# Injuries Leading to Permanent Medical Impairment among Road Users Groups

Helena Stigson, Anders Kullgren

***Abstract*** As road traffic fatalities decline in Europe, attention shifts to long-term consequences. Few stakeholders can measure and track long-term consequences over time. There are measures to predict long-term consequences, such as risk for Permanent Medical Impairment (PMI) and the predicted Functional Capacity Index (pFCI). The aim was to map distribution and severity of injuries resulting in PMI for road user groups, injury types and body regions. A further aim was to compare mean PMI with AIS2015 and pFCI. Injuries resulting in PMI year 2000-2022 (n=14,932) and reported to Folksam Insurance Group were used. Injured car occupants, motorcyclists, moped riders, pedestrians and bicyclists coded according to AIS2015 were included. Cervical spine and extremity injuries account for most PMI, while head injuries resulted in the highest average impairment. Most injuries leading to PMI had low AIS level. A weak correspondence between pFCI and PMI was found, highlighting the need for improving indicators such as pFCI to better mirror long-term consequences and their impact. Most injuries resulting in PMI corresponded to a low risk of long-term consequences according to pFCI. The results of this could be used to improve pFCI, which would support more effective prevention strategies aligned with Vision Zero.

***Keywords*** AIS; Long-term consequences; Permanent medical impairment; pFCI Traffic injuries;

## I. INTRODUCTION

Over the past decades, substantial improvements in road infrastructure and vehicle safety have led to notable reductions in traffic fatalities across many high-income countries [1]. In Europe, fatality numbers have decreased steadily, prompting a shift in focus toward the broader and more complex burden of non-fatal injuries [2]. While fatalities are well documented and routinely monitored, the long-term health consequences of injuries remain insufficiently understood. This lack of knowledge partly stems from the limited ability of most stakeholders to follow injured individuals over time using conventional data sources such as police reports or hospital records. These sources typically capture the immediate outcome of a crash but rarely provide insight into persistent functional limitations or permanent impairment.

Permanent medical impairment (PMI) [4,9] has therefore emerged as a valuable measure for assessing long-term consequences of road traffic injuries. Previous research has shown that injuries classified as minor or moderate according to the Abbreviated Injury Scale (AIS) [3] can still carry substantial long-term consequences [4]. For instance, cervical spine injuries and injuries to the extremities—common among car occupants, cyclists, and pedestrians—frequently result in persistent symptoms affecting daily activities. Importantly, approximately 10% of all AIS 1 injuries lead to PMI, underscoring the limitations of severity measures based solely on threat-to-life scales. To cover injuries leading to long-term consequences, PMI is used in Sweden as the definition of a serious injury. This is important in the Vision-Zero approach where injuries leading to fatality or serious injury should be avoided. Vision Zero has defined a serious injury as an injury with a long-term consequence [5].

Recent studies have further highlighted the broad health burden associated with PMI. Stigson *et al.* [6] demonstrated that 85% of individuals with PMI continued to experience symptoms 8–18 years after the crash, reporting reduced health-related quality of life and substantial decreases in physical activity. These findings underscore that the long-term consequences of traffic injuries are both widespread and enduring, affecting not only physical function but also psychological wellbeing and overall health status. Moreover, long-term consequences differ across road user groups, injury types, and demographic categories, yet current scales rarely

H.Stigson (email: helena.stigson@folksam.se; tel: +46 70-831 62 04) is a Senior Researcher and A. Kullgren is Head of Research at Folksam Insurance Group, Sweden. Both are also affiliated to Chalmers University of Technology and Karolinska Institutet, Sweden.

capture these variations in sufficient detail.

Another scale, the Functional Capacity Index (FCI) was developed to predict the outcome of the injury at one year post injury based on the AIS diagnosis [7]. A revised version has been introduced with predicted Functional Capacity Index (pFCI) values linked to the AIS-IDs in the AIS2015 codebook [3]. The intention of pFCI is to provide a widely accessible, injury-based prediction of 12-month functional outcomes without requiring long-term follow-up. However, evidence supporting its predictive validity has been limited. Palmer *et al.* [8] highlighted limitations in its ability to predict long-term consequences. It is crucial that measures developed and used to predict long-term consequences do mirror those road users sustaining injuries leading to long-term consequences.

Despite growing recognition of the importance of long-term outcomes, European road safety monitoring still primarily relies on fatality counts and in best case scenarios hospital reported injuries—metrics that do not adequately reflect the true burden of impairing injuries. Vision Zero and the Safe System approach emphasise preventing injuries that lead to unacceptable health loss, but progress toward this goal requires more comprehensive approaches to identifying and evaluating serious injuries. Because insurance data allow longitudinal follow up, they represent a unique opportunity to assess the full spectrum of injuries that result in PMI.

There is therefore a strong need for updated population-based evidence on the long-term consequences of road traffic injuries across different road user groups. Little is known about how injuries leading to PMI are distributed across age, sex, injury types and road user categories—information that is crucial for developing effective prevention strategies. To address these gaps, the present study aims to map distribution and severity of injuries resulting in PMI for road user groups, injury types and body regions. A further aim was to compare AIS2015 severity level, pFCI and PMI.

## II. METHODS

The study only includes injuries leading to PMI among different road users. Injury diagnoses not leading to PMI were not included in the analysis. In total 10,753 car occupants were included, as well as a random sample of motorcyclists and moped riders (n = 357). Pedestrians and bicyclists were included only if they were struck by a motor vehicle (n = 792). The analysis therefore comprises all injured car occupants and a subset of vulnerable road users who sustained injuries resulting in PMI during 2000–2022. Characteristics of injuries leading to PMI, both in general and by age, gender, injury type and injured body region divided into different road users were analysed. The material represents injuries leading to PMI reported to Folksam via a motor insurance (Folksam has approximately 20% market share of passenger cars in Sweden). The degree of PMI for each injury is assigned according to established coding guidelines following a follow-up period, typically of at least three years, to capture the long-term outcome after injury. The impairment ranges between 1 and 99% and may vary between individuals with the same diagnosis [10]. All injuries were classified according to the Abbreviated Injury Scale (AIS) 2015, and for each diagnose the AIS level and corresponding pFCI were registered. The AIS coding has been made by several people during the years of the database, and severe and/or complicated injuries have been coded in a consensus group including trained and certified staff in AIS coding. Analyses were made comparing average degree of PMI for combinations of AIS level and pFCI.

To study mean impairment and number of injuries leading to PMI for injury types and body regions, these were categorised in Head (skull/brain and face), Extremities (upper and lower extremities), Spine (cervical, thoracic and lumbar spine), Torso (thorax and abdomen) and Other (whole body and burns) and Injury types were categorised into Amputation (all limbs), Concussion, Contusion/laceration, Dislocation/rupture, Fracture, Intracranial injury (hematoma and DAI), Sprain/strain and Other (burns and injuries to ear, eye and teeth).

## III. RESULTS

In total 11,902 road users with 14,932 injuries leading to PMI were included, Table I. Injuries to car occupants represented the largest group (n = 13,354). The sex distribution was broadly similar overall, with 7,236 injuries to males and 7,682 injuries to females, although the composition varied across user categories. For example, motorcyclists were predominantly male, whereas pedestrian injuries demonstrated a more balanced distribution. The average age across all road users was 42.0 years, ranging from 1 to 97 years, with generally comparable age distributions between males and females within each group.

TABLE I
Characteristics of the included injuries, by road user groups.

| Road User | Bicyclist | Car occupant | Moped rider | Motorcycle rider | Pedestrian | All road users |
|---|---|---|---|---|---|---|
| **Number of injuries** | n | n | n | n | n | n |
| Total | 675 | 13,355 | 155 | 353 | 394 | 14,932 |
| Male | 320 | 6379 | 90 | 318 | 130 | 7237 |
| Female | 355 | 6964 | 65 | 35 | 263 | 7682 |
| Unknown gender | | 12 | | | 1 | 13 |
| ***Average Age*** | *years* | *years* | *years* | *years* | *years* | *years* |
| Total | 49,7 | 41,5 | 29,8 | 40,0 | 53,3 | 42,0 |
| Male | 49,5 | 41,1 | 31,5 | 40,0 | 51,2 | 41,5 |
| Female | 49,9 | 41,9 | 27,5 | 40,0 | 54,4 | 42,6 |
| ***Body Region*** | *n* | *n* | *n* | *n* | *n* | *n* |
| Head | 55 (8%) | 406 (3%) | 5 (3%) | 12 (3%) | 34 (9%) | 512 (3%) |
| Cervical Spine | 87 (13%) | 7805 (58%) | 9 (6%) | 22 (6%) | 26 (7%) | 7949 (53%) |
| Face | 22 (3%) | 217 (2%) | | 3 (1%) | 7 (2%) | 249 (2%) |
| Upper Extremities | 230 (34%) | 1533 (11%) | 61 (39%) | 157 (44%) | 84 (21%) | 2065 (14%) |
| Lower Extremities | 223 (33%) | 1612 (12%) | 71 (46%) | 124 (35%) | 215 (55%) | 2245 (15%) |
| Thorax | 5 (1%) | 174 (1%) | 2 (1%) | 3 (1%) | 1 (0%) | 185 (1%) |
| Thoracic Spine | 27 (4%) | 513 (4%) | 2 (1%) | 13 (4%) | 5 (1%) | 560 (4%) |
| Abdomen | 2 (0%) | 61 (0%) | 1 (1%) | 2 (1%) | 3 (1%) | 69 (0%) |
| Lumbar Spine | 19 (3%) | 918 (7%) | 3 (2%) | 15 (4%) | 9 (2%) | 964 (6%) |
| External | 1 (0%) | 10 (0%) | | | | 11 (0%) |
| Mental impairment | 4 (1%) | 106 (1%) | 1 (1%) | 2 (1%) | 10 (3%) | 123 (1%) |
| **AIS level** | *n* | *n* | *n* | *n* | *n* | *n* |
| AIS1 | 265 | 9535 | 40 | 89 | 102 | 10,031 |
| AIS2 | 325 | 2868 | 91 | 199 | 220 | 3703 |
| AIS3 | 67 | 673 | 22 | 50 | 54 | 866 |
| AIS4 | 8 | 134 | 1 | 10 | 8 | 161 |
| AIS5 | 6 | 39 | | 3 | | 48 |

The anatomical distribution of injuries also varied substantially between road user types. Cervical spine injuries were the most frequently recorded overall (n = 7,949), largely concentrated among car occupants. Cervical spine injuries accounted for 58% of all car occupant injuries. Injuries to the upper and lower extremities were most common for all road users except car occupants. Head injuries had the highest proportion for bicyclists and pedestrians. In contrast, thoracic and abdominal injuries were relatively uncommon. Injury severity assessed using AIS levels, showed that most injuries leading to PMI were AIS1 (n = 10,031, 67%) and AIS2 (n = 3,702, 25%). Only a small number of cases were AIS4 or AIS5 (n=209, 1,4%), Table I. Impairments related to mental disorders were documented for 123 road users. The highest proportion within each road-user category was observed among pedestrians, although the largest absolute number of cases occurred among car occupants.

The highest mean PMI was found to be skull/brain injuries among motorcycle riders (32.3%), Table II. Also, injuries to the spine had the highest mean PMI among motorcycle riders. The mean PMI for motorcycle riders was 6.2% in comparison with 4.6 for all road users. The lowest mean PMI was found for moped riders. Skull/brain was the body region with highest mean PMI, while Thorax had lowest mean PMI, Table II.

TABLE II
Average degree (%) of PMI for road user groups.

| Road user / body region | Bicyclist | Car occupant | Moped rider | Motorcycle | Pedestrian | Average for all road users |
|---|---|---|---|---|---|---|
| Skull/brain | 13.6 | 15.8 | 17.6 | 32.3 | 11.1 | 15.6 |
| Cervical Spine | 4.4 | 4.4 | 3.0 | 12.6 | 3.4 | 4.4 |
| Face | 3.5 | 5.7 | | 4.0 | 7.9 | 5.6 |
| Upper Extremities | 3.1 | 3.3 | 2.5 | 3.3 | 4.6 | 3.3 |
| Lower Extremities | 4.2 | 4.1 | 2.8 | 4.4 | 4.4 | 4.1 |
| Thorax | 2.4 | 2.5 | 3.0 | 4.7 | 1.0 | 2.5 |
| Thoracic Spine | 8.8 | 3.8 | 3.5 | 18.7 | 2.4 | 4.4 |
| Abdomen | 2.5 | 4.7 | 5.0 | 1.0 | 2.7 | 4.4 |
| Lumbar Spine | 3.2 | 4.1 | 1.7 | 12.7 | 3.7 | 4.2 |
| External | 3.0 | 4.3 | | | | 4.2 |
| Average for each road user | 4.7 | 4.5 | 3.1 | 6.2 | 5.0 | 4.6 |

Extremity injuries and injuries to the spine, particularly fractures and sprains/strains, stands for the largest proportion of cases overall (3,585 fractures and 8,820 sprains/strains), but were associated with relatively low mean impairment (3% to 4%), Table III. When summarised across body regions, the highest overall mean impairment was observed in the head category (12.3%), whereas torso injuries showed the lowest (3.0%). Contusions and lacerations to the spinal cord resulted in the highest mean impairment 35.8 % (range 1% - 99% (n = 128)).

TABLE III
Mean impairment percentage and number of injuries leading to PMI and divided into injury type and body regions

| Injury type / body regions | Head | Extremities | Spine | Torso | Other | All body regions |
|---|---|---|---|---|---|---|
| Amputation | | 12.1 (47) | | | | 12.1 (47) |
| Concussion | 5.0 (112) | | | | | 5.0 (112) |
| Contusion/laceration | 10.3 (158) | 2.7 (702) | 35.8 (135) | 3.3 (124) | 2.2 (5) | 7.6 (1117) |
| Dislocation / Rupture | 5.9 (8) | 4.0 (391) | 4.6 (109) | 8.5 (12) | | 4.3 (520) |
| Fracture | 6.4 (148) | 3.9 (2687) | 4.1 (899) | 2.2 (117) | | 4.0 (3851) |
| Intracranial injury | 22.9 (242) | | | | | 22.9 (242) |
| Sprain / strain | | 3.0 (483) | 3.9 (8337) | | | 3.9 (8820) |
| Other | 7.0 (93) | | | 5.0 (1) | 5.8 (6) | 6.9 (100) |
| All injury types | 12.3 (761) | 3.7(4310) | 4.4 (9473) | 3.0 (254) | 4.2 (11) | 4.6 (14809) |

In Table IV mean percentage of PMI can be seen for all injuries and for three body regions: spine, extremities and head (skull/brain and face). The mean percentage of PMI increased with higher AIS levels, e.g. for spine injuries the mean PMI increased from 3.9% at AIS1 to 79.5% at AIS5. A comparable pattern was observed for extremity injuries, where mean PMI ranged from 2.6–5.2% at AIS1 to 12.2–28.3% at AIS4. Injuries to the head showed consistently high impairment percentages at higher AIS levels, with mean PMI values of 32.2% at AIS 4 and 54.1% at AIS 5.

When examining pFCI levels, the expected inverse pattern was not reflected in the measures mean PMI. Although the pFCI scale ranges from 1 (worst possible state) to 5 (perfect state), several injuries with substantial permanent impairment were assigned a pFCI score of 5. This mismatch was most pronounced for head injuries, where mean PMI values associated with pFCI 5 ranged from 11.5 to 54.1%. The skull/brain injury types not correlating well were for AIS level 3; brain contusions, intracranial hematomas (epidural, subdural, subarachnoid or subpial), cerebral edema, and skull base fractures. For AIS level 4 they were intracranial hematoma, DAI, complex skull base fracture, and complex skull fracture. For AIS level 5 it was DAI with an average PMI of 58.4% (n=14).

Similar discrepancies were also present for spine and extremity injuries, where pFCI 5 corresponded to mean PMI values of 4.0% and 3.3%, respectively. Spine and extremity injuries at pFCI level of 5 accounted for 83% of all injuries. No major differences between male and female road users were found when studying corresponding information as in Table IV, except males that had a slightly higher mean PMI for head injuries compared to females.

TABLE IV
Number injuries and mean percentage of PMI for combinations of AIS and pFCI levels for all injuries and for injuries to the head, spine and extremities.

| **All injuries** | **AIS / pFCI** | **pFCI 1** | **pFCI 2** | **pFCI 3** | **pFCI 4** | **pFCI 5** | **Weighted average** |
|---|---|---|---|---|---|---|---|
| | AIS 1 | S | | 5.2 (62) | 3.1 (29) | 3.7 (9940) | 3.8 (10031) |
| | AIS 2 | | 7.3 (23) | 8.0 (31) | 4.1 (1069) | 4.1 (2579) | 4.2 (3702) |
| | AIS 3 | 36.8 (4) | 13.1 (48) | 7.8 (52) | 5.8 (121) | 7.9 (641) | 8.0 (866) |
| | AIS 4 | 55.8 (16) | 30.4 (47) | 17.2 (5) | | 28.5 (93) | 31.4 (161) |
| | AIS 5 | 69.6 (41) | | 2.0 (1) | | 6.2 (6) | 60.2 (48) |
| | AIS1-5 | 63.8 (61) | 18.9 (118) | 7.1 (151) | 4.3 (1219) | 4.2 (13260) | 4.6 (14809) |
| **Head** | **AIS / pFCI** | **pFCI 1** | **pFCI 2** | **pFCI 3** | **pFCI 4** | **pFCI 5** | **Weighted average** |
| | AIS1 | | | 5.2 (53) | | 3.8 (136) | 4.2 (189) |
| | AIS2 | | | 10.6 (14) | | 6.7 (269) | 6.9 (283) |
| | AIS3 | | 30.8 (4) | 8.4 (14) | | 15.8 (162) | 15.6 (180) |
| | AIS4 | 55.5 (2) | 39.6 (5) | 25.3 (3) | | 31.4 (83) | 32.2 (93) |
| | AIS5 | 54.1 (16) | | | | | 54.1 (16) |
| | AIS1-5 | 54.2 (18) | 35.7 (9) | 7.4 (84) | | 11.5 (650) | 12.3 (761) |
| **Spine** | **AIS / pFCI** | **pFCI 1** | **pFCI 2** | **pFCI 3** | **pFCI 4** | **pFCI 5** | **Weighted average** |
| | AIS1 | | | | | 3.9 (8389) | 3.9 (8389) |
| | AIS2 | | 18.2 (4) | | | 4.3 (870) | 4.3 (874) |
| | AIS3 | 42.3 (3) | 43.0 (2) | | 25.7 (3) | 5.9 (150) | 7.5 (158) |
| | AIS4 | 6.9 (10) | 54.6 (17) | | | | 59.1 (27) |
| | AIS5 | 79.5 (25) | | | | | 79.5 (25) |
| | AIS1-5 | 73.2 (38) | 47.3 (23) | | 25.7 (3) | 4.0 (9409) | 4.4 (9473) |
| **Extremities** | **AIS / pFCI** | **pFCI 1** | **pFCI 2** | **pFCI 3** | **pFCI 4** | **pFCI 5** | **Weighted average** |
| | AIS 1 | | | 5.2 (9) | 3.1 (29) | 2.6 (1319) | 2.6 (1357) |
| | AIS 2 | | 4.9 (19) | 5.9 (17) | 4.1 (1068) | 3.6 (1331) | 3.8 (2435) |
| | AIS 3 | | 10.0 (42) | 7.6 (38) | 5.2 (115) | 5.0 (294) | 5.7 (489) |
| | AIS 4 | 28.2 (4) | 12.2 (25) | | | | 14.4 (29) |
| | AIS1-5 | 28.2 (4) | 9.5 (86) | 6.8 (64) | 4.2 (1212) | 3.3 (2944) | 3.7 (4310) |

## IV. DISCUSSION

By leveraging insurance data covering more than 14,000 injuries leading to permanent medical impairment sustained by nearly 12,000 individuals across different road user groups, the study provides the most comprehensive overview to date of road traffic injuries resulting in PMI. The predominance of cervical spine injuries and extremity injuries is consistent with previous studies, where such injuries are frequent among car occupants, cyclists and pedestrians [6][4]. Previous studies have shown that even injuries classified as minor or moderate according to the Abbreviated Injury Scale (AIS) may result in long-lasting symptoms and functional limitations [4][9]. The present study confirms and extends those findings by demonstrating that the majority of injuries leading to PMI were indeed of AIS1 or AIS2 level, emphasising the limitations of threat-to-life scales when used to identify injuries leading to long-term consequences. Even if AIS1 neck injuries are excluded, the majority of injuries leading to PMI are of AIS1 or AIS2 levels.

Head injuries showed the highest mean impairment levels, in line with earlier studies of substantial long-term burden following traumatic brain injuries [6]. Spine-related impairment also followed expected patterns, with increasing PMI across increased AIS levels. Importantly, however, the predicted functional loss estimated by pFCI did not correspond well with PMI. Several injuries that resulted in substantial PMI were assigned a pFCI score of 5, particularly among head injuries at AIS levels 3 and 4. Furthermore, injuries to the spine and extremities accounted for 83% of all injuries leading to PMI. These findings suggest that pFCI, in its current form, does not appear to adequately reflect the functional consequences of the most common injury types in real-world crashes as 90% (13 259/14 809) of the injuries with PMI were classified as pFCI5 (perfect state).

More than 90% of all injuries leading to PMI were classified as “minor” or “moderate” (AIS1 or AIS2). In most countries these injuries are not covered in official road traffic injury statistics and preventive strategies. This highlights a substantial blind spot in tracking injuries over time, which largely rely on fatalities or police reported accidents/hospital admissions. Within Vision Zero and the Safe System approach injuries that result in permanent functional loss are considered unacceptable outcomes [5]. It is therefore important that injuries classified as AIS1 and AIS2 resulting in long-term consequences are considered when prioritising and developing preventive actions. Insurance-based follow-up therefore represents a valuable complement to traditional data sources, enabling more accurate identification of high-burden injury outcomes and target groups.

Clear differences were observed across road user categories. Not surprisingly motorcycle riders had the highest mean PMI, where injuries to skull/brain and spine showed the highest mean PMI. Motorcycle riders are relatively unprotected and are often exposed to hazardous situation. The lowest mean PMI was seen for moped riders. The speed is lower than for motorcycle riders and the injury severity is often low, which is seen in Table I and Table II. However, it should be noted that the moped riders were more than 10 years younger than any other group, which will influence the risk for long-term consequences.

A key strength of this study is the use of longitudinal insurance data, allowing follow-up until final impairment determination—typically three years post the crash. The consistent injury classification using AIS 2015 further enhances comparability across road user groups.

Limitations include incomplete case coverage: only car occupants are fully represented, whereas pedestrians and bicyclists are included solely when a motor vehicle was involved. As a consequence, the sample of pedestrians and bicyclists is skewed, and the average severity of these crashes would probably differ if also single-bicycle crashes would have been included.

The injury distribution would differ if all crashes for all road-user groups had been included. Because pedestrians and bicyclists were only included when a motor vehicle is involved, and only a subset of motorcyclists and moped riders were included, the dataset does not represent all injuries leading to PMI in these groups. As a result, these data should not be used to compare number of injuries among road user groups. In addition, the number of injuries is sensitive to coding practices and how injuries are defined and recorded, particularly in multi-impact scenarios.

Another notable aspect is that the percentage of PMI may vary across individuals with similar diagnoses due to personal factors not captured in the data, this may also apply across different road user groups. Given that all cases represent PMI (≥1%), differences in the exact grade of PMI are of limited relevance. Measures of central tendency (mean or median) are therefore not the primary focus of the present study. Instead, the key interest lies in how PMI is distributed and how it can be compared with other measures.

## V. CONCLUSION

Long-term consequences of road traffic injuries across a wide range of road user groups show that cervical spine and extremity injuries stand for the majority of injuries leading to PMI, while head injuries resulted in the highest average impairment percentages. Most injuries leading to PMI had low AIS levels, underscoring limitations of threat-to-life-based severity measures for identifying injuries resulting in long-term consequences. A weak correspondence between pFCI and PMI was found, that further highlights the need for improving indicators such as pFCI to better mirror long-term consequences and their impact. Most injuries resulting in PMI corresponded to a low risk of long-term consequences according to pFCI. The results of this could be used to improve pFCI, which would support more effective prevention strategies aligned with Vision Zero and the Safe System approach.

## VI. REFERENCES

[1] WHO (2026) European status report on road safety 2025 (WHO/EURO:2026-12950-52724-81866). Retrieved from https://iris.who.int/server/api/core/bitstreams/54e9f070-6fc9-46d1-b2a9-cd3c12f4fe10/content. Accessed 2026-03-31.

[2] Tingvall, C., Ifver, J., Krafft, M., Kullgren, A., Lie, A., Rizzi, M., . . . Strandroth, J. (2013) The Consequences of Adopting a MAIS 3 Injury Target for Road Safety in the EU, a Comparison with Targets Based on Fatalities and Long-term Consequences. Proceedings of the Int. IRCOBI Conf. on the Biomechanics of Injury, 2013, Gothenburg, Sweden.

[3] AAAM (2015) The Abbreviated Injury Scale 2015 update 2015, Association for the Advancement of Automotive Medicine, Des Plaines IL.

[4] Malm, S., Krafft, M., Kullgren, A., Ydenius, A., & Tingvall, C. (2008) Risk of permanent medical impairment (RPMI) in road traffic accidents. Annu Proc Assoc Adv Automot Med, 52, pp.93-100.

[5] Mooren L, Grzebieta R, Job S (2011) Safe System – Comparisons of this approach in Australia, Proceedings of the *Australasian College of Road Safety National Conference* - A SAFE SYSTEM – MAKING IT HAPPEN!, Melbourne, Australia.

[6] Stigson, H., Boström, M., & Kullgren, A. (2020) Health status and quality of life among road users with permanent medical impairment several years after the crash. Traffic Injury Prevention, 21(sup1), pp.43-48.

[7] Mackenzie EJ., Damiano A., Miller T., Luchter S. (1996) The development of the Functional Capacity Index. The Journal of Trauma Vol 41, No 5, pp.799-807

[8] Palmer, C. S., Gabbe, B. J., & Cameron, P. A. (2017) Revised Functional Capacity Index as a predictor of outcome following injury. *British Journal of Surgery, 104*(13), 1874-1883. doi:10.1002/bjs.10638

[9] Gustafsson, Stigson, H., M., Krafft, M., & Kullgren, A. (2015) Risk of Permanent Medical Impairment (RPMI) in Car Crashes Correlated to Age and Gender. Traffic Inj Prev, 16 pp.353-361

[10] SvenskFörsäkring (2023) *Medicinsk Invaliditet - skador (in Swedish only)*. Retrieved from Svensk Försäkring, Stockholm, Sweden: https://www.svenskforsakring.se/globalassets/medicinska-tabellverk/medicinska-tabellverk/medicinsk-invaliditet-skador-2023.pdf/, accessed 3/6 2026