurich, Switzerland  
email: [laura.ringel@bd.zh.ch](mailto:laura.ringel@bd.zh.ch)

<sup>#</sup>Transport Infrastructure Group  
Berne University of Applied Sciences  
Pestalozzistr. 20, 3400 Burgdorf, Switzerland  
email: [clemens.kielhauser@bfh.ch](mailto:clemens.kielhauser@bfh.ch)

<sup>†</sup>Chair of Infrastructure Management  
ETH Zurich  
Stefano-Francini-Platz 5, 8093 Zurich, Switzerland  
email: [adey@ibi.baug.ethz.ch](mailto:adey@ibi.baug.ethz.ch)

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### 1 INTRODUCTION

City traffic planners are striving to adapt their infrastructure to not only increase the number of cyclists but also to ensure that city cycling is both enjoyable and safe. In Switzerland and in many other countries, it is suspected that only one of ten bicycle accidents is reported to the police [1–5]. Only knowing about 10% of the accidents, on top of the fact that there are luckily not many accidents from a statistical perspective, casts doubt about where efforts should be made to improve cycling infrastructure, and how effective the actions taken actually are.

To deal with this lack of data, this paper proposes to use surveys of cyclists besides police records to obtain a more complete picture of the number and location of cycling accidents, including the ones not reported to police, and the locations that cyclists perceive as dangerous. The combination of survey and police reported data gives a considerably different and more complete impression of where there is potential to improve cycling infrastructure, when compared to that obtained using only police reported accidents. This work expounds how the survey responses about hazard perception and unreported accidents help provide a more complete overview of the accident potential of the existing cycling network and how they form a base of immensely useful inputs for planning improvements.

### 2 STUDY

The two data sets used in this study are police accident data (compiled by police officers when managing accident sites) and survey questions answered by affected cyclists retrospectively.

86% of the personal experienced accidents stated in the survey were not reported to the police. Since the number of accidents is a key factor in the prioritisation of bicycle safety measures, it is important to know where unreported bicycle accidents are happening. The accident severity is another key factor in the prioritisation of bicycle safety measures. 42% of the serious injury accidents, 84% of the slight injury accidents and 88% of the property damage accidents stated in the survey were unreported. Extrapolation shows that the monetised costs of unreported accidents is 4.56 times higher than the police reported accidents. Thus, there is a large amount of accident costs that cannot be spatially allocated. Furthermore, combining not police reported and police reported accidents highlighted key accident locations that appeared to be less important when only police reported accidents were considered.

The type of accident is a key factor when striving to understand how the dangerous situations evolve at an accident site. Unsurprisingly, the police reports showed an overrepresentation of accidents with seriously injured casualties. However, 42% of the accidents with serious casualties stated in the survey were not reported to the police. Furthermore, 84% of the survey accidents involving slight injuries were not reported to the police.

While both data sets contained a high number of single-vehicle accidents, these accidents did not mirror the same leading causes. The combination of police-reported and unreported survey accidents showed a high proportion for the leading cause “acute-angled tram track crossing”, whereas the police reported accidents alone showed a low proportion. On the other hand, “Other influence related to inattention or distraction” was the most common leading cause within the police reported accidents, while the combined data set displays this leading cause only in a small part of the accidents. Furthermore, the influence of alcohol showed a much higher representation in the reported accidents than in the combined set.

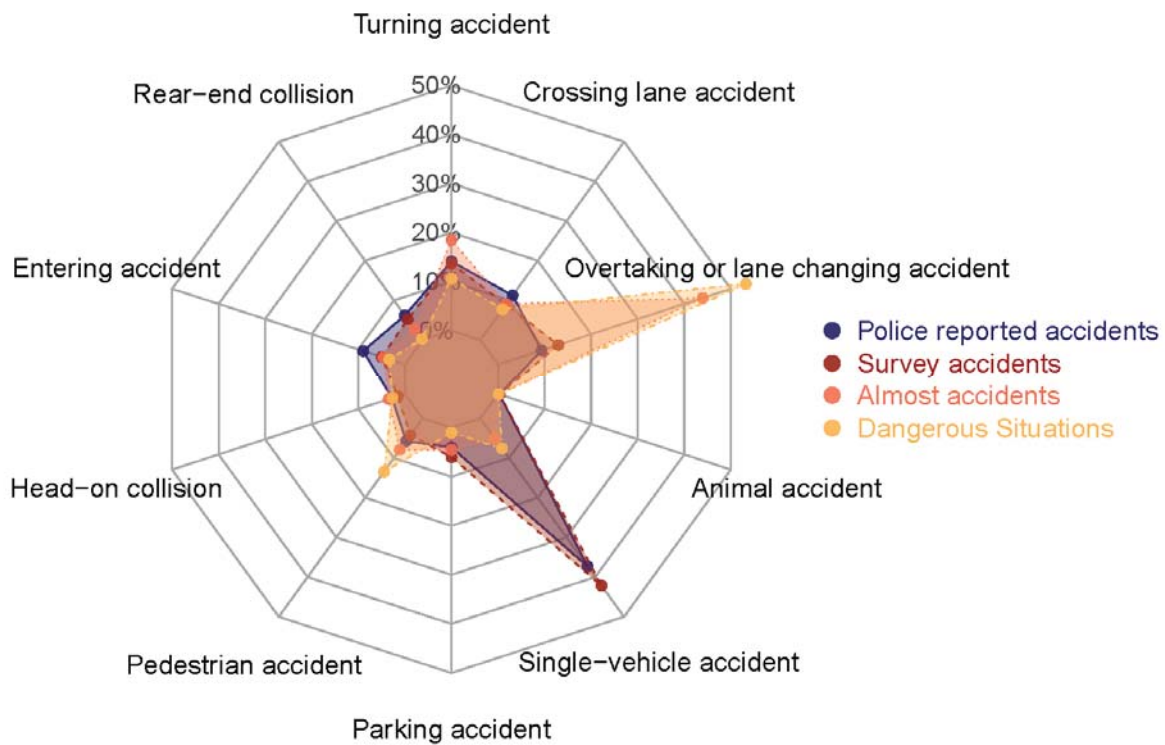


Figure 1: Frequency of accident type groups according to different sources

Another aspect that only a combination of survey and police reported data allows is the comparison of spots that were perceived as dangerous and spots that actually proved to be dangerous. The knowledge about where cyclists perceive danger can be used as indicator of which situations should be reduced for cyclists in order to get more people cycling. Additionally, a comparison between perceived and actual risk can be done. The comparison of the accident type groups of actual accidents, almost accidents and as hazardous perceived situations showed an enormous difference (Figure 1). The actual accidents mirrored in 37% (police reports) or 42% (survey) of the cases single-vehicle accidents. Almost accidents and dangerous situations fell to 44% respectively 53% under the category “Overtaking or lane changing accident”. These findings suggest that, regarding these two accident types, there is a big difference between risk perception and actual risk.

### 3 CONCLUSIONS

Since the prioritisation of infrastructure renewals also builds on results of accident analysis, more efforts should be made to gather knowledge about not police reported accidents. This study shows that a combined view of police and survey accident data leads to a different prioritisation of accidents spots. The presented method represents an approach to gain a more holistic view on accident occurrences. It enables the quantification of the estimated number of unknown cases, reveals their characteristics and thus offers a wider understanding of where prevention measures should be placed. Furthermore, the method has proven to be

promising when aiming to collect more information on accident sites and sites or situations that give cyclists the feeling of unease.

In this study, we saw a very clear difference in risk perception and actual risk between accident types. The results beg the question if cities with different styles of cycling infrastructure paint different pictures in that regard. Generally, comparing different cities regarding their number of unknown accidents and the perception of danger by cyclists could establish a basis to measure the success of accident prevention strategies and cycling infrastructure planning.

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