

The weighting of non-fatal injuries

Overview

Since the 1990s the rail industry has used fatalities and weighted injuries (FWI) to assess risk and carry out cost benefit analysis. The figures of 10 major injuries or 200 minor injuries (based on the statutory definitions set out in the Railways (Notice of Accidents) Order 1986) were deemed to be statistically equivalent to one actual fatality. These ratios or weightings had been developed by British Rail in consultation with the Department of Transport who were using the same ratios at the time.

More recently, the Department for Transport (DfT) has started to use the values published in RIDDOR 95 (HSE 1995); while different injury weightings are used by London Underground (LUL) and by other railways across Europe. However the GB rail industry continues to use the definitions from the Railways Order 1986.

Previous work concluded that the injury to fatality ratios currently used have not been objectively justified, although they have delivered a basis for consistent decision making over time. This, research aimed to develop updated injury weightings for the UK rail industry, with more robust justification.

Aims

The aim of this work was to inform the RSSB safety decisions programme and

through that support the industry decision as to how to use the information generated. The specific objectives of this work were:

- 1) To determine and recommend the weightings (in relation to fatalities) for major and minor injuries for passenger, workers and members of the public
- 2) To provide a robust justification for the injury weightings recommended.
- 3) To assess the impact the new weightings would have on risk assessments, considering the effect on the industry risk profile of the industry and subsequent cost benefit analyses.

Findings

This work came to the following conclusions:

- The current primary breakdown of non-fatal rail injuries into major and minor injuries should be retained with no further subdivision of the major injury category. However, there is a case for subdividing the minor category into reportable minor injuries and non-reportable minors, as defined by RIDDOR 95.
- The equivalence ratio for major injuries should be maintained at its current level of 10 majors to 1 fatality.

- On the assumption that reportable minor injuries constitute 15% of all minors and that, in turn, one-fifth of reportable minor injuries are in fact of equivalent severity to the least severe of those non-fatal injuries classified as major, then the equivalence ratio for reportable minor injuries should be set in the region of 200 reportable minors to 1 fatality.
- Treating all non-reportable minor injuries as involving no more than minor cuts and bruises from which full recovery will be complete within a matter of days or weeks, then the equivalence ratio for non-reportable minor injuries should be set at 7000 non-reportable minors to 1 fatality.
- If a single equivalence ratio is required for all minor rail injuries (including reportables and non-reportables) then on the above assumptions concerning proportionate breakdowns, that ratio should be set at 1250 minors to 1 fatality.
- These changes would result in the predicted level of overall risk for the GB mainline railway of 182 FWI/year (as derived by version 5 of the Safety Risk Model) reducing by approximately 30% to 128 FWI/year.

Method

First, the research considered what was judged to be the most appropriate injury classification system available in the existing transport safety literature. The DfT eight point injury code classification, called the Galasko scale, is the only current scale with a broadly applicable breakdown of non-fatal physical injuries with relative valuation based on willingness to pay (WTP). For current purposes, there would be no point in considering any injury classification system for which such values do not exist or cannot easily be computed.

Second, the relative frequencies were estimated for those injury types in rail-

related accidents through the use of data collected from two systems:

- the Safety Management Information System (SMIS) - RSSB's database containing all safety related events that occur on Network Rail managed infrastructure
- the Trauma Audit and Research Network (TARN) - a national research group which collects anonymised injury data from subscribers who currently represent 50% of hospitals in England and Wales dealing with accident victims

By combining different subsets of those injuries, and weighting the values of each by their respective frequencies, various rail-related categories were constructed and 'injury to fatality' ratios were assigned to each of them.

Finally a supplementary empirical study was conducted, to provide information about the broad acceptability of the weights emerging from the main report. While the sample size was well below that considered to be required to draw statistically significant conclusions, the results are considered reasonably indicative of those which might be expected in a full scale survey.

Next Steps

This work informed the RSSB safety decisions programme and helped the industry to confirm its intended changes to the valuing of fatalities and weighted injuries. This decision and the basis for it are set out in the RSSB paper '[Proposals for the weighting of major and minor injuries](#)'.

The supplier of this work (Oxford Risk) offered the following recommendations for further work:

- 1) The rail industry, in cooperation with other interested agencies such as the DfT, should set in motion as soon as possible empirical work aimed at: a) developing an appropriate

classification and breakdown of non-fatal injuries (including their long-term effects) in the light of current medical knowledge; b) establishing WTP-based valuation relativities in relation to the prevention of a statistical fatality for the estimated breakdown of non-fatal injuries; and c) establishing reliable equivalence ratios for a finer breakdown of major and minor injuries than is feasible at present, given the limitations of currently available data.

- Industry response to the recommendation:

Given the evidence in the study, it is believed that such a wider empirical study would not result in weightings lower (higher monetary value per injury) than the weightings proposed. The proposed weightings are considered by both industry and the Office of Rail Regulation to provide a sensible balance between directed industry safety expenditure and the need to take reasonable account of non-reportable and shock/trauma incidents. Thus RSSB recommended that further refinement of the weightings via a further costly empirical study is not warranted at this time.

- 2) RSSB and the industry should consider the purpose and processes relating to the SMIS data base. If it is to provide a more comprehensive view of actual injuries and outcomes it will be necessary to change the way such information is collected and recorded. It may be necessary to follow up those taken to hospital, especially with major injuries, so that the actual injuries, and perhaps subsequent outcomes, can be used to update SMIS.

- Industry response to the recommendation:

The SMIS Programme Board and User Group are industry working

groups that exist to steer the development of SMIS. One of their objectives is to ensure that data collected is robust and meaningful, and that collection methods are appropriate. This is an ongoing process and will continue to improve.

- 3) RSSB should liaise with TARN to ensure its data is available for analysis in future. This data, which would still be a sample and subset of all injuries, should nevertheless add considerably to the quality of injury and outcome data available on rail incidents.

- Industry response to the recommendation:

This will be considered in light of the industry decision to adopt new injury ratios, and to review the accuracy of the revised values in 2012, in time for any adjustments to be effected for the regulatory Control Period 5 and Government's High Level Output Specification 2 from 2014

Contact

Head of Management Research
R&D Programme
Rail Safety and Standards Board
research@rssb.co.uk