

Highways Economics Note No. 1

2003 Valuation of the Benefits of
Prevention of Road Accidents and
Casualties

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Department for Transport



2003 Valuation of the Benefits of Prevention of Road Accidents and Casualties

1. This note gives the Department for Transport estimates of the values for prevention of road casualties and road accidents for use in the appraisal of road schemes. Based on 2003 road accident data, the estimates are given for 2003 at June 2003 prices and values. The note also explains the basis upon which the estimates are made.
2. Estimates of the total value of prevention of road casualties and road accidents in Great Britain are also given for 2003. These do not represent actual costs incurred as the result of road accidents. They are the cost-benefit values and represent the benefits which would be obtained by prevention of road accidents.

Benefits to Society Arising from Prevention of Road Accidents and Casualties

Casualties

3. Since 1993, the valuation of both fatal and non-fatal casualties has been based on a consistent willingness to pay (WTP) approach. This approach encompasses all aspects of the valuation of casualties including the human costs and the direct economic costs i.e. an amount to reflect the pain, grief and suffering and the lost output and medical costs associated with road accident injuries.
4. The methodology for non-fatal casualties was described in an article in Road Accidents Great Britain (RAGB) 1992, and a further article in RAGB 1994 gives updated information. More detailed descriptions of methods and the underlying research have been published by the Transport Research Laboratory. In particular, a summary account of the full methodology has been published (Hopkin and Simpson, 1995). Full references are to be found at the end of this note. RAGB 1997 contained an article describing the results of recent research on the value of prevention of a road accident fatality. The research showed that a figure in the range £750,000 to £1,250,000 in 1997 prices could be regarded as being broadly acceptable. The mid-point of this range has been adopted as the basis for the value of prevention of a fatality. A similar approach has been used to derive the values for serious and slight casualties which are pegged to the fatal value. The values, updated to 2003 prices, by severity of casualty and by class of road user, are set out in Tables 1 and 2 respectively.

5. The values for the prevention of fatal, serious and slight casualties include the following elements of cost:
 - loss of output due to injury. This is calculated as the present value of the expected loss of earnings plus any non-wage payments (national insurance contributions, etc.) paid by the employer.
 - ambulance costs and the costs of hospital treatment.
 - human costs, based on WTP values, which represent pain, grief and suffering to the casualty, relatives and friends, and, for fatal casualties, the intrinsic loss of enjoyment of life over and above the consumption of goods and services.

Accidents

6. It is to be noted that the value of prevention of an injury accident is greater than the value of the corresponding casualty e.g. value of preventing a fatal accident is greater than the value of a fatality for two reasons. The first is that an injury accident is classified according to the most severe casualty but will on average involve more than one casualty – for example in 2003, a fatal accident on average involved 1.8 fatalities, 0.39 serious casualties and 0.56 slight casualties. The second reason is that there are some costs which are part of the valuation of an injury accident but which are not specific to casualties. These are:
 - costs of damage to vehicles and property
 - costs of police and the administrative costs of accident insurance
7. Details of the derivation of these costs are available in a published Transport Research Laboratory Report (Simpson and O'Reilly, 1994).
8. In Tables 3 and 5 in Appendix 1, elements of value are shown grouped according to whether they relate specifically to casualties or to accidents. The casualty related values are lost output, medical and ambulance costs, and human costs. The costs of police and property damage are shown separately as accident related costs. The total value of prevention of an accident is the aggregate of both sets of values.
9. Tables 4a-c, and 6 show values by road type. In previous editions of Highways Economics Notes No. 1 (HEN1), the terms 'urban' and 'rural' roads have been defined according to speed limit with urban roads defined as those with speed limits of 40mph or less. In 2002 the headings were changed to built-up and non built-up, but the values are on exactly the same basis as before, using speed limits as the criterion. This change in terminology has been made for consistency with tables in Road Casualties Great Britain. Urban roads are now defined as major or minor roads within an urban area with a population of 10,000 or more, based on the 1991 Office of the Deputy Prime Minister definition of urban settlements. Rural roads are major and minor roads

outside urban areas. If values are required for urban and rural roads rather than built-up and non built-up they can be supplied on request.

10. The values to be used for injury accidents vary between built-up and non built-up roads and motorways because the average number of casualties per injury accident differs between categories of road (see Tables 4a, b and c). In addition, the cost of vehicle damage per accident varies by road category. For example, a serious accident on a non built-up road will on average involve 1.20 serious casualties, compared with 1.08 serious casualties on a built-up road, together with a greater amount of vehicle damage. Current practice is to calculate average values for prevention of accidents separately for built-up roads, non built-up roads and motorways.

Uprating of Values

11. For 2003, values have been updated using an index which reflects inflation and real per capita economic growth in the period June 2002 to June 2003. This is done by multiplying the 2002 values by a factor equal to:

$$1 + \frac{\% \text{ increase in nominal GDP per capita}}{100}$$

12. If values are required at June 2004 price and output levels (i.e. 2003 accidents at 2004 values) these should be calculated by adjusting the June 2003 figures given in the Appendix by the current estimates of the increase in nominal GDP per capita. For 2003–2004 the estimated Q2 per capita nominal GDP increase is 4.99%. Therefore values for June 2004 can be obtained by multiplying the estimates in Appendix 1 by 1.0499.
13. Whatever the base price level chosen, most appraisals involve forecasting values of the prevention of accidents in future years at that base price level. In this case future accident values can be derived at the selected price level by increasing the estimates by the expected long term GDP per capita growth rate, on the assumption that the real cost of each element of accident costs (such as labour costs, etc.) will rise in line with increases in output. The best working assumption to make at the moment is that GDP per capita growth will be 3.2% for 2004 and 2.6% for 2005, and these rates should be used to uprate for GDP growth alone.

Use of Accident and Casualty Values for Appraisal

14. The most appropriate accident or casualty value figures to use from Appendix 1 depends on the amount of information available for the scheme under review. Where large numbers of fatal, serious and slight accidents are known for the part of the network under consideration, then these may provide a reliable guide to the proportion of casualties of different severity to be expected in future. More usually, there is only

data for a small number of accidents on the part of the network which is being considered. Therefore, the observed severity mix cannot be expected to provide a reliable guide to the future severity mix. In this case, or where there is no breakdown by severity and only the total number of injury accidents is available, the average values for all injury accidents should be used. This is equivalent to assuming the national proportions of different severities.

15. A similar approach should be employed for valuation of casualties (average values by severity of casualty and by class of road user are provided in Tables 1 and 2). The variation between classes of road user is due to different proportions of each class suffering fatal, serious or slight injuries when involved in a road accident. There may be some over-estimation of average values of prevention per accident and per casualty due to under-reporting of less severe accidents. Variations between road user categories in the extent of under-reporting of less severe casualties would affect comparison of average values per casualty by class of road user.
16. In addition to values for prevention of injury accidents, estimates are provided for damage-only accidents. Since damage-only accidents are not comprehensively reported by the police, there may be no reliable information on their number. In these circumstances an estimate can be made of the value of prevention of accidents (including damage-only accidents) using an average accident value per injury accident (as in Tables 4a, b and c). These values include an allowance for damage-only accidents, which is calculated assuming an average of 17.7 damage-only accidents for every injury accident on built-up roads, 7.8 on non built-up roads and 7.6 on motorways.
17. Appendix 1 also includes tables (4b and 4c) showing average accident values by type of road in daylight hours and in darkness.
18. In appraising road proposals, using the COBA method, the accident rates and values given in the COBA Manual (Design Manual for Roads and Bridges, Volume 13, Section 1, Part 2, Chapters 3, 4 and 5), should be used. The valuation of accidents given in the COBA Manual differs from the values shown in this note in three respects:
 1. COBA values are expressed in a 1998 price base, rather than the 2003 price base here.
 2. In COBA, severity splits are averaged over three to five years; and
 3. COBA uses a finer disaggregation of road categories and also details junctions separately.

The Total Value of Prevention of Road Accidents in Great Britain in 2003

19. In 2003, 3,247 fatal accidents, 28,913 serious accidents and 181,870 slight accidents were reported. In cost-benefit terms the value of prevention of these 214,030 injury accidents is estimated to have been £13,083m in 2003 prices and values. In addition, there were an estimated 3.2m damage-only accidents valued at a further £5,011m. The total value of prevention of all road accidents in 2003 was therefore estimated to have been £18,094m (see Appendix 1, tables 5 and 6).
20. The above relates to the total value to the community of the benefits of prevention of road accidents, although the incidence of costs will, of course, vary between groups of road users and also between road users and other members of society (i.e. some costs, such as lost output will not be borne exclusively by casualties themselves, since the taxation and social security systems will ensure that the burden of lost output will be shared by the population at large). Also, some elements of cost, (lost output, medical costs, police and damage costs), represent direct costs which will be incurred as the result of road accidents. However, human costs, as calculated using willingness to pay methods, represent the ex ante benefit of avoidance of risk of a road accident, rather than ex post values of the consequences of an accident. Consequently, Appendix 1 gives a breakdown of the total value of prevention of road accidents by severity and element of cost (table 5), and by severity and category of road (table 6), without attempting to allocate costs by responsibility or final incidence.

Further Information

21. This note is the twenty-sixth in a regular series of Highways Economic Notes on Valuation of Accidents. The note is usually updated annually. Values for base dates other than 2003 can be obtained as described in paragraphs 12 and 13. Further information on the use of accident or casualty values generally, may be sought by telephoning 020-7944-2034. More detailed information on the methodology for valuation of road accidents is available in the RAGB articles and research reports listed below. TRL reports are available from TRL Ltd, Crowthorne, Berkshire (telephone 01344 773131, e-mail: enquiries@trl.co.uk). Information on accident numbers and rates (rather than costs) may be obtained from two annual The Stationery Office/DfT publications, *Road Casualties Great Britain*, and *Transport Statistics Great Britain*. This and other recent Highways Economic Notes No.1 can be found on the Department's web site <http://www.dft.gov.uk>, under Road Safety/Economic Assessment.

References

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Health and Safety Executive Publications

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*Valuing Health and Safety Controls: Report on the Findings of the Roads VOSL
“Peg” Main Study* [Available from HSE see below]

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Appendix 1

The Valuation of the Benefits of Prevention of Road Accidents and Casualties in 2003 at June 2003 Prices¹

- Table 1** – Average values per casualty by severity and element of cost
- Table 2** – Average values per casualty, by class of road user
- Table 3** – Average values per accident, by severity of accident and element of cost
- Table 4a** – Average values per accident by severity of accident and class of road: all hours
- Table 4b** – Average values per accident by severity of accident and class of road: daylight hours
- Table 4c** – Average values per accident by severity of accident and class of road: hours of darkness
- Table 5** – Total value of prevention of accidents by severity of accident and element of cost
- Table 6** – Total value of prevention of accidents by severity of accident and class of road
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¹ Note that because some elements of accident values are not quantified, total accident values may be regarded as minimum estimates

Table 1: Average value of prevention per casualty by severity and element of cost				
2003				£ June 2003
Injury severity	Lost output	Medical and ambulance	Human costs	TOTAL
Fatal	451,110	770	860,380	1,312,260
Serious	17,380	10,530	119,550	147,460
Slight	1,840	780	8,750	11,370
Average, all casualties	9,060	1,910	31,880	42,850

Table 2: Average value of prevention per road casualty by class of road user¹

2003	£ June 2003
Pedestrian	65,790
Pedal cyclist	38,430
Bus and coach occupants	20,290
Goods vehicle occupants	41,260
Car and taxi occupants	34,800
Motorised two-wheeler riders and passengers	76,310
All motor vehicle users	37,300
Average, all road users	42,860

¹ Note that the variation in value between classes of road user is due to differences in proportions of fatal, serious and slight casualties among each class of road user.

Table 3: Average value of prevention per accident by severity and element of cost

2003	Cost Element						£ June 2003
Accident severity	Casualty related costs			Accident related costs			TOTAL
	Lost output	Medical and ambulance	Human costs	Police cost	Insurance and admin	Damage to property	
Fatal	495,240	5,410	981,460	1,530	240	9,030	1,492,910
Serious	20,250	12,130	137,680	210	150	4,110	174,530
Slight	2,430	1,030	11,540	50	90	2,410	17,550
All injury	12,310	2,590	43,290	90	100	2,740	61,120
Damage only	–	–	–	3	50	1,520	1,570

Table 4a: Average value of prevention per accident by severity and class of road: all hours

2003	Road Class			£ June 2003
Accident severity	Built-up ¹	Non Built-up ²	Motorway	All
Fatal	1,422,080	1,532,040	1,630,430	1,492,910
Serious	166,340	189,310	195,150	174,520
Slight	16,560	19,710	23,500	17,540
All injury	44,770	102,690	76,580	61,120
Damage only	1,470	2,170	2,080	1,570
Average cost per injury accident including an allowance for damage on accidents	72,720	119,580	92,420	84,540

¹ Built-up roads are those roads other than motorways with speed limits of 40mph or less
² Non Built-up roads are those roads other than motorways with speed limits greater than 40mph

Table 4b: Average value of prevention per accident by severity and class of road: daylight hours				
2003	Road Class			£ June 2003
Accident severity	Built-up¹	Non Built-up²	Motorway	All
Fatal	1,378,730	1,528,440	1,647,210	1,475,370
Serious	163,230	186,360	195,800	171,800
Slight	16,440	19,690	23,490	17,430
All injury	41,610	93,560	62,990	54,630
Damage only	1,470	2,170	2,080	1,560
Average cost per injury accident including an allowance for damage on accidents	67,570	110,460	78,830	78,060

1 Built-up roads are those roads other than motorways with speed limits of 40mph or less
 2 Non Built-up roads are those roads other than motorways with speed limits greater than 40mph

Table 4c: Average value of prevention per accident by severity and class of road: hours of darkness				
2003	Road Class			£ June 2003
Accident severity	Built-up¹	Non Built-up²	Motorway	All
Fatal	1,478,230	1,538,020	1,616,640	1,518,160
Serious	172,360	196,020	194,020	180,040
Slight	16,930	19,740	23,550	17,840
All injury	60,580	126,650	108,520	78,360
Damage only	1,420	2,120	2,040	1,520
Average cost per injury accident including an allowance for damage on accidents	85,750	143,200	124,020	101,060

1 Built-up roads are those roads other than motorways with speed limits of 40mph or less
 2 Non Built-up roads are those roads other than motorways with speed limits greater than 40mph

Table 5: Total¹ value of prevention of accidents by severity and element of cost

2003		Cost Element					£ million June 2003
Accident severity	Casualty related costs			Accident related costs			TOTAL
	Lost output	Medical and ambulance	Human costs	Police costs	Insurance admin	Damage to property	
Fatal	1,610	20	3,190	5	1	30	4,850
Serious	590	350	3,980	6	4	120	5,050
Slight	440	190	2,100	8	20	440	3,190
All injury	2,630	560	9,270	20	20	590	13,090
Damage only	–	–	–	9	140	4,860	5,010
All accidents	2,630	560	9,270	30	160	5,450	18,100

¹ Note that totals may not equal the sum of their elements due to rounding

Table 6: Total¹ value of prevention of accidents by severity and class of road

2003		Road Class			£ million June 2003
Accident severity	Built-up ²	Non Built-up ³	Motorway	All	
Fatal	1,880	2,670	300	4,850	
Serious	3,140	1,720	190	5,050	
Slight	2,230	780	180	3,190	
All injury	7,250	5,160	670	13,080	
Damage only	4,020	850	140	5,010	
All accidents	11,270	6,010	810	18,100	

¹ Note that totals may not equal the sum of their elements due to rounding

² Built-up roads are those roads other than motorways with speed limits of 40mph or less

³ Non Built-up roads are those roads other than motorways with speed limits greater than 40mph