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# Long-term problems influencing health-related quality of life after road traffic injury – Differences between bicyclists and car occupants

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## ABSTRACT

The aim of this study was to describe and compare road traffic injuries leading to long-term problems in Health related quality of life (HRQoL), with regards to road user group, injury severity and injured body region, which is important when considering injury preventive strategies. From the Swedish Traffic Accident Data Acquisition (STRADA), a randomized sample of people injured in a road traffic crash and seeking emergency hospital care in connection to the crash between 1<sup>st</sup> of January 2007 and 31<sup>st</sup> of December 2009 was drawn (n=4761). HRQoL was investigated using a self-report survey, namely the EQ-5D. Among the responding persons injured in a bicycle crash (n=402) or car crash (n=557) the injury outcome of reporting or not reporting any problem in HRQoL was compared between bicyclists and car occupants depending on injured body region and injury severity. The results showed that 59% of car occupants and 44% of bicyclists reported problems in HRQoL after a road traffic injury. Pain/discomfort and anxiety/depression were the health-related dimensions where people most frequently reported problems. Leg injuries were most often associated with reporting problems in HRQoL, for both bicyclists and car occupants. Another finding was that car occupants consistently reported more problems in HRQoL compared to bicyclists, even when controlled for injury severity and injured body region.

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## 1. Introduction

The World Health Organization (WHO) estimates that 1.2 million people are killed and 50 million are injured annually in road crashes around the world, and millions more suffer injuries with long-term consequences (WHO, 2015). The consequences of these injuries impacts on various aspects in human life and health. For example, physical, psychological, social, occupational and economic consequences (Mayou and Bryant, 2003). In Sweden, the health consequences of road traffic injuries are described in terms of Permanent Medical Impairment (PMI). Medical impairment relates to the functional reduction after injury, without regard to cause or the injured persons occupation, hobbies or other circumstances (Malm et al., 2008). Hence, it is the functional impairment and not the disability resulting from the impairment that is evaluated (Berg et al., 2016). Over the past decades there has been a paradigm shift in healthcare from a biomedical to a biopsychosocial view of health, where the patients view is incorporated (Wood-Dauphinee, 1999). This means that the individual's perception of the injury, that is its impact on the personal life situation, is another way to understand the magnitude of road traffic harms. Health related quality of life (HRQoL) is the health-related subset of quality of life and represents a multidimensional perspective of health that takes into account physical, psychological and social functioning and well-being (Bowling, 2001).

Some studies have investigated HRQoL after traffic injury. Alghnam et al. (2014) carried out a longitudinal follow-up study examining the relationship between traffic-related injuries and HRQoL using the Short form 12 (SF-12) showing that persons suffering non-fatal motor vehicle injuries reported impacts on physical health up to 9 months after injury. Jagnoor et al. (2015) studied HRQoL outcomes

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among patients with mild to moderate injuries after a motor vehicle crash. HRQoL was measured with SF-12 and EQ-5D and a large share of the persons experienced HRQoL problems, although the follow-up was limited to only two months. One Swedish study investigated long-term health-loss, including HRQoL, after traffic injury and found that among 200 non-fatally injured adults and 30 children, 38% of adults and 13% of children experienced long-term loss of health one year after injury. (Maraste et al., 2003). Also, Mayou and Bryant (2003) investigated long-term consequences after traffic crash including some aspects of HRQoL. They investigated consequences of traffic crashes for different road users (vehicle occupants, motorcyclists, cyclists, and pedestrians) among adult persons ( $n=1441$ ) attending an emergency hospital. They found that despite differences between the road user groups in terms of injuries, immediate reactions and treatment, there were few longer-term differences. Compared to other road user groups, bicyclists suffered less severe injuries and their injuries were likely to be head, face, arm and leg injuries. Vehicle occupants reported problems related to pain more frequently than the other groups. Nhac-Vu et al. (2014) found that injury type was related to consequences in quality of life at one year after road traffic crash: among groups with poor outcome at one year, more than two thirds had lower limb injuries associated with restricted leisure activity.

It is known from previous studies that long-term consequences differ depending on injury severity and injured body region (Malm et al., 2008). Also, people's own perception of how their injury affects their life can vary, and will not necessarily be in line with an objective measurement. However, no previous studies have investigated HRQoL after traffic injury with regards to self-reported problems in HRQoL, taking into account injury severity and injured body region, which is important when considering injury preventive strategies. Therefore, the aim of the present study was to describe and compare road traffic injuries leading to problems in HRQoL, with regards to road user group, injury severity and injured body region. Bicyclists and car occupants were the road user groups included because firstly, the risk of permanent medical impairment (RPMI) was developed based on medical impairment among injured car occupants (Malm et al., 2008). RPMI is the predictive measure of medical impairment and is applied in Sweden to estimate the health impact of road traffic crashes (Berg et al., 2016). Secondly because of the increased interest in public policy to increase the level of bicycling by transferring car trips to bicycle trips. Hence, in the future one might expect that bicycle related injuries will continue to increase. (STA, 2015). The following research questions were investigated:

- How many of those injured in a car or bicycle crash report problems in HRQoL and what are the types of problems?
- How do problems in HRQoL differ depending on road user group, injury severity and injured body region?

## 2. Materials and methods

Medical outcome data regarding injuries was obtained from the data acquisition system Swedish Traffic Accident Data Acquisition (STRADA) and HRQoL data was obtained from a self-report survey using the EuroQoL-5D (EQ-5D).

STRADA contains information on crashes and injuries occurring in the Swedish road transport system as reported by the police, and medical data on persons injured as reported by emergency care hospitals. The police data and the hospital data are two separate databases, that can be automatically merged if needed. The present study was based on hospital records only. This was because most often bicycle crashes are not reported by the police (VTI, 2014). The hospital reports are from persons seeking emergency hospital care after a road traffic crash, without necessarily being hospitalized. The hospital records include detailed information on a person's medical condition and contain information on the position and severity of each injury (VTI, 2014). Injury severity measures include the Abbreviated Injury Scale (AIS), the Maximum Abbreviated Injury Scale (MAIS) (AAAM, 2005), and ICD-10 diagnoses for individual injuries. The definition of the crash type normally describes the pre-crash travel direction of the vehicles rather than the direction of impact force (i.e., a head-on crash can involve a frontal-side impact).

The EuroQoL-5D (EQ-5D) was used to evaluate HRQoL. EQ-5D is a generic self-administered HRQoL measurement developed by the EuroQoL group. It is used in a variety of ways including providing evidence of medical effectiveness of drugs, in economic studies, and in population health surveys (Rabin and de Charro, 2001). The EQ-5D consists of two parts. Part 1 a descriptive system that comprises five dimensions – mobility, self-care, usual activities, pain/discomfort and anxiety/depression – that are assessed with three degrees of severity (1 = no problems, 2 = some problems, 3 = extreme problems). In Part 2 – the EQ VAS – the respondent's self-rated health is rated from 0 to 100 on a vertical, visual analogue scale (VAS), anchored by worst and best imaginable health state. In this study, only the first part of the EQ-5D was used to describe loss of HRQoL. The EQ-5D has previously been validated for injuries (Öster et al., 2009; Hung et al., 2015) and has also for example been used to evaluate HRQoL after major trauma (Ulvik et al., 2008), polytrauma (Gross et al., 2010), and general

**Table 1**  
Injured body region and injury severity of final sample after randomized stratified sample.

Body region	MAIS			Total
	1	2	3+	
Head	200	200	200	600
Cervical spine	200	200	104	504
Face	200	200	55	455
Upper extremities	200	200	67	467
Lower extremities and pelvis	200	200	200	600
Thorax	200	200	200	600
Thoracic spine	200	200	51	451
Abdomen	26	125	77	228
Lumbar spine	200	200	44	444
External	200	200	12	412
Total	1826	1925	1010	4761

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