



Valuation of benefits of health and safety control: Follow-up study

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Valuation of benefits of health and safety control: Follow-up study

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This report summarises the findings of a follow-up study to the HSE/DETR/Home Office/HM Treasury Project 'relativities' study (HSE CRR 273/2000), which sought to elicit public preferences for preventing fatalities in several hazard contexts (railway/road accidents and public/home fires).

The very public debate in the media and elsewhere regarding the organisation of rail safety following the Ladbroke grove rail accident in October 1999 prompted the HSE to commission the follow-up study reported here. Of particular interest was the effect of this tragedy upon people's perceptions of rail hazards and how this might feed through into their preferences for safety prioritisation. Such findings are considered useful in and of themselves in relation to understanding the impact on public preferences of social amplification of risk processes following a major disaster.

The follow-up study was carried out solely in the London commuter area with a view to including a large number of rail users. It was felt that a combination of the timing of data collection (after Ladbroke Grove) and the sample composition (London commuter belt) might well yield a significantly higher rail/roads value-for-preventing-a-fatality ratio

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VALUATION OF BENEFITS OF HEALTH AND SAFETY CONTROL: FOLLOW-UP STUDY

1 OVERVIEW

This report summarises the findings of a follow-up study to the HSE/ DETR/Home Office/HM Treasury Project "relativities" main study, the latter having been carried out during October and November 1998 (see Beattie *et al.*, 2000). The main aim of the 1998 study was to estimate the ratios of the values of preventing statistical fatalities (VPFs) for three hazard contexts (railway accidents, domestic fires, and fires in public places) relative to the roads VPF estimated in the earlier "peg" main study (also Beattie *et al.*, 2000). Moreover, we were interested in exploring the extent to which the kinds of 'psychometric' dimensions that psychological research has identified as feeding into people's perceptions of risks (e.g., the *voluntariness* of the risk, the degree of *personal control* or *responsibility* – see Slovic *et al.*, 1980) carry over into a desire for different values to be placed on preventing deaths in different contexts.

Somewhat surprisingly, and in marked contrast to our earlier findings concerning the valuation of Underground safety (Jones-Lee & Loomes, 1995), this "relativities" main study yielded a rail/roads VPF ratio of between 0.80 and 0.83, entailing a rail VPF that stands at a *discount* of some 20% relative to its roads counterpart.¹ At face value, these results have fairly large implications for present risk regulation practice if the latter is to take any account of the preferences of members of the public.

Our findings reflected a number of considerations. Roads were generally given a higher priority because of the high annual baseline number of deaths. Conversely, rail safety was seen as lower in priority because of the low personal and household exposure (around a third of the sample had not travelled at all by rail in the previous 12 months), and the relatively low number of rail deaths per annum. At the time of conducting the survey, people expressed the view that this sector was already very safe, being generally well regulated – as testified by the low number of rail deaths and actual accidents. Consequently, rail was perceived not to be in need of such urgent attention, at least compared to the other areas of risk regulation studied.

Another contributory factor may have been a phenomenon labelled by Freudenburg (1992) as the 'atrophy of vigilance'. That is, given that the main study was carried out some 10 years after the Clapham Rail crash (in which 35 people died) and one year after the Southall accident (in which there were 7 fatalities), for most respondents rail safety was unlikely to have been a particularly salient consideration. This effect may have been reinforced by the fact that our original sample, designed as it was to reflect broad travel patterns across the country as a whole, involved only a minority of regular rail users.

The very public debate in the media and elsewhere regarding the organisation of rail safety following the Ladbroke Grove rail accident in October 1999 (in which there were 29 passenger fatalities) prompted the HSE to commission the follow-up study reported here. Of particular interest was the effect of this tragedy upon people's perceptions of rail hazards and how this might feed through into their preferences for safety prioritisation. Such findings were considered useful in and of themselves in relation to our understanding of the impact upon

¹ However, it should be noted that if the data reported in Jones-Lee and Loomes (1995) are analysed according to our now – preferred procedure – see Beattie *et al.* (2000) – then the Underground/roads VPF ratio comes somewhat closer to the rail/roads ratio found in the 1998 main study, though it is still in excess of 1.0

public preferences of 'social amplification of risk' processes following a major disaster (Kasperson *et al.*, 1988).

It should be noted, however, that it was not intended for this follow-up study to be a strict replication of the 1998 main study, the main difference being that, in contrast to the main study – where samples were drawn from Bangor, Brighton, Newcastle, and York – it was decided to carry out the follow-up study solely in the London commuter area, with a view to including a larger proportion of individuals who are regular rail users. Our hypothesis was that the combination of the timing of data collection (i.e., after the Ladbroke Grove accident) and the sample composition (i.e., London commuter belt sample with a higher proportion of rail users) might well yield a significantly higher rail/roads VPF ratio - possibly with the rail VPF standing as a *premium* rather than a *discount* relative to its roads counterpart.

If such a follow-up study were to generate findings that differed significantly from those obtained in the 1998 main study then it would, of course, raise difficult policy questions (not least being which set of results and whose preferences to use as a basis for long-run safety expenditure decisions). From a scientific perspective, however, it seemed particularly important in the context of the increasing use of willingness-to-pay based values of public safety in allocative and regulatory decision making to establish the *facts*. A summary of the main findings and conclusions of the follow-up study can be found at Section 6.

2 SAMPLE

The follow-up study was carried out between 28 January and 7 February 2000, i.e. just over 3 months after the Ladbroke Grove accident. It involved a quota sample of 150 drawn from Reading (N=50), Guildford (N=60) and St Albans (N=40). Full details of the sample recruited and how it compares to the main study sample are provided in Appendix A. The sample was selected by a professional market research organisation (Wilson Research and Consultancy) on the basis of gender, age, social class and rail use quotas specified by the research team.²

In summary, there were no statistically significant differences in the age, sex, occupational classification, or car mileage distributions between the present study sample and either the proposed quota or the main study. Notably, however, significant differences were found in the household income and rail mileage distributions. Firstly, a higher percentage of respondents reported household incomes over £20,000 per annum (67.0% vs. 40.8%). This finding is as expected given that the sample was recruited from the London commuter belt. Secondly, twice as many respondents reported that they were travelling more than 20 miles per week by train (29.2% vs. 14.6%) with nearly four times as many travelling more than 100 miles per week (19.7% vs. 5.4%).

3 PROCEDURE

The procedure replicated as far as possible that used in the 1998 main study. In summary:

- Respondents (recruited into groups of 4-5 participants) were introduced to the aims of the project and the four hazard contexts: car accidents, domestic fires, railway accidents and fires in public places.

² The gender, age and social class quotas were set to reflect national breakdowns for Great Britain, while the use quota required that at least 40% of respondents in each location should be regular rail users.

- Respondents rated their chances of dying from each of these hazards during the next 5-10 years compared to the average for the UK population.
- Respondents then discussed factors likely to increase/reduce the risks and were presented with a slide which summarised the main factors that were associated with above average risks in each context.
- The **four safety programmes** were then introduced, each of which was expected to cost the same amount of money and prevent 10 deaths over a 5-10 year period. Throughout the rest of this report the labels shown in brackets are used to refer to these safety programmes:
 - ROAD (RD): prevent 10 car driver/ passenger deaths
 - DOMESTIC FIRE (DF): prevent 10 deaths in domestic fires
 - RAILWAY (RL): prevent 10 rail passenger deaths
 - PUBLIC FIRE (PF): prevent 10 deaths in fires in public places
- Respondents were asked to react to the default “**argument for equality**” as shown below:

"The lives of all types of accident victims are equally valuable. If the programmes save the same number of lives for the same cost, they should be prioritised equally."
- Three “**arguments for prioritising**” were also raised for discussion based on the *scale* (number-event), *voluntariness* (choice), and *expert-knowledge* dimensions.
- Each respondent **completed two Safety Priorities Questionnaires (SPQs)**, each of which asked them to consider a pair of the safety programmes. For example, in the car accidents vs. domestic fires version they were asked to consider “A programme of ROAD SAFETY measures expected to prevent 10 car drivers and passengers being killed in road accidents” compared to “A programme of DOMESTIC FIRE SAFETY measures expected to prevent 10 people being killed by fires in their own homes”. On each page of the questionnaire respondents were presented with one of a number of arguments for or against choosing between the pair of safety programmes. The following nine dimensions were selected:
 - *scale*: the number of people killed in a single event
 - *personal-control*: how much personal control they have over the risks
 - *voluntariness*: how much choice they have over being exposed to the risks
 - *media-attention*: how much media attention the risks receive
 - *expert-knowledge*: how much experts know about the risks
 - *uneasiness*: how uneasy they feel about the risks
 - *household-benefit*: the benefits of the safety programmes to the respondents and their households
 - *number-per-year*: the number of deaths per year
 - *age-affected*: the ages of people affected

In each case, respondents were asked whether the pair of programmes differed on that dimension, and if so, whether this difference constituted an argument for giving one programme higher priority than the other. A respondent might say that there was no difference, or that there was a difference but that it did not constitute an argument for

prioritising, or that the difference was an argument for giving one programme priority – in which case, the respondent was asked to identify which programme this difference favoured.

- Having completed the two SPQs, respondents gave an overall **ranking of the four safety programmes**, followed by a discussion of the reasons for their priorities.
- Quantitative information about the strength of respondents' preferences in relative form was gathered using 'matching' questions involving a two-step **card-sorting** and **tables** procedure. The card-sorting exercise was used solely as a 'warm-up' after which respondents completed six **tables** (presented in a random order) comparing all six possible pairs of the four safety programmes: A) RD vs. DF; B) RD vs. RL; C) RD vs. PF, D) DF vs. RL; E) DF vs. PF; and F) PF vs. RL. Each table followed a similar format in that for each line except the middle one, the programme on the LEFT (e.g. road) prevented different numbers of deaths from the programme on the RIGHT (e.g. domestic fire). On each line respondents were instructed to put an L against cases where they would prefer that priority was given to the programme on the LEFT, R against cases for giving priority to the programme on the RIGHT, or H against cases where it was HARD TO CHOOSE. As in the main study, respondents completed one of two versions of the tables: referred to as the 'Top-R' and 'Top-L' versions. In both versions the numbers in the table were symmetrical around the middle line where both programmes prevented the same numbers of deaths; but in the 'Top-R' version, the lines in the top half favoured the programme on the RIGHT (e.g., LEFT - Prevent 10 car driver/passenger deaths vs. RIGHT - Prevent 11, 12, 15, 18, 20, 25, 30, 40, 50, 70 and 100 deaths in domestic fires) whereas the lines in the bottom half favoured the programme on the LEFT (e.g., LEFT - Prevent 11, 12, 15, 18, 20, 25, 30, 40, 50, 70 and 100 car driver/passenger deaths vs. RIGHT - Prevent 10 deaths in domestic fires); whereas in the 'Top-L' version, the lines in the top half favoured the programme on the LEFT and the lines in the bottom half favoured the programme on the RIGHT. Since the standardised instructions used by moderators asked respondents to start from the top of their tables, this manipulation allowed us to test for a 'starting point' effect: i.e., whether the fact that the top line in the 'Top-L' version favoured the programme on the left (e.g., LEFT - Prevent 100 car driver/passenger deaths vs. RIGHT - Prevent 10 deaths in domestic fires) caused responses to differ systematically from those elicited by the 'Top-R' version which favoured the programme on the right (e.g., LEFT - Prevent 10 car driver/passenger deaths vs. RIGHT - Prevent 100 deaths in domestic fires).
- The groups were concluded by eliciting general discussion surrounding 3 questions relating specifically to people's views in light of the Ladbroke Grove accident, with the aim of subjecting their comments to qualitative analysis:
 - A) *You may remember (or people in the group have already mentioned) the accident at Ladbroke Grove last October where 29 passengers died in a collision between two trains. Do you think that event changed your opinion of the current levels of safety on the railways, and if so how? If it didn't change your opinion, why?*
 - B) *Do you think your knowledge of the accident influenced the priority you personally gave to rail safety when ranking it in the exercise earlier?*
 - C) *Some people might have placed the railways as a low personal priority, compared to the other safety issues. On the other hand some people in Government and the Press are saying the railway industry (Railtrack, the Train Companies) should invest even more in safety following the Ladbroke Grove accident. What do you think about this?*

4 QUANTITATIVE RESULTS

For the purposes of this report the findings reported in this section will concentrate largely on the data relating to people's perceptions of rail hazards and their preferences for rail (vs. road) safety. Where appropriate, data from the present study are compared directly with the 1998 main study findings.

4.1 Comparative Risk Ratings

Table 1 shows how the respondents perceived their risk from each of the hazards relative to the rest of the UK population. Comparative data from the 1998 main study are also shown in italics.

Table 1
Comparative Risk Ratings (%)

	car accidents		domestic fires		railway accidents		fires in public places	
'below average'	30.7%	<i>23.1%</i>	62.0%	<i>61.5%</i>	54.0%	<i>74.6%</i>	39.3%	<i>28.5%</i>
'about average'	52.0%	<i>62.3%</i>	36.7%	<i>30.8%</i>	30.0%	<i>23.1%</i>	59.3%	<i>66.1%</i>
'above average'	17.3%	<i>14.6%</i>	1.3%	<i>7.7%</i>	16.0%	<i>2.3%</i>	1.3%	<i>5.4%</i>
$\chi^2(2)$, p=	2.77, 0.25		7.29, 0.026		19.4, 0.001		6.48, 0.04	

(Present Study | *Main Study*)

Statistically significant differences in the distributions of responses between the main and follow-up studies were found for all hazards apart from car accidents. For domestic fires and fires in public places, higher percentages of respondents rated themselves as 'about average' or 'below average' than 'above average'. For railway accidents, a lower percentage of respondents rated themselves as 'below average' risk (just over half rather than three-quarters), with higher percentages rating themselves as 'about average' and 'above average'. These differences can be most easily explained by the fact that the present sample was deliberately designed to include more respondents who were heavy or regular rail users. There does, however, appear to be some evidence of 'unrealistic optimism' in the sample (cf. Weinstein, 1989), given that although just over half the respondents rated themselves as 'below average', the median estimated annual rail mileage was slightly above that of the national average (see Appendix A).

4.2 Prioritisation of Safety Programmes

Table 2 summarises the respondents' rankings of the four safety programmes. Comparative data from the main study are also shown in italics.

Table 2
Prioritisation of Safety Programmes

	road		Public fire		domestic fire		railway	
first	69.3%	75.4%	24.7%	31.5%	18.0%	33.1%	43.3%	17.7%
second	11.3%	12.3%	26.7%	27.7%	18.7%	24.6%	20.0%	17.7%
third	14.0%	8.5%	30.0%	35.4%	28.0%	21.5%	22.7%	30.0%
fourth	5.3%	3.9%	18.7%	5.4%	35.3%	20.8%	14.0%	34.5%
$\chi^2(3), p=$	2.61, 0.46		11.7, 0.009		13.8, 0.003		28.8, 0.001	

(Present Study | *Main Study*)

The distributions of rankings were significantly different between the main and follow-up studies for all programmes apart from the road safety programme. The public fire and domestic fire programmes were shifted slightly *down* the rankings (from first to second, third and fourth places) whereas the railway programme was shifted *up* (from fourth and third to first and second). Notably, however, despite this shift in rankings the road safety programme was still put in first rank by more respondents than the railway programme.

4.3 Safety Priorities Questionnaires (SPQs)

Detailed analyses of the quantitative data to emerge from the SPQs are presented in Appendix B. Table 3 presents the overall picture, showing comparable data from the main study. In summary:

- *scale* (number-event): In line with the main study, a majority of responses (76.8%) agreed that the number killed in a single event differed across the pairs of contexts considered. In the main study, the most common judgement was that this difference was not an argument for priority. The respondents in the present study were slightly (but notably not significantly) more likely to endorse the difference as an argument for priority to the hazard they felt was more likely to kill a larger number of people in a single event (shown as 'priority SAME' in Table 3). This slightly stronger tendency for *scale* to be endorsed as an argument for priority may provide some explanation of why the railway programme has been shifted up the ranking in the present study. (As in the earlier study, railway accidents were typically perceived to kill a larger number of people in a single event than that other three hazards.)
- *personal-control*: Here very similar patterns have emerged between the SPQ data for the two studies. Hazards were differentiated on this dimension 78% of the time and in about two-thirds of these cases respondents endorsed the difference as an argument for priority to the hazard they felt they had less control over (again shown as 'priority SAME' in Table 3). (As in the earlier study, respondents typically felt they had least control over railway accidents and fires in public places, followed by car accidents, then domestic fires.)
- *voluntariness* (choice): In the present study, a slightly (but not significantly) higher percentage of responses (75.5%) judged *voluntariness* as a differentiating issue. Again, about two-thirds of those differentiating endorsed this as an argument for priority to the hazard where they felt they had less choice over exposure. (As in the earlier study, respondents typically felt they had least choice over their exposure to railway accidents, followed by public fires, then car accidents, then domestic fires.)

- *media-attention*: In the present study, hazards were differentiated on this dimension about 70% of the time. What is notable is that the difference was endorsed significantly more often as an argument for priority to the hazard they felt received more media attention (30% rather than 19.2%). Although the majority of respondents did *not* endorse *media attention* as a reason, this slightly stronger tendency may provide some explanation of why the railway programme has been shifted up the ranking in the present study. (As in the earlier study, railway accidents were typically perceived to receive most media attention and car accidents the least.)
- *expert-knowledge*: Here very similar patterns emerged between the SPQ data for the two studies. A clear majority of responses were in the 'don't know' or 'no difference' categories (57.7%). Where respondents did differentiate between the two contexts there was a clear majority (about two-thirds) endorsing the difference as an argument for priority to the hazard where there were more gaps in expert knowledge. (As in the earlier study, respondents typically felt there were most gaps for railway accidents, followed by public fires, then domestic fires and car accidents.)
- *uneasiness*: Here, only around 23% of responses fell into the 'don't know' or 'no difference' categories. Of the remainder, a majority of cases considered the difference as an argument for priority to the hazard they felt more uneasy about. Notably, this is one dimension on which it would appear that perceptions are different between the two studies, with relatively more *uneasiness* about the risks of railway accidents in the present study, providing another potential explanation of why this programme has been shifted up the ranking. (In the present study respondents typically felt *second* most uneasy about railway accidents (behind car accidents), whereas in the main study respondents felt *least* uneasy about this hazard.)
- *household-benefit*: In the present study it would appear that respondents were slightly (but not significantly) less likely to differentiate the hazards on this dimension (around 60% rather than 70%). However, as in the earlier study, in a majority of cases the difference was endorsed as an argument for priority to the hazard they felt their household would benefit more from. Notably there were no obvious differences in the programmes that respondents perceived they would benefit most from between the main and follow-up studies. (Respondents typically felt they would benefit most from the road programme, followed by the public fire and domestic fires programmes, and would benefit least from the rail programme.)
- *number-per-year*: In the present study significantly fewer respondents endorsed the view that the context with the higher baseline number of fatalities per year should be given priority (48.8% vs. 58.1%), providing another potential explanation of why the railway programme has been shifted up the ranking. (As in the earlier study, respondents were told that car accidents caused 1800 passenger and driver deaths per year, domestic fires 600, public fires 35, and railway accidents 15 - although respondents were asked to bear in mind that in 1999 there were an additional 29 passenger deaths over and above this figure in just one accident, the Ladbroke Grove Rail Crash).
- *age-affected*: Again, in line with the main study data, responses were fairly equivocal about the issue of age, with no clear-cut evidence whether or not age is a variable that people believe should matter in prioritisation.

In summary, the data from the SPQs offer a number of potential explanations for why respondents in the present study placed the railway programme relatively higher in their orders of priority:

- *scale* and *media attention* were endorsed slightly more often as arguments for priority;
- respondents were relatively more *uneasy* about the risks of railway accidents;
- slightly fewer respondents endorsed the view that a context with a higher baseline (*number-per-year*) should be given priority.

Further insights into the reasons for respondents' priorities are provided by the qualitative analyses of the focus group discussion reported in Section 5.

Table 3
SPQ Data - The Overall Picture

	DIFFERENCE TO EITHER CONTEXT						NO DIFFERENCE/ DON'T KNOW		χ^2 , p=
	priority SAME		not an argument		priority OTHER				
(larger) scale	119 (40.1%)	85 (33.1%)	94 (31.7%)	100 (38.9%)	15 (5.1%)	20 (7.8%)	69 (23.2%)	52 (20.2%)	6.09, 0.11
(less) personal-control	151 (51.0%)	120 (46.5%)	70 (23.6%)	65 (25.3%)	9 (3.0%)	15 (5.8%)	66 (22.3%)	58 (22.5%)	3.16, 0.37
(more) involuntary	149 (50.2%)	114 (44.5%)	65 (21.9%)	48 (18.8%)	10 (3.4%)	11 (4.3%)	73 (24.5%)	83 (32.4%)	4.89, 0.18
(more) media-attention	89 (30.0%)	50 (19.2%)	106 (35.7%)	110 (42.3%)	16 (5.4%)	11 (4.2%)	86 (29.0%)	89 (34.2%)	9.58, 0.02
(more gaps) expert-knowledge	84 (28.4%)	68 (26.5%)	37 (12.5%)	30 (11.7%)	4 (1.4%)	6 (2.3%)	171 (57.7%)	153 (59.5%)	1.07, 0.78
(more) uneasy	147 (49.5%)	138 (53.5%)	77 (25.9%)	66 (25.6%)	5 (1.7%)	4 (1.6%)	68 (22.9%)	50 (19.4%)	1.25, 0.74
(more) household-benefit	129 (43.9%)	119 (46.9%)	47 (16.1%)	52 (20.5%)	0	5 (2.0%)	117 (39.9%)	78 (30.7%)	4.92, 0.09
	Priority HIGH RISK		not an argument		priority LOW RISK				
(different) number-per-year	145 (48.8%)	150 (58.1%)	126 (42.4%)	95 (36.8%)	26 (8.8%)	13 (5.0%)			6.06, 0.048
	priority EITHER		not an argument						
(different) age-groups affected	139 (46.8%)	123 (47.5%)	158 (53.2%)	136 (52.5%)					0.03, 0.87

(Present Study | *Main Study*)

4.4 Relativity Values

As in the 1998 main study, the tables procedure was the primary source of quantitative data about the strength of respondents' preferences in relative form.

The irregularities apparent on recording the matching responses elicited from the tables are shown in Table 4. For comparison purposes, equivalent data from the main study are also shown in italics. Data for the present study are based on a total of 900 tables (N=150 respondents x 6 tables).

Table 4
Tables Procedural Problems

Type of Irregularity	Present Study	<i>Main Study</i>
L,R,Hs "out of place" • L, R or H choices on each line were out of sequence	5.0%	<i>5.8%</i>
"Unreadable" Table	2.9%	<i>2.8%</i>
Relativity "out of range" • L or R chosen on all lines	6.2%	<i>8.7%</i>
"Upturned" Table • Ls or Rs entered upside down	0.004%	<i>1.8%</i>
Empty Table • No Ls or Rs entered on the table	1.55%	<i>0</i>
Relativity values inconsistent with order of priority	8.2%	<i>8.5%</i>

It is clear from these data that there were similar percentages of "out of place", "unreadable" and "out of range" tables in both studies. However, although there were fewer "upturned" tables in the present study, there was a small percentage of "empty" tables (i.e., not completed at all). Clearly, a small minority of respondents skipped pages in their questionnaire booklets.

These procedural problems resulted in the exclusion of 13 of the 150 respondents' data: 8 (5.3%) from "unreadable" tables and 5 (3.3%) from "empty" tables. A further 2 respondents' data could not be used because the collated questionnaires were missing one of the six tables. In total 15 respondents' data (10%) were unusable. This is a slightly higher percentage than the 1998 main study where 11 out of 130 (8.5%) were excluded.

Finally, in 8.2% of tables the ratios of the VPFs that would be inferred from the matching responses were in the *opposite* direction from that predicted by the orders of priority for that pair of safety programmes indicated by the respondents' initial rankings. This is a very similar percentage to the earlier study.

Two methods were used to compute R_{Ci} ratios from the matching responses elicited, where R_{Ci} represents the value the i^{th} respondent assigns to a context C relative to the value assigned to their highest ranked context (i.e., each respondent's highest ranked context is always assigned a value of 1.0 and the lower ranked contexts are assigned values ≤ 1.0 .)

- *Direct Method:* The R_{Ci} ratios for each context were computed from the matching responses drawn *directly* from the three tables comparing the 1ST vs. 2ND, 1ST vs. 3RD and 1ST vs. 4TH ranked contexts. For example, consider an individual who gave RD top priority, DF second, RL third and PF fourth. Hence, R_{DFi} would be calculated from the matching responses from table A (RD vs. DF), R_{RLi} from table B (RD vs. RL) and R_{PFi} from table C (RD vs. PF). Suppose in table A the individual regards the prevention of 10 RD deaths as being as good as 20 DF deaths, in table B 10 RD deaths as being as good as 25 rail deaths, and in table C 10 RD deaths as being as good as 50 PF deaths. It follows that $R_{RDi}=1.0$, $R_{DFi}=10/20=0.50$, $R_{RLi}=10/25=0.40$, and $R_{PFi}=10/50=0.20$.
- *Chained Method:* The R_{Ci} ratios for each context were computed from matching responses which were inferred by *chaining* together the responses from the three tables comparing the 1ST vs. 2ND, 2ND vs. 3RD, and 3RD vs. 4TH ranked contexts. Taking the same individual again it would follow that R_{DFi} would be calculated from the matching responses from table A (RD vs. DF). However, under the chained method R_{RLi} would be calculated from table A (RD vs DF) and table D (DF vs RL), while R_{PFi} would be calculated from Table A (RD vs DF), table D (DF vs RL) and table F (RL vs PF). Suppose in table A the individual regards the prevention of 10 RD deaths as being as good as 20 DF deaths, in table D 10 DF deaths as being as good as 12 rail deaths, and in table F 10 RL deaths as being as good as 25 PF deaths. It then follows that $R_{RDi}=1.0$, $R_{DFi}=10/20=0.50$, $R_{RLi}=10/20 \times 10/12=0.42$, and $R_{PFi}=10/20 \times 10/12 \times 10/25=0.17$.

The latter two cases show how using the direct and chained methods to compute the R_{Ci} values may give rise to different answers if responses are not completely internally consistent. From Table 5 (in which V_{RD} , V_{RL} , V_{DF} and V_{PF} denote the VPFs for the four contexts) it can be seen that the mean R_{Ci} values estimated by the chained method are significantly lower than their directly estimated counterparts for all contexts apart from the roads. However, despite this lack of complete internal consistency, these differences result in the chained method producing relativities values (which are derived from the ratios between the *mean* R_{Ci} values) only between 0.046 and 0.055 lower than the direct method. Notably, similar differences were found in the main study. More detailed consistency checks on the data are presented in Appendix C.

Table 5
Mean (and Standard Error) R_{Ci} Values and Relativities Elicited for Each Context

	Present Study (N=135)			Main Study (N=119)		
	Direct	Chained	p value ^a	Direct	Chained	p value ^a
road (RD)	0.878 (0.021)	0.884 (0.027)	0.72	0.881 (0.023)	0.901 (0.020)	0.01
domestic fire (DF)	0.781 (0.025)	0.746 (0.027)	0.006	0.776 (0.027)	0.834 (0.022)	0.0007
rail (RL)	0.881 (0.019)	0.838 (0.022)	0.0001	0.705 (0.029)	0.751 (0.027)	0.003
public fire (PF)	0.843 (0.021)	0.805 (0.023)	0.002	0.811 (0.023)	0.832 (0.022)	0.058
RELATIVITIES						
V_{DF}/V_{RD}	0.890	0.844	n/a	0.926	0.881	n/a
V_{RL}/V_{RD}	1.003	0.948	n/a	0.834	0.800	n/a

V_{PF}/V_{RD}	0.960	0.911	n/a	0.923	0.921	n/a
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^aThe p-values reported are based on two-tailed t-tests of the hypothesis that the mean R_{Ci} ratios calculated using the chained and direct methods are different from one another

The larger percentage of regular rail users in the present study enabled us to divide the sample into two groups according to the respondents' reported annual rail mileage. Two sub-samples were formed, the first (“low rail users”) comprising of 42 respondents who had travelled 200 miles or less in the last 12 months (from whom data from 37 were usable), the second (“high rail users”) comprising 43 respondents who had travelled 1000 miles or more (42 usable).

Table 6 presents the mean R_{Ci} values for the road and railway contexts in these two sub-samples (all data are based on the values elicited using the direct method). Notably, whereas the mean R_{RD_i} value was significantly lower in the high rail-users sub-sample, the mean R_{RL_i} value was not significantly different. This is reflected by the relativity value being about 0.2 higher in the high rail-user sub-sample.

Table 6
Mean (and Standard Error) R_{Ci} Ratios Elicited by Low and High Rail Users for the Road and Rail Contexts

	Low rail-users £ 200 miles/yr (N=37)	High rail-users ³ 1000 miles/yr (N=42)	p value
road (RD)	0.912 (0.031)	0.790 (0.048)	0.041 ^a
rail (RL)	0.851 (0.037)	0.914 (0.030)	0.190 ^b
RELATIVITY			
V_{RL}/V_{RD}	0.933	1.157	n/a

^aThe p-value reported is based on a one-tailed t-test of the hypothesis that the mean R_{RD_i} ratio is lower in the high rail-use sub-sample

^bThe p-value reported is based on a one-tailed t-test of the hypothesis that the mean R_{RL_i} ratio is higher in the high rail-use sub-sample

5 QUALITATIVE RESULTS

As with the quantitative data, the analysis here will concentrate primarily upon a discussion of the ways in which the qualitative results help us to understand the present sample's preferences for the rail safety programme. For this reason we focus in particular upon an analysis of the reasons given for ranking the safety programmes and the free discussion of rail safety in the light of the Ladbroke Grove accident, introduced as a new task at the very end of the group protocol.

5.1 Reasons for Ranking the Four Safety Programmes

5.1.1 Preamble

An important part of the qualitative results arises from the analysis of reasons for particular rankings of the four safety programmes. It provides detailed contextual information, alongside the factors already highlighted in the SPQ analysis above, regarding the issues respondents view as important in forming their prioritisations.

To recap, following completion of the SPQs respondents were asked to rank the four safety programmes in terms of how they wished to see them prioritised against one another. Respondents could give a strict ranking (1 through to 4) but were free also to allocate equal priority to some or all of the programmes. In the event only 7% of respondents (11 out of 150) gave equal priority to all four programmes (compared to 8% in the main study). As shown in Table 2, the roads programme was typically ranked first by respondents (similar to the pattern found in the main study in 1998) while the railway programme was ranked first or second (a clear, and statistically significant, difference from the main study where rail was often ranked in 3rd or 4th position). Fires in public places and domestic fires seem to have been displaced in the current study from the higher rankings by this change in the preference for rail safety. As a first issue, therefore, we are interested in the reasons given for the significant change in the ranking of the rail programme.

On completion of the ranking task the moderator asked all respondents to say a few words about the reasons underlying their rankings. Respondents were free to give no reason, a single reason, or several reasons for their particular ranking of a programme. Transcribed tapes were available from all 30 groups, and hence the comments of all 150 participants in the present study are included in the analysis we present here.

The transcribed responses were systematically content analysed (see Weber, 1990) using the coding scheme developed previously for the main study. Where, in a very few instances, new categories were suggested by the data these were also included in the coding scheme. However, in large measure the scheme developed for the main study analysis was satisfactory for classifying the reasons in the present data. The codings for each of the four contexts are shown in Tables 7 – 10 respectively. In each table the left - most column gives the basic categories used, shown in lower case.

As discussed previously in the main study technical appendix, some of the basic coding categories represent bi-polar concepts. The most important of these are:

<i>low number of deaths</i>	versus	<i>high number of deaths</i>
<i>in control (of risk)</i>	versus	<i>no control</i>
<i>own choice (regarding exposure)</i>	versus	<i>no choice</i>
<i>has knowledge of risk</i>	versus	<i>no knowledge of risk</i>
<i>low personal exposure</i>	versus	<i>significant (or high) personal exposure</i>
<i>(risk is) other's responsibility</i>	versus	<i>own responsibility</i>

As in the main study analysis, the basic codings have been grouped under a set of higher order themes, shown in the tables in bold. Hence, referring to the codings for the domestic fire programme shown in Table 7 the three specific codings of *other's responsibility*, *own*

responsibility and *who causes accidents* have been grouped under the more general theme of **Responsibility/Blame**. It is encouraging that the broad themes used in this grouping are *common* both to all four contexts, and to both main and present studies, which implies some degree of theoretical generality in reasons people have advanced for preferences.

Frequencies (n) are given in the tables for the total number of respondents who mentioned this reason as a justification for a 'high' priority (ranked 1st or 2nd) or 'low' priority (ranked 3rd or 4th) respectively. These frequencies are also shown as percentages (%) of the total number of respondents (N) who gave a high or low rank to the particular programme. Referring to Table 7, for example, there were 9 respondents who mentioned *age of vulnerable* as a reason for placing the domestic fire programme in one of the top two rankings; representing 16% of the total of 55 respondents who ranked the domestic fire programme as a 'high' priority in the current study. To facilitate comparison between the two studies, the present study's frequencies and percentages (based upon the full overall sample of 150 respondents' comments analysed) are grouped in the left hand columns of each table, and the corresponding main study data (based upon a total of 118 respondents analysed) in the columns to the right.

5.1.2 Summary of Reasons for Ranking the Domestic Fire, Fires in Public Places, and Road Safety Programmes

Referring first to Tables 7, 8 and 9 it is notable how remarkably similar, for many of the codes, the pattern of percentages is between the present study and the main study. To illustrate this very briefly, consider each context in turn.

In Table 7 for the domestic fire safety programme, 22% of respondents in the present study who rank it as a 'low' priority do so because it is seen as one's *own responsibility* while 30% did so in the main study. Similarly the associated code *in (personal) control* of domestic fire risk is endorsed as a reason for a 'low' ranking by 27% (present study) and 16% (main study). The main reason for ranking domestic fires a 'high' priority is the *high number of deaths* at 13% (present study) and 19% (main study) respectively. The only notable difference between the codings in the two studies appears to be with the categories *family exposure* and *personal exposure*, which are cited a little less frequently in the present study than they were in the main study.

In Table 8 for the public fire safety programme, 14% (present study) and 17% (main study) of respondents select it as a 'high' priority because of *no control* while 23% (in both studies) select it as a 'low' priority because they viewed it as *properly regulated* already. In both studies the fact that public fire safety is out of your hands and *other's responsibility* is sometimes given as a reason for a 'high' and sometimes a 'low' ranking. It is also notable that fires in public places was the only one of the four contexts to elicit consistent comments, albeit not as a dominating reason, about people's *fear or dread* of meeting one's death in this particular way at 10% in both the present and main studies.

Table 7
Reasons Given for Rankings: Domestic Fire Safety Programme

REASONS GIVEN	Present Study				Main Study			
	'High' (1st or 2nd) Priority		'Low' (3rd or 4 th) Priority		'High' (1st or 2nd) Priority		'Low' (3rd or 4 th) Priority	
	n	%	n	%	n	%	n	%
Age								
age of vulnerable	9	16%	3	3%	6	9%	2	4%
Baseline Deaths								
high number of deaths	7	13%			13	19%	1	2%
Choice or Control								
in control	3	6%	26	27%	4	6%	8	16%
no control	2	4%	3	3%	3	4%		
own choice			4	4%	1	2%	3	6%
Dread								
fear or dread	2	4%	1	1%	2	3%	2	4%
Event Characteristics								
flats a problem			2	2%	1	2%		
Knowledge of Risk								
has knowledge of risk			2	2%	2	3%	2	4%
no knowledge of risk	5	9%	3	3%	3	4%	2	4%
media impact					2	3%		
personal experience	2	4%	1	1%			1	2%
Personal/Family Exposure								
sig family exposure	5	9%			11	16%		
sig pers exposure	1	2%	2	2%	7	10%	1	2%
Responsibility/Blame								
other's responsibility			3	3%				
own responsibility	2	4%	21	22%	5	7%	15	30%
who causes accidents	2	4%	2	2%	5	7%	5	10%
Safety Measures/Regulation								
efficacy of measures	2	4%	3	3%	5	7%	3	6%
need for improvement	1	2%			3	4%		
uncertainty/chance/luck			2	2%				
Societal Exposure								
number exposed	2	4%	2	2%	2	3%		
Miscellaneous								
affects the poor	1	2%	1	1%				
N (PARTICIPANTS) WHO SELECTED THESE RANKS	55		95		68		50	
	(Total = 150)				(Total = 118)			

Table 8
Reasons Given for Rankings: Public Fire Safety Programme

REASONS GIVEN	Present Study				Main Study			
	'High' (1st or 2nd) Priority		'Low' (3rd or 4th) Priority		'High' (1st or 2nd) Priority		'Low' (3rd or 4th) Priority	
	n	%	n	%	n	%	n	%
Age								
age of vulnerable	2	3%					1	2%
Baseline Deaths								
low number of deaths	1	1%	4	5%	2	3%	8	15%
Choice or Control								
in control	1	1%	1	1%	1	1%		
no control	11	14%	3	4%	12	17%	3	6%
own choice	1	1%	2	3%			1	2%
no choice					2	3%		
Dread								
fear or dread	8	10%	1	1%	7	10%	1	2%
no fear or dread	1	1%	3	4%				
Event Characteristics								
crowding/crowded places					2	3%	2	4%
panic	1	1%			2	3%		
scale	3	4%	3	4%	3	4%	1	2%
Knowledge of Risk								
have knowledge of risk			1	1%			1	2%
no knowledge of risk	5	6%			5	7%		
media impact	1	1%			1	1%	1	2%
personal experience	3	4%						
recent accident			1	1%	1	1%		
uncertainty/chance/luck	2	3%	2	3%	3	4%		
Personal/Family Exposure								
low personal exposure			1	1%			3	6%
sig family exposure	5	6%			1	1%		
sig pers exposure	2	3%	2	3%	3	4%	1	2%
Responsibility/Blame								
others' responsibility	10	13%	9	12%	7	10%	7	14%
own responsibility			1	1%				
public private	5	6%			7	10%	5	10%
who causes accidents					2	3%		
Safety Measures/Regulation								
danger/unsafe	5	6%						
efficacy of measures			3	4%	3	4%	2	4%
is properly regulated			17	23%	2	3%	11	23%
lot spent already							2	4%
Societal Exposure								
few accidents	1	1%	5	7%	1	1%		
number exposed	5	6%			3	4%	2	4%
N (PARTICIPANTS) WHO SELECTED THESE RANKS	77		73		70		48	
	(Total = 150)				(Total = 118)			

Turning to Table 9 for the road safety programme, 25% of the sample in the present study rank it as a 'high' priority because of the *high number of deaths* on the roads while 26% did so in the main study. Other reasons frequently given for ranking the road as a 'high' priority include *family exposure* at 17% (present study) and 12% (main study), *personal exposure* at 19% (present study) and 18% (main study), references to other people in the roads *who cause accidents* at 14% (present) and 18% (main study) and the related category of *no control* 11% (present) and 10% (main).

The very close similarities observed here between the pattern of principal percentages in the main and present studies for the two fire and road safety programmes are methodologically important for the following two reasons.

First, it was always a recognised limitation of the procedure used to gather this part of the qualitative data in the 1998 main study that a respondent would briefly give only one or at most two or three reasons for their ranking. This meant that since the set of reasons given for any context are widely varied, the frequencies of individuals citing a particular reason (e.g. *high number of deaths* for ranking road 'high') were still relatively small (in this example 27 people out of 106 respondents) in relation to the overall sample size, resulting in percentages always well under 50%. Accordingly, one might well argue that the particular pattern of reasons cited in any one context was overly subject to chance factors. However, we argued in the main study qualitative analysis that the most commonly cited categories, taken as a whole, did reflect a more widely held constellation of risk beliefs and perceptions attached to any particular context. For, if respondents were to be given the opportunity to express an extended set of reasons for their preferences, they would typically cite several of the common categories arising in the analysis (and, indeed, a few respondents did just this). The fact that the holistic pattern of percentages for these main categories is almost identical across main and present studies in these three contexts lends further credibility to such an interpretation.

Second, in conducting the present study we were primarily interested in any *changes* in the rankings and codings generated for the rail context between November 1998 and January 2000, and which might therefore be due to the impact of the Ladbroke Grove rail accident and/or the different sample employed (i.e. the inclusion of a higher percentage of regular rail users). The importance of any such changes that there are to the codings for the rail programme across the two studies (which we go on to discuss in the next section) can be evaluated against the fact that the holistic perceptions in the other three contexts appear to be inherently stable across the two studies. Under such circumstances, we can be more confident that in the case of rail we are picking up a true shift in public discourse and preferences in the codings shown in Table 10, rather than mere random variation within what appears on the surface to be a relatively small sample of respondents and frequencies.

Table 9
Reasons Given for Rankings: Road Safety Programme

REASONS GIVEN	Present Study				Main Study			
	'High' (1st or 2nd) Priority		'Low' (3rd or 4th) Priority		'High' (1st or 2nd) Priority		'Low' (3rd or 4th) Priority	
	n	%	n	%	n	%	n	%
Age								
age of vulnerable	6	5%			5	5%		
Baseline Deaths								
high number of deaths	30	25%			27	26%	1	8%
low percentage reduction			3	10%			1	8%
Benefits								
future hidden benefits	2	2%						
sig personal benefit	2	2%			2	2%		
Choice or Control								
in control	2	2%	5	17%	2	2%	2	17%
no control	13	11%	2	7%	11	10%	1	8%
own choice			1	3%	1	1%	1	8%
no choice	2	2%			2	2%		
Dread								
fear or dread	7	6%			2	2%		
Event Characteristics								
accident impacts other than death	2	2%						
crowding	2	2%			1	1%		
Knowledge of Risk								
direct experience					3	3%		
media impact					1	1%		
no knowledge of risk	3	2%			1	1%		
personal experience	4	3%						
recent accident					2	2%		
Personal/Family Exposure								
sig family exposure	21	17%			13	12%		
sig pers exposure	23	19%	1	3%	19	18%	1	8%
Responsibility/Blame								
others' responsibility	2	2%			2	2%		
own responsibility	3	2%	6	21%	4	4%	1	8%
who causes accidents	17	14%	3	10%	19	18%	2	16%
Safety Measures/Regulation								
danger/unsafe	2	2%						
efficacy of measures	5	4%	1	3%	6	6%	1	8%
is properly regulated	1	1%	2	7%			1	8%
uncertainty/chance/luck	1	1%			3	3%		
Societal Exposure								
high number accidents	2	2%			1	1%		
important problem	1	1%			2	2%		
increasing problem	3	2%	1	3%	4	4%		
number exposed	7	6%	1	3%	5	5%	1	8%
N (PARTICIPANTS) WHO SELECTED THESE RANKS	121		29		106		12	
	(Total = 150)				(Total = 118)			

5.1.3 Summary of Reasons for Ranking the Railway Safety Programme

Table 10 shows the reasons given for the various rankings of the railway safety programme. Before going on to consider differences between the present and 1998 main study it is worth first recapping on our conclusions from the main study regarding people's overall reasons for ranking the rail programme as a low priority.

In the main study conducted in November and December 1998, two thirds of respondents placed the rail programme in the bottom two priority rankings. There were three reasons commonly cited for this (shown in the two right-most columns in Table 10). First *the low number of deaths* (described to participants at that time as typically 15 passenger deaths per annum) was the most frequently cited reason for the group of respondents who gave a low priority. This was often contrasted explicitly with the much higher number of deaths on the roads or in fires in the home, and we interpreted this as signalling to respondents a low risk or adequate degree of safety. This interpretation is supported by the references made to *is properly regulated*, which was an unanticipated category in the 1998 main study. Again one can interpret 'properly regulated' as an inference drawn from the low number of deaths and accidents. Finally, many respondents mentioned *low exposure*; specifically, that either they or their families rarely used the train. The following example is from a respondent who used all three reasons in a single argument. Note also that this respondent is explicitly using the number of deaths per annum as a proxy for *risk*:

"The rail passengers is the one that I think I have been unfair on to a certain respect, because I don't travel by train nor does my family. But on saying that I look back at the pie charts and that is the lowest risk anyway. You know there is a lot less deaths, although equally everyone's life is valuable. On the rail side they are obviously taking a lot more precautions. Maybe that's already in hand and doesn't need as much money putting into it." (Main Study 1998, York Group 2, Female 2).

Comparing the 1998 data with that obtained from the present study, as noted above, the differences between the two sets of rankings are highly statistically significant, with just under two thirds of respondents placing the rail programme either first or second in priority in the present study compared to only one third in the main study (Table 2). Table 10 helps to explain the reasons for this difference where we see both similarities, but also some very clear differences, between the sets of reasons given in 2000 compared to those cited in 1998. We discuss the similarities first.

For respondents who ranked the rail programme as a 'low' priority in both studies, 25% in the main study and 24% in the present gave the *low number of deaths* as a reason. As noted above, in the main study it seemed to be the case that these respondents interpreted the low number of deaths as an indicator of low risk or adequate safety. A very similar line of reasoning is deployed by many of the respondents in the present study. For example:

"And number three I put as rail passenger deaths because the figures are so low. Even though I do use the trains a lot I think you are far more likely to be killed in a car accident or in a fire than you are on a train" (Present Study 2000, Reading Group 9, Female 4)

"I am thinking about the number of deaths it seems to be the priority. I do think that rail travel is safer, terrible things happen we know but they happen only the once, and by and large it is much safer" (Present Study 2000, Guildford Group 11, Male 2)

Table 10
Reasons Given for Rankings: Railway Safety Programme

REASONS GIVEN	Present Study				Main Study			
	'High' (1st or 2nd) Priority		'Low' (3rd or 4th) Priority		'High' (1st or 2nd) Priority		'Low' (3rd or 4th) Priority	
	n	%	n	%	n	%	n	%
Age								
age of vulnerable					1	3%	1	1%
Baseline Deaths								
high percentage reduction	3	3%			1	3%		
low number of deaths	2	2%	13	24%	2	5%	20	25%
Choice or Control								
in control	1	1%					3	4%
no control	15	16%	1	2%	4	11%	2	3%
own choice							1	1%
no choice	3	3%			2	5%		
Dread								
fear or dread	5	5%	1	2%				
no fear or dread			1	2%			3	4%
Event Characteristics								
crowding of passengers	6	6%	1	2%				
horrific accident	6	6%	3	5%				
scale	12	13%	3	5%			1	1%
Knowledge of Risk								
have knowledge of risk			1	2%			1	1%
media impact	7	7%	5	9%	1	3%	1	1%
personal experience			1	2%				
recent accident	13	14%	2	4%			1	1%
Personal/Family Exposure								
low family exposure			3	5%			4	5%
low personal exposure	3	3%	10	18%			14	18%
sig family exposure	4	4%					4	5%
sig pers exposure	16	17%	2	4%	1	3%	2	3%
Responsibility/Blame								
others' responsibility	16	17%	7	13%	7	18%	5	6%
privatisation			1	2%	2	5%	2	3%
public private	5	5%	1	2%	2	5%	4	5%
moral outrage	1	1%	3	5%				
who causes accidents					1	3%	2	3%
Safety Measures/Regulation								
cutting corners			1	2%	1	3%		
danger/unsafe	11	13%	1	2%				
efficacy of measures	2	2%	1	2%	1	3%	5	6%
is properly regulated			4	7%			11	14%
not properly regulated	2	2%	1	2%				
a lot spent already			1	2%			2	3%
not enough spent	2	2%	1	2%				
Societal Exposure								
few accidents			5	9%	2	5%	5	6%
increasing problem	1	1%			1	3%		
number exposed	3	3%	1	2%			2	3%

Table 10 cont...

REASONS GIVEN	Present Study				Main Study			
	'High' (1st or 2nd) Priority		'Low' (3rd or 4th) Priority		'High' (1st or 2nd) Priority		'Low' (3rd or 4th) Priority	
Misc								
discourage use of car	4	4%			2	5%	1	1%
N (PARTICIPANTS) WHO SELECTED THESE RANKS	95		55		38		80	
	(Total = 150)				(Total = 118)			

“And I have put rail passengers last actually, and that is given that there are fifteen people a year. Albeit that there is a great deal of media coverage. And to a degree they are safe” (Present Study 2000, St Albans Group 6, Male 1)

However the arguments above, while similar to those used in 1998, are not identical given that in the second and third quotations above the respondents qualify their judgements regarding the low number of deaths. The respondent from Guildford Group 11 does this by mentioning the severe impacts of a single (if rare) accident and that ‘*by and large* it is safer’ while the respondent from St Albans Group 6 states that “*to a degree* they are safe”. Inspection of the set of reasons given by this group of respondents (not reproduced in full here) suggests that several who ranked rail as ‘low’ priority in the present study expressed a similar degree of ambivalence or uncertainty, while still accepting that the overall risk was acceptable or low because of the small number of deaths. In clear contrast, in the main study the typical response regarding the low number of deaths was generally unequivocal regarding the safety of the railways in the UK, as illustrated in the quotation from York Group 2 reproduced above. This suggests a very subtle shift, even among those still ranking rail as a low priority in January/February 2000, in beliefs about current levels of rail safety.

A second striking similarity between the 1998 and 2000 data concerns beliefs about responsibility and control. For respondents who ranked the rail programme as a ‘high’ priority, 18% in the main study and 17% in the present study mentioned *other’s responsibility* as a reason for such a ranking. Indeed, in both studies it is the most frequently cited reason for according a high priority to rail, and is also often associated in the reasons given with comments about *lack of control* as a rail passenger (11% in the main study and 16% in the present study). For example:

“With the railways and that they can make sure all the emergency functions are working correctly. Because when you go on a train you put your life in somebody else’s hands, you have got no control at all” (Present Study 2000, Guildford Group 8, Male 2)

“They are out of your control the trains, as Lucy was saying you are relying upon somebody for getting you from A to B” (Present Study 2000, Reading Group 6, Female 2)

This corroborating evidence concerning the importance of responsibility and control are significant first because they are based upon a much larger number of participants (95) choosing rail as their first or second priority in the present study, compared to far fewer (38) in

the main study (making generalisations from the 1998 data difficult). Second, because they again mirror the results of the Jones-Lee and Loomes (1995) study for London Underground where both of these factors were endorsed as reasons for giving priority to Underground safety investment over road safety investment. It seems, therefore, that responsibility and control are particularly important for public services such as rail. Furthermore, because one has to place trust in the authorities to manage safety (also Slovic, 1993), an implicit duty of care is inherent to the linkage being made between other's responsibility and lack of control, as illustrated in the following two quotations:

“Number two the rail passengers. I think you sort of put your trust in the railways. And certain things has gone wrong which they can't help, but with reflection I think we deserve something especially when I travel on them which I do three times a week. I always travel peak times, it's always crowded, and there is no way that I could get out. If it all goes wrong you are all stuffed basically, and I don't feel there is any safety there at all” (Present Study 2000, Reading Group 6, Female 1)

“Railway I am putting my life in other people's hands to a certain extent, they owe a responsibility to me” (Present Study 2000, St Albans Group 3, Male1)

While it is clear that perceived lack of control is almost always associated with a 'high' ranking and never with a 'low' ranking, the issue of government or private sector responsibility can cut both ways. Some respondents in both main (6%) and present (13%) studies mentioned *other's responsibility* while nevertheless giving a 'low' ranking to the rail programme. In these cases, however, comments did not highlight issues around duty of care, but centred upon either the fact that safety was seen as something others had to sort out (so why should the individual user contribute further to safety), or that others were in charge of this and doing so adequately (in the main relativities study in particular). For example, the following respondents both ranked Rail as 'low' priority:

“Yes but also I agree with what a couple of the others said I actually do think it is up to them. They get enough blinking money from us, and instead of putting it in their back pocket they should be putting it into their company” (Present Study 2000, Guildford Group 11, Female 2)

“Well you do think that you are safe don't you as rail passengers, and in a public place. You think that's sorted don't you, you think the government and that sort of organisation will look after that for you” (Main Relativities Study 1998, York Group 2, Male 2).

This possible dual interpretation of 'responsibility' is also mirrored in the qualitative data for the public fire safety programme in Table 8. However, although *others' responsibility* can sometimes be associated with 'low' rankings, this should not detract from the fact that, on the evidence here, corporate or government responsibility for safety is endorsed by many participants in both the rail and public fires contexts as a very clear reason for according priority to that context – particularly so in the aftermath of a major accident (see below). One can also speculate that this reason would almost certainly dominate discourse if, hypothetically, an equivalent number of annual fatalities (e.g. 1800) were to be seen in both the rail and roads contexts.

The discussion turns now to the *differences* between the present and main studies in expressed reasons given for ranking the rail safety programme. As might have been expected given the composition of the two study samples, a far greater proportion cited *personal exposure* as a

clear reason for giving a 'high' priority to the rail programme in the present study (17%) compared to the main study (3%). On the other hand an equal percentage (18%) of the respondents who ranked rail 'low' in both the main study and the present study mentioned *low personal exposure*, while 5% in each study mentioned *low family exposure* as persuasive reasons for giving low priority to the rail programme. This latter finding is not surprising since a proportion of the sample in both studies still rarely travelled by train while most people in the two studies did travel by car. A consistent pattern therefore, confirmed by both the findings from the SPQ and analysis of the quantitative preferences of the high versus low rail users in the present study (see Table 6), is that personal and, where relevant, family exposure to risk is a highly important driver of people's safety preferences.

We had also predicted at the outset of the present study that the Ladbroke Grove rail accident, which had occurred some four months prior to conducting the present fieldwork, might also contribute to a distinctive shift in preferences (within this - South East commuter belt - sample in particular) independent of levels of actual rail use. Insofar as expressed reasons can be held to be related to any such change, the qualitative data appears to confirm this prediction in a number of ways. We have noted above a level of ambivalence in the comments of those respondents in the present study who were persuaded by the low number of deaths on the railways. Table 10 shows further important differences.

The first important difference concerns remarks associated with **Safety Measures or Regulation** which are shown towards the bottom of Table 10. While, as noted above, in the main study in 1998 we had been surprised by the number of references (14%), by those who had ranked rail as a 'low' priority, to *is properly regulated*, there were only half as many such comments made in the present study (7%). Conversely, of those who had ranked rail a 'high' priority in both studies, 12% in the present study made reference to *lack of safety or danger*, while there were *no* references at all to lack of safety during the main study. Compare, for example, the following quotes from the present study with that quoted earlier from the main study York Group 2.

"And practically in every incident it is a glaring weakness and I have given them priority, so I have got rail first" (Present Study 2000, St Albans Group 7, Male 2)

"Rail [first priority] is because of the accident last year I think, it shouldn't be happening those sort of things. I mean recently last week that engine fell out of that train just outside Basingstoke and I used to use that line a lot. So it shouldn't be happening so I definitely would like to see more money spent definitely" (Present Study 2000, Reading Group 7, Female 2)

"One railway to make it safer platforms bigger because it is a priority. I just think that the railways are the dangerous places especially the stations. So make the platforms wider more space for the people" (Present Study 2000, Guildford Group 6, Male 1)

This pattern is reinforced by: (a) the fact that of the 'high' priority respondents 5% remarked that they feared travelling by train in the present study while again *no* respondents had said this in 1998; and (b) the comments, noted above, expressing ambivalence about current levels of safety.

We can conclude from all of this cumulative evidence that there is indeed a difference in the general perception of rail safety in 2000, compared to that expressed in 1998. Specifically, while in the 1998 study there was evidence of almost unanimous agreement that the railways were safe, in the present study this belief had faltered with fewer clear-cut references to adequate levels of safety and far more to indicate that railways are perceived to be unsafe (or possibly so). This shift in discourse is all the more striking when we consider that for the public

fires context (where there has been no recent major accident in the UK) the judgement that the sector is safe, which was based upon very similar arguments to those advanced for the railways in the 1998 study, has remained remarkably stable over the period of the two studies. Note also that in two of the quotes immediately above, railway safety concerns go beyond the Ladbroke Grove accident to focus upon other safety issues (maintenance and platforms respectively), suggesting a more general unease with the safety of the system that was not present in 1998. In summary, it seems that the above represent a genuinely held set of views, which are a result at least in some measure of the Ladbroke Grove accident in combination with possibly other less serious incidents, and which reflect an underlying and essentially new unease about safety on the railways.

Finally, some of the respondents who had ranked rail 'high' in the present study cited a number of linked themes likely to be derived from knowledge of the Ladbroke Grove accident, including direct references, *and which again were wholly absent in the 1998 data* (despite the fact that the 1998 study had been conducted one year after the, admittedly less prominent, Southall accident in 1997 where 7 people had died). These included references to the *recent accident* (14%), to the *scale* or disastrous nature of railway accidents (13%), to the effects of the *media* impact (7%), and to *horrific accidents* (6%). The following are typical examples:

"I was thinking about the last rail crash. The television and the papers they make it so, they bring it in your face sort of thing. And I know that not so many people die it is just the shock as to how many there is each time this happens" (Present Study 2000, Guildford Group 5, Female 2)

"I think I utilise personally the rail more often and I see more people involved in day to day commuting more often. And I feel that any one problem could cause far more deaths than say a fire in a small place" (Present Study 2000, Guildford Group 4, Male 3)

"Well the only reason I gave the railway, as I say I am still very emotional you know about these terrible crashes so that gets priority for me" (Present Study 2000, St Albans Group 3, Female 1)

Interestingly, in the quotes above and in the SPQ analysis, we appear to be picking up a greater willingness on the part of a subset of participants to endorse the 'scale' or disastrous nature of an accident, as well as the associated media portrayal of such events, as legitimate reasons for prioritising. In the previous main study, and in other studies where scale *per se* was investigated (Slovic, Lichtenstein & Fischhoff, 1984; Jones-Lee & Loomes, 1995), this had generally not been endorsed as a legitimate reason for prioritising safety. It may therefore only be in the immediate aftermath of a very real and major accident, such as Ladbroke Grove, that such reasons are endorsed by people, perhaps because of the vividness or direct emotional impact that a multiple fatality event inevitably generates. It is also clear that for most people not directly involved in the event, vividness and emotional impact will be transitory states, which will fade with time (as had, for example, any effects of the 1988 Clapham accident by the time the 1998 main study was conducted). On these grounds it must be a point of debate as to whether considerations of scale or media impact should *per se* enter automatically into societal choices about long-term risk regulation in a situation where major accidents are still relatively uncommon. On the other hand, personal exposure, lack of control, others' responsibility, and a general unease about safety levels - as generic factors which cut across all of the sectors studied here - would all seem to present at least some legitimate basis for differential regulation.

5.1.4 Overall Summary of Reasons for Rankings

The main findings from the present study are summarised in Figure 1. It shows the four safety contexts studied, ordered from top to bottom, in the way that they were prioritised by the current sample of respondents. Arguments that were frequently used to justify a ‘high’ priority to a context are shown on the left hand side of the diagram, and arguments used to justify a ‘low’ priority immediately to the right.

Looking to the left of the ROADS box (top of Figure 1) respondents reported that they gave roads a very high priority because of the higher baseline deaths per year, as well as higher perceived personal and household exposure. Respondents also reported that perceived lack of control (because others would inevitably involve you in accidents, however carefully you drove) was also a reason for giving priority to the roads programme. Taken together, these themes from the qualitative analysis are congruent with the findings from the SPQ data. As noted in the analysis of the main study data, we interpret this as showing that the very large number of deaths on the roads, in combination with other factors, may be viewed as symbolic of a large or important safety problem or risk, that needs to be tackled first, and in this way gains priority in the rankings. Very few respondents gave roads a low priority, and therefore there were no identifiable patterns or themes to the small number of arguments given for a low ranking, as shown on the right of Figure 1.

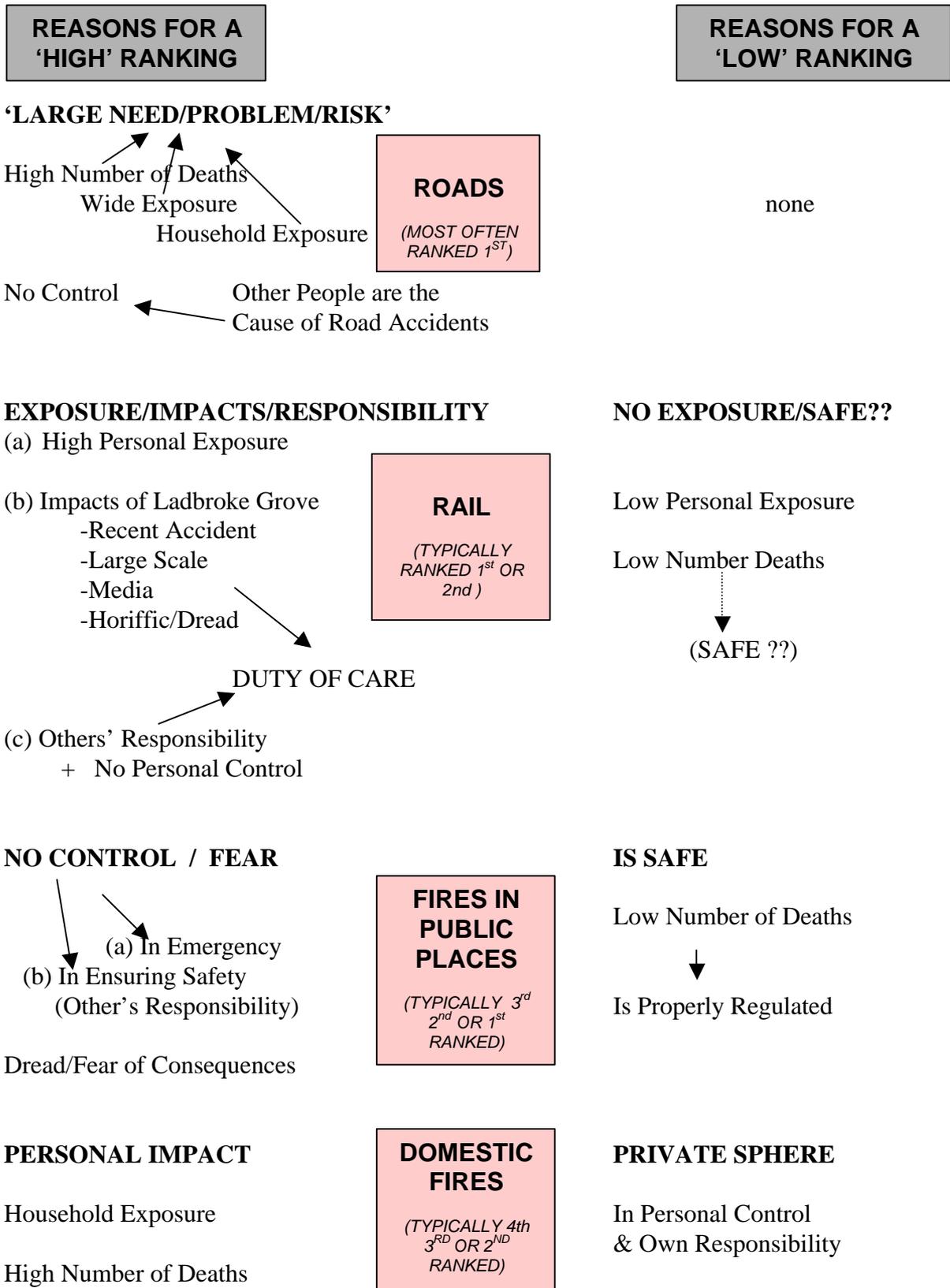
For rail (middle of Figure 1) there are clearly both arguments for and against giving priority to this context. Looking to the right of the RAIL box it is clear that, as in the case of the main relativities study, both low personal/household exposure and the low number of deaths are reasons for giving low priority. However, while in 1998 we concluded from the data that people interpreted the low number of deaths as an indicator of adequate safety, here respondents are more equivocal about this. Turning to the arguments given by the participants who accorded rail a high priority, in the 1998 main study we concluded that *other’s responsibility* was the only consistent reason given for prioritising railways (and even this only weakly). A far stronger set of arguments are endorsed in the present study, and these are shown to the left of the RAIL box. They include first, considerations of level of exposure (for the regular rail commuters in the present sample). Second, a group of issues associated with the Ladbroke Grove accident including the scale of the event, its media impacts, and associated horrific characteristics together with dread of such consequences. Third, the fact that rail safety is somebody else’s responsibility (who in turn owes passengers a duty of care), associated with beliefs about low personal control over the risk, are clearly endorsed as arguments for prioritising. Whether actual lack of control and responsibility for safety are in any sense changed from the situation pertaining in 1998 is somewhat of a moot point. However, it may well be that in the glare of publicity surrounding a major accident, the duty of care owed by operators and government to those who cannot control the risk themselves is made much more salient to both passengers and people more generally. Hence the Ladbroke Grove impacts and responsibility/control issues are shown interacting together to emphasise a duty of care.

For fires in public places (middle of Figure 1) there are arguments both for and against giving priority to this context. Safety here is seen primarily as the responsibility of others (typically the authorities, owners of premises, or companies), rather than being something the individual at risk has direct responsibility for. However, while this factor is important in policy terms, it alone may not be a sufficient reason in and of itself for people to attach a high ranking to the public fires context. For fires in public places it appears to be the case that a more important counter-argument for people is the low number of deaths in comparison to the roads and domestic fires, which signals that safety is already at a high level here. Where people did rank public fires as a high priority it seems more to do with anxiety/dread about the nature of the event and a lack of control over one’s fate were a fire to break out. In support of the findings of the SPQ analysis it is clear from the ranking discussions that the varied perception variables

that imply priority should go to public fires are balanced by the (low) baseline deaths and the associated inference that this sector is safe, or is properly regulated already.

For domestic fires (bottom of Figure 1) there was a clear and highly consistent set of arguments for giving low priority to this context, the view being that the home is the most private domain of the four. In total just under 50% (46 individuals of the 95 who ranked Domestic Fires as 'low') mentioned either that safety was your own responsibility or that you were in control in the home. Where domestic fires were accorded a 'high' priority this was due to the ages of those involved (young or sometimes the old) in combination with the high number of deaths and personal/family exposure.

Figure 1
Schematic Diagram of the Principal Reasons given in Each Context
(Present Study Jan/Feb 2000)



5.2 Analysis of Free Discussion of Ladbroke Grove

“Well I think I missed the other disaster a few years back, the Southall one by one train. And I missed this one by one train and it's, and we actually employed a counsellor line where I work. And I did take the time to actually call up, because it did actually shake me up really. And I didn't actually travel on the trains until after Christmas. So yeah it did change my perception of what it was like getting on a train everyday, and I was travelling on a train everyday then on that route. And two accidents on the same line in a short period of time, you start to think. God you know”
(Present Study 2000, Reading Group 6, Male 2)

Although the group of respondents in the present study did not include anybody who reported that they had themselves been on either of the trains involved in the Ladbroke Grove accident, some of them, particularly rail commuters within the Reading sub-sample such as the man from Reading Group 6 quoted immediately above, did hold some very close personal associations with the events at Ladbroke Grove.

As noted earlier, right at the end of each group session, and after the ranking exercise and the quantitative elicitation procedures had been completed in the same order and way as in the main study in 1998, the following three new questions were presented to respondents. These were intended to stimulate a free discussion of the Ladbroke Grove disaster.

- A) *You may remember (or people in the group have already mentioned) the accident at Ladbroke Grove last October where 29 passengers died in a collision between two trains. Do you think that event changed your opinion of the current levels of safety on the railways, and if so how? If it didn't change your opinion, why?*
- B) *Do you think your knowledge of the accident influenced the priority you personally gave to rail safety when ranking it in the exercise earlier?*
- C) *Some people might have placed the railways as a low personal priority, compared to the other safety issues. On the other hand some people in Government and the Press are saying the railway industry (Railtrack, the Train Companies) should invest even more in safety following the Ladbroke Grove accident. What do you think about this?*

The data-base of transcribed material for the free discussion from the 30 groups in the present study was entered into the HyperResearch qualitative data analysis programme for further thematic analysis. Because we wanted to be sensitive to possible new categories and interpretations contained in the free discussions, this material was analysed iteratively using the approach of grounded theory. To recap, with this approach the researcher works through the transcribed material systematically assigning codes to significant themes and instances as they arise in the data, developing an account by comparing similarities and differences between cases and themes and in relation to the research question to hand. The aim is to build an account that is both theoretically rich and grounded in the data.

The three questions posed to respondents invite fairly specific answers, although as anticipated the discussions ranged over an extremely wide set of issues not all necessarily directly related to the questions posed. The respondents appear to have taken the questions (correctly) as prompts to bring out their views about the safety of railways in general. Accordingly, the analysis here focuses upon the major themes to emerge from these more unstructured

discussions. Of course it may well be the case here, since the whole study up until this point had been focused upon safety issues and the concluding questions above pertained specifically to Ladbroke Grove, that other more day-to-day concerns associated with rail travel (crime, delays) have not been elicited. This does not mean that those other concerns are not important to people, just that the inevitable framing prompting the discussions is safety.

A large variety of issues were raised in the discussions, and these are shown in Table 11. Against each is shown the number of groups in which this issue was raised. For example the issue *profit over safety* was raised in 21 (or just over two thirds) of the 30 groups. We cannot discuss in detail every theme shown in the Table, but in order to make sense of the major thrust of the group discussions we focus here upon the issues mentioned with high frequency. In order to make analytic sense of the overall discussions, the frequently occurring codes which also have thematic linkages have been grouped under the following three major themes which help us to summarise the discussions within the groups as a whole: (a) **Poor State of System**; (b) **Direct Causes of Ladbroke Grove**; and (c) **Moral Outrage**.

5.2.1 The Poor State of the System

In response to the first question put to respondents “Do you think Ladbroke Grove changed your view of safety?” a variety of responses were offered. A very few responses indicated that the railways were *not unsafe* (in 6 groups). The majority response, however, found in 20 of the groups, was that the railways were regarded as being *less safe* than had been perceived to be the case prior to the accident. In many of the discussions these opening references were associated with a more general set of remarks about the perceived poor state of the railway system in the UK as a whole. These we have coded as *other incidents* (mentioned in 22 of the groups), *media attention* (16 groups), *poor state of the system* (15), *accidents and change* (13), *other country’s railways* (14), *crowding* (13) and *accidents and greater awareness* (10).

Taking first the codes *less safe* together with *accidents and greater awareness* as well as *media attention*, in a number of the quotes respondents indicated that although there were still a *relatively low number of deaths* on the railways (mentioned in 15 of the groups) their opinion regarding levels of safety had changed for the worse since the Ladbroke Grove accident. Many people felt that the events surrounding the accident had provided them with new knowledge about safety issues on the railways, and hence they were more aware of this. Respondents referred typically either to feeling less safe because they perceived that there were more crashes than before, or to now having more knowledge about things that could go wrong, or which had been going wrong on the railways. These data support our interpretation, made earlier from the rankings qualitative analysis (Section 5.1), that respondents were exhibiting a general heightened awareness of, or ambivalence about, railway safety matters in ways that differed from the 1998 main study responses. For example:

*“Whether it was the media or whatever, there just seemed to be more rail crashes”
(Present Study 2000, St Albans Group 8, Female 1)*

“Well I must admit I used to feel quite safe travelling on a train, but I don't now. I mean years ago I probably would never even consider a train de-rail, and the driver going to go through a red light. But now you are more aware of things that can happen” (Present Study 2000, Guildford Group 9, Female 2)

Table 11
Concepts Generated from Open Coding of the Free Discussions of Ladbroke Grove

Principal Themes (Grouped under Researcher's Meta-Categories Shown in Bold)	No. of Groups in Which Discussed	Other Miscellaneous Themes Discussed	No. of Groups in Which Discussed
Poor State of System			
Other Incidents	22	Behaviour Changes	6
Less Safe	20	Externalities	2
Media Attention	16	Fear of Fire	3
Low Number of Deaths	15	Few Accidents	3
Poor State of System	15	Forcing onto Roads	5
Other Countries' Railways	14	HSE	3
Accidents and Change	13	Impact on Relatives	2
Crowding	13	Many Lives at Risk	3
Accidents and Awareness	10	Muggings and Crime	2
Not Unsafe	6	No Choice	3
Waiting to Happen	5	No Personal Control	7
		Personal Association	12
Causes of Ladbroke Grove		Personal Concern	18
SPADs	18	Rail Subsidies	5
Frontline Blame	15	Railtrack	9
Corporate Blame	10	Rail vs Road Safety	13
Management Responsibility	9	Surprise	4
Privatisation	8	Time Heals	3
Signals as Cause	8	Training	8
Faulty Equipment	4	Uncertainty	12
Fragmentation	3	Underground (Tube)	6
Corporate Manslaughter	2	Who Pays for Safety	7
Responsibility at Top	2		
Moral Outrage			
Should Fix Earlier	22		
Profit Over Safety	21		
Prevention is Easy	16		
Moral Outrage	15		
Expectation of Safety	15		
Distrust Rail Companies	14		
Costs vs Lives	13		
Distrust Government	12		
High Cost of Rail Travel	11		
Other's Responsibility	8		
Profiteering	8		
Production over Safety	4		
Costs Minimal to Rectify	2		
Expensive to Rectify	2		
Distrust the System	2		

“Yes it made me more aware of the way they monitor the signalling. It made me more aware of that maybe they don't check as much as they should. So it would affect me using the train, so I think it is less safe definitely yeah” (Present Study 2000, Reading Group 3, Male 1)

We know that significant accidents can be interpreted as events which herald a new or previously hidden underlying problem or concern. As one of the intellectual building blocks to the social amplification of risk framework, Slovic, Lichtenstein and Fischhoff (1984; also Slovic 1992) have proposed that certain hazardous events might hold such a ‘signal value’ for people. They suggest that high signal value might also be linked to the potential for second order social amplification effects: that is changes to behaviour such as consumer avoidance of a product or service. One example would be the commuter from Reading Group 6, quoted at the beginning of this section, who reported avoiding rail travel for a period of time after the Ladbroke Grove accident. The possibility of severe secondary economic consequences during a risk controversy is, of course, one very good rationale for paying greater regulatory and management attention to hazards where such effects might be expected to occur. Indeed, one can argue that potential secondary impacts (or ‘ripple effects’, in the social amplification terminology) should be explicitly considered in any cost-benefit analysis for a new system or technology.

The media are, of course, main drivers of amplification effects, and many respondents mentioned (in 16, or over half of the groups) the considerable *media attention* attached to Ladbroke Grove and other major accidents. The data are interesting, however, in that while people acknowledged that the media are needed to inform them, some respondents were also clear that they believed the media sometimes ‘hype’ or overplay matters. This would support the findings from the SPQ analysis (in Section 4.3), where media attention is only weakly endorsed as a reason, in and of itself, for prioritising safety.

“Anything like the Paddington railway disaster or a disco, where a mass gets killed. That sort of thing seems to come out in the papers a lot more and a lot quicker than when Joe Bloggs down the road gets hit by a car, or gets killed in a car. One individual doesn't seem to be news nowadays, whereas a mass is news” (Present Study 2000, Guildford Group 12, Male 1)

“But whether it is all media hype whatever you know you can't always believe everybody can you” (Present Study 2000, Guildford Group 5, Female 1)

“Well I have got a personal experience, [a close relative] was injured in that Ladbroke Grove accident, and we found it very very hard to actually watch the TV or the radio. That is all we heard there was no escaping it, and that really did make it very very difficult to sort of put it behind us you know. So yes I thought the media coverage was completely disproportionate to the amount of deaths. Because it was no more than a few days on the road, but it is in a single occurrence” (Present Study 2000, Reading Group 1, Male 1)

On the other hand, a number of respondents, while being unhappy that matters should reach such a pass, also recognised that new safety measures might follow a major accident and strong media interest in the events (*accidents and change*, mentioned in 13 groups). Whether people felt that things ultimately change depended of course on their trust in the politicians, authorities and companies to respond to events (see the comments on ‘trust’, in 5.2.3 below).

“I think it is like the Hillsborough disaster a few years ago and Bradford fire disaster. It is those incidences that change things, it changed safety in sports grounds football grounds and things like that. The same thing has happened here, and unfortunately it is a media driven thing.” (Present Study 2000, Reading Group 6, Male 2)

While accidents and media attention are interpreted as signalling that all is not right, what seemed to be of more importance to our respondents was the strong belief that the Ladbroke Grove accident was part of a pattern - that is it was in some way related to, or symbolic of, a range of *other incidents* (mentioned in 22 groups) that had recently occurred on the railways. Such references focused upon other crashes or on incidents where drivers pass through red lights. The current levels of Signals Passed at Danger (SPADs), highlighted by the publicity surrounding Ladbroke Grove, appears to have surprised and shocked many of our respondents. Alternatively, parallels were drawn with other rail accidents (Clapham, Southall) or with other major disasters such as the King’s Cross Underground fire or the Hillsborough football stadium disaster. For example:

“I won't go on a train now, all of the accidents they all have. They seem so major don't they” (Present Study 2000, Reading Group 10, Female 1)

“I am shocked at the amount of trains that go through X amount of red lights, I still can't believe that” (Present Study 2000, St Albans Group 3, Male 1)

Male 1: “It did actually open my eyes a bit to what was going on. I didn't realise that so many lights were being crashed and jumped shall we say. And it did increase my concern and made me think that yeah I would like to put more priority on getting it right”

Q: So it might have influenced you?

Male 2: “Oh yes. If I was jumping red lights all the time in the car I wouldn't have much of a chance”

Male 3: “I think it all came about after Clapham didn't it? There was a big enquiry after the Clapham disaster, and they said then that they should spend more money”

Male 5: “And the Southall one did it follow that?”

(Present Study 2000, all Guildford Group 4)

The references to other incidents occurring regularly on the railways were often coupled with remarks on the general *poor state of the system* (mentioned in 15 groups). These would pick up on a variety of issues not necessarily solely associated with safety, but which are taken to be indicative of a degraded and poorly working system: including references to lack of investment, perceptions of run down systems and infrastructure (including the tracks), and low levels of staffing and training. Unfavourable comparisons here were often made with earlier times, or between the UK and *other countries' railways* (14 groups) particularly France and Europe.

“I am just surprised that there aren't more accidents than there are. And all these accidents that we see on the television....it is just waiting to happen....And it is not just the rolling stock it is the tracks as well” (Present Study 2000, Guildford Group 4, Male 4)

“I think that people now realise just how run down the railways are, because of these accidents particularly. I think that we are all very much aware it is run down. The tube you know with water going down through tunnels, they are not running on time,

security as well. The rail tracks you see videos of tracks with weeds growing out of the track . You know it didn't use to be like that “ (Present Study 2000, St Albans Group 1, Female 3)

“But then they say look at France and other countries, and their safety records are a lot better. And it is because if they do go through a red light they have got all these special things and it will automatically stop the train. In France you can't go through a red light, but in this country you can” (Present Study 2000, Guildford Group 12, Female 1)

Finally, a major concern with the UK system as a whole was the level of *crowding* (mentioned in 13 of the groups) that commuters in particular face, both in terms of general levels of discomfort in the face of high ticket prices and an inability to travel in any other way, or as an extra risk factor perceived by respondents to be important in the event of a major accident or incident. For example:

“My wife travels on the train and you are crammed in like sardines. And she can't get a seat and she pays two thousand pounds a year for that service. That is from Watford to London it is disgraceful you just don't get a seat” (Present Study 2000, St Albans Group 3, Male 3)

“Travelling on the trains you are as if you are in a cattle cart and you can't move. And you are standing and I remember saying to my partner a few months before the Clapham disaster. If it happened then there would be hundreds of people dead” (Present Study 2000, Reading Group 8, Male 2)

5.2.2 Direct Causes of Ladbroke Grove

Not surprisingly there was considerable discussion in the groups of the precise causes of the Ladbroke Grove disaster. In part these are picking up on mediated accounts derived from the press and TV, as well as personal conversations with others. In many cases SPADs were correctly identified (in 18 of our groups) as the precipitating cause of the accident, although, as noted above, there was considerable surprise expressed at the fact that trains could physically pass red signals at all, and at the numbers of SPADs reported in the media. Inevitably there was a recognition of the driver's role here, and this was accompanied by a number of discussions regarding the responsibilities of the driver to ensure that signals are not passed at danger, and whether the blame should be laid at the driver's door (*frontline blame*, in 15 groups). In general, many of the comments were ambivalent on this score, and - reflecting current safety thinking on the role of organizational factors in major accidents (see Turner and Pidgeon, 1997; Reason, 1997) - there was also considerable recognition in the groups that management and corporate factors might also have had a significant role to play in the accident (*management responsibilities* were mentioned in 9 groups, and *corporate blame* in 10 groups). Such organizational factors suggested to respondents that the driver should not be solely to blame, or to blame at all, for the accident. For at least two respondents the events constituted *corporate manslaughter*. These sections of the tapes contained a number of quite lively debates between group members regarding the respective causes of the accident, with opinions differing widely. The following interchange from Guildford group 2 is a good representative of these discussions.

- Female 4: "Yes but they Railtrack are responsible for their own safety"*
- Female 2: "There again I put it down to the drivers I really do"*
- Female 4: "Yes but there again the signal was in a bad place, and he was a new driver and couldn't see it the sun was in his eyes"*
- Female 2: "But even other drivers say that they skip red lights all the time. If I skip a red light all the time I am going to be penalised aren't I. I am going to lose my licence and be banned"*
- Female 5: "But then the company has to take responsibility they knew that when the sun shone you couldn't see it"*
- Female 4: "But they have warning signals in the carriage as well don't they?"*
- Female 3: "Not in all trains and not in the train that actually caused the crash"*
- Female 4: "But on the other train it did have a red signal light thing but it had been switched off"*
- Female 5: "So who's fault was that the drivers? He switched it off"*
- Female 4: "No because it wasn't working"*
- Female 1: "Well I think it was the company rather than the driver. I think it is a big responsibility to stick on one driver's head when it is not a public service. When it is not running a hundred percent I don't think it should be down to the driver"*

(Present Study 2000, All Guildford Group 2)

It is interesting to note how the argument above revolves around the balance between driver and company responsibility. In many respects these 'lay' discussions are a fair reflection of the inherent difficulty of assigning responsibility when dealing with any major, complex systems failure involving a combination of both human and organizational preconditions. Note also that in this group discussion the issue of disabled warning systems, which is strictly speaking relevant (as far as we presently know) only to the previous Southall disaster on the Paddington line, is also brought into the argument.

Although there was some general discussion of *privatisation* (in 8 groups) very few respondents raised the organizational *fragmentation* that has occurred since the mid-1990s as a possible precondition to the accident (mentioned in only 3 groups). One can argue (e.g. Evans, 2000) that, on the strict statistical record to date at least, the railways are no less safe than they were pre-privatisation. On the other hand, a counter-argument can be advanced, based upon research on the patterns of preconditions underlying major accidents more generally (Turner and Pidgeon, 1997), that the nature of major railway accidents is likely to change with such organizational restructuring. This is because novel responsibility and communication difficulties are likely to occur at the interfaces between the respective organizations involved in the UK railway system. Meeting this challenge may require rather different risk management strategies than have been used in the past. More important, however, as a possible background precondition to Ladbroke Grove (in the minds of this sample of respondents at least) appears to have been a perceived lack of appropriate investment in safety. We discuss this important issue more fully in the following sub-section.

5.2.3 Moral Outrage

“Well they should plough more of their profits back into the safety they charge enough on the rail fare. They are just lining their pockets with it instead of ploughing it back into the interest of the public, and making it safe and it is not safe. It is the public's money that they are milking off, it is outrageous” (Present Study 2000, St Albans Group 4, Female 2)

We have labelled the final group of themes, exemplified by the quotation immediately above, under the general heading of ‘moral outrage’. This reflects in part the anger that a major disaster can engender in people when there is a perception that possible measures for prevention have not been implemented, raising serious issues of corporate accountability. It was clear from both attending the groups as moderators, and from subsequent analysis of the free discussion data, that many of our respondents felt very unhappy about the events leading up to the Ladbroke Grove disaster, and about railway safety management in general (in ways that had not been evident to us in the main study in 1998). In many respects these concerns pick up on - albeit very much in lay terms once again - a number of important threads (the Hidden recommendations from the 1989 Clapham inquiry, Automatic Train Protection systems, and the costs of safety investment) that have formed the overall context for discussing train protection issues in the UK over the past 10 years.

The sense of moral outrage in this situation seems to have been driven by a number of factors in combination. Firstly, respondents argued that the history of similar incidents highlighted in the media (and as noted above, particularly SPADs), meant that the authorities had had knowledge of the problem in advance. This was also coupled with the perception - rightly or wrongly - that solutions to this problem were already well understood and relatively easy to effect (mentioned in 16 of the groups), leading to the conclusion that the problem should have been resolved earlier. While the code *should fix earlier* was an unexpected one, in the end it became one of the most commonly occurring themes (22 groups, or well over two thirds, mentioned this in one way or another). For example, all of the quotes below express a level of disquiet or anger at the situation:

Female 5: “Well Ladbroke Grove was just waiting to happen there were lots of reports in the papers leading up to that. If you read them. That the drivers were going through red lights, and the numbers of them that they were going through were increasing dramatically. And so it was just bound to happen sometime and that there would be a big crash”

Female 2: “Well that's what annoys me it was something that was going to happen and they never did anything about it. I mean you think how, they are providing a public service and that is the attitude that they take”

(Present Study 2000, Both Guildford Group 2)

“Well they are such obvious things that's what sends my mind boggling it is such obvious things that they should be doing” (Present Study 2000, Guildford Group 12, Female 1)

“I was shocked that the information that they already had, prior to the accident happening. It was an accident that didn't need to happen. They already had the information and they should have acted upon it. You know they knew that that signalling was in a blind spot” (Present Study 2000, Reading Group 5, Female 2)

That the problem which killed so many people was not resolved earlier - and in many of the respondents' view *should* have been - was both disturbing to people and also linked to a second issue, specifically, a perception on the part of the respondents that those operating (and in some cases regulating) the railways were deliberately putting profits before safety. Whatever the rights and wrongs of what is undoubtedly a complex situation with regard to recent safety investment in the railways, and safety investment to prevent SPADs in particular, *profit over safety* was mentioned in 21 of the 30 groups, *privatisation* as a cause in 8 groups, and in some instances an explicit charge of *profiteering* (8 groups) was laid too. The balancing of *costs against lives* was also touched upon in 13 of the groups. This was also sometimes set against the view that it is expensive in the UK to travel by train regularly (the *high cost of rail travel* was discussed in 11 groups) and that accordingly the fare-paying public has a right to *expect safety* (mentioned in 15 of the groups). The following is an extended set of quotes, and while some may appear intemperate in their language, they are intended to convey the very considerable depth of feeling expressed by a number of our respondents.

"I am a little cross really and angry for the people that were in that accident....And those people at the top it is disgusting what they might not do, instead of just getting on with it" (Present Study 2000, St Albans Group 1, Female 1)

"I think it was shocking when they knew that there were flaws in their safety and that they were cutting costs" (Present Study 2000, St Albans Group 4, Male 1)

"They have got the technology all it is is pound notes. As far as I am concerned these people are murderers" (Present Study 2000, Guildford Group 11, Male 1)

"It seems like pure incompetence occurred somewhere along the line. Because it was a problem that they had known about for some time. I mean if you were one of the families that were killed it would be infuriating really" (Present Study 2000, Reading Group 7, Male 1)

"Something like that ATP....I wonder why they don't do it. I can sit there as I am and I could tear my hair out, why don't they just do it!" (Present Study 2000, Reading Group 8, Female 1)

"You pay your money and you put yourselves into their hands, and you should feel safe I think" (Present Study 2000, St Albans Group 8, Male 1)

The combination of 'warnings', incidents and accidents, for a problem part-human and part-management that could have been corrected earlier, set against a background perception that profits are being put before safety, means that much of the blame for the events is seen - by this sample of respondents at least - to lie with those managing safety. Returning to the social amplification of risk framework, it is clear that it is precisely under such circumstances - where one has a synergistic interaction of blame issues, extensive loss of life and media attention - that one would expect an issue to gain significant public comment and attention (Kasperson, 1992; Pidgeon, 1999). This appears to have been the case with the Ladbroke Grove accident.

Returning to our earlier conclusions from the qualitative analysis of the rankings data (in section 5.1), we argued there that it might only be in the glare of publicity surrounding a major accident that the duty of care owed by government and operators to those who cannot control the risk themselves is made salient to people. The free discussion data strongly reinforces this interpretation. As the final quote of the set above suggests, putting yourself into another's hands brings with it an expectation that a system should be managed safely (or at least with a

reasonable degree of competence and care). The evidence presented here on the contextual issues driving a feeling of ‘moral outrage’ and anger in our respondents, helps to explain a further aspect of the social and interpretative processes by which people make sense of, and attend to, significant risk issues in the aftermath of a disaster and why in this instance the duty of care is seen, in hindsight, to have been broken.

A final issue to raise is that of trust. Respondents in our study rarely used the words trust or distrust directly, and the object of distrust often remained vague (“they’ or “the authorities”). However, remarks in a number of the groups appeared to indicate, albeit indirectly, a level of distrust in both the *rail companies* (in 14 of the groups) or the *government/authorities* (in 12 of the groups) as a result of the Ladbroke Grove events. This is hardly surprising given the media and public debate about liability issues and the levels of moral outrage expressed. Trust in governments, regulators and business is, of course, a key current concept in our understanding of public responses to risk issues (see Slovic, 1993; Cvetkovich and Löfstedt, 1999).

Trust is clearly a complex concept, and one that has attracted a number of definitions over the years. However, in this case the impression that those who were responsible might not have acted fully in the public interest and could not be relied upon to see through the recommendations of earlier inquiries, or in some cases were suspected of actively concealing information for commercial or other reasons, indicates a degree of scepticism about the current systems of railway safety management and decision-making. The following are just a few illustrative examples from the current groups.

“Yes but what I am saying is the people who run the railway make up their own minds on things....at the end of the day they will still do what they want to do, and this is the thing that worries me slightly. The railways will still do what they want” (Present Study 2000, Guildford Group 3, Female 4)

Male 1: “Well if they had implemented the last report they did after the last accident Paddington would not have happened”

Male 3: “Yes I believe that very strongly yes”

Female 2 “Well I think they just make sympathetic noises”

(Present Study 2000, All St Albans Group 2)

Q: You were saying earlier that you thought the rail problems were well known about?

Female 1 “Yes I think they were. I think that there was too much money at stake, and they have to keep the service travelling along. And as much money as they can make. I just think that they are all criminals really I do”

Female 2: “I think a lot of it was swept under the carpet”

Female 1: “Of course it is”

(Present Study 2000, Both Reading Group 5)

The scepticism expressed by some of our respondents is unlikely to have been engendered solely by the Ladbroke Grove disaster (a whole history of events in relation to railway safety, as well as wider issues of corporate involvement and safety regulation, will all count as important here), but matters can hardly have been helped. Distrust can be thought of as a further significant ‘secondary’ social amplification impact of such a major disaster - and one with very real long-term consequences for both the railway industry and for regulators.

6 SUMMARY AND CONCLUSIONS

The main findings and conclusions of the present study are as follows:

- In prioritising the four safety programmes (roads, rail, domestic fires and fires in public places) that would each prevent the *same* number of premature deaths at the *same* cost over the next 5-10 years, there is a clear and statistically significant upward shift in the priority given to the rail programme relative to the prioritisation in the 1998 main study. Thus, while in the main study only 35.4% of respondents gave the rail safety programme first or second priority, in the present study the percentage has risen to 63.3%. By contrast, the prioritisation given to the road safety programme is statistically *not* significantly different, the main study percentage of respondents who gave the road safety programme first or second priority being 87.7%, while the corresponding percentage for the present study is 80.6%. Given the rise in the rail priority and the relative stability of the road priority, it is clear that the domestic fire and fire in public places priorities have fallen somewhat.
- Responses to the question concerning personal exposure to risk, the Safety Priorities Questionnaires, and qualitative analysis of (a) respondents' reported reasons for their rankings in the prioritisation task and (b) the free discussions of Ladbroke Grove, suggest that a number of factors contributed to the significant rise in the priority given to rail safety in the present study relative to the 1998 main study. These included:
 - (i) Higher perceived personal and household exposure to rail risks, which was almost certainly largely a result of the fact that the follow-up study sample was deliberately selected so as to contain a substantially larger proportion of regular rail users than was the case in the main study.
 - (ii) Various factors that would appear to reflect changes in perceptions and attitudes to risk as a result of the Ladbroke Grove accident, including an increase in the salience of media impact and the possibility of large-scale loss of life in rail accidents, as well as the horror and dread associated with such accidents; a decrease in the level of belief in the adequacy of the level of safety provided by Railtrack, the rail operators and the rail safety regulators; a sense of 'moral outrage' at a problem people felt should have been adequately dealt with before the accident; and a decrease in the salience of baseline levels of risk in determining the priority that should be given to safety programmes in the four different contexts.
- While it might have been expected that the marked rise in rail safety prioritisation and the generally heightened level of concern about rail safety observed in the present study would have resulted in a corresponding substantial upward shift in the valuation of rail safety relative to road safety, this was in fact *not* the case. Although the value of preventing a rail fatality relative to the corresponding value for a road fatality has risen somewhat, it has done so by only a relatively modest amount. In particular, for the sample as a whole, using the "direct" method (whereby each relativity is computed with reference to the first-ranked context in the prioritisation exercise), the rail/roads valuation relativity has risen from 0.834 to 1.003 – an increase of only 20%.
- Indeed, even when one considers the sub-sample of "high" rail users (i.e. those who travel 1,000 miles or more per year by rail) the rail/roads valuation relativity is only 1.157. Clearly, therefore, even if we focus on those who are regular rail users, it would appear that their preferences and attitudes to risk *per se* provide no justification for Railtrack's higher

VPF (for use in cases in which members of the travelling public have little or no control over risks as in, for example, train collisions) of some 2.8 times the DETR roads figure.³ The follow-up study relative valuation results therefore suggest that if a justification for Railtrack's higher figure *is* to be found, then it will almost certainly need to be sought in considerations other than the preferences of the travelling public, as such.

- Given the differences between the rail/roads valuation relativities for the follow-up sample taken as a whole, and for the subsamples of “low” rail users and “high” rail users – 1.003, 0.933 and 1.157 respectively – it is natural to ask which of these figures should be taken to represent “public preferences” were one to seek to determine a thoroughgoing preference-based rail VPF. Given that the national average rail mileage is 350 miles per year and given that in the main study (which, unlike the follow-up study, was not deliberately aimed at the London commuting area) more than 50% of the sample were “low” rail users under the definition being used here, it is hard to argue that the preferences of low rail users should be completely discounted in determining a rail VPF, especially as rail safety expenditure is, at least in part, financed by government subsidy, funded ultimately by taxation. However, although low rail users do undoubtedly make an indirect contribution to rail safety expenditure through taxation, it seems clear that the lion's share of this expenditure is financed by Railtrack and the train operators from fare revenues. Given this and given that those who are high rail users will be the principal beneficiaries of improved levels of rail safety, there would seem to be a persuasive case in favour of giving most weight to the high rail users' valuation relativity in determining a preference-based rail VPF and corresponding monetary values for the prevention of non-fatal rail injuries.
- Finally, it would appear that at least part of the difference between the follow-up and main study rail/roads valuation relativities is a direct reflection of the impact of the Ladbroke Grove accident on the travelling public's perceptions of and attitudes towards rail risk. This raises the difficult question of whether the rail VPF should be based principally on “calm, considered” preferences or, instead, on preferences that reflect the heightened concern over rail safety that inevitably results from an accident such as Ladbroke Grove. There appears to be no easy answer to this question. On the one hand, there is a widely-held belief on the part of those who advocate the use of preference-based values in public policy-making that these preferences should indeed be well-informed, calmly arrived-at and carefully-considered. However, it would, at best, seem somewhat cold-blooded and at worst ethically (and indeed, politically) unacceptable to completely set aside the understandable public reaction to a major rail accident.

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³ Currently, Railtrack employs two distinct VPFs in its cost-benefit analysis of proposed rail safety projects. The lower figure, which is applied to situations in which passengers or staff can be taken to have a substantial degree of control – as in single fatality accidents on platforms – is essentially the DETR roads figure updated for inflation and growth in real income per capita. By contrast, the higher figure is, as noted, applied to cases in which potential victims have little or no control over risks.

REFERENCES

- Beattie, J., Carthy, T., Chilton, S., Covey, J., Dolan, P., Hopkins, L., Jones-Lee, M., Loomes, G., Pidgeon, N., Robinson, A., & Spencer, A. (2000). *The Valuation of Benefits of Health and Safety Control: Final Report*. London, HSE.
- Cvetkovich, G. & Löfstedt, R. (eds.) (1999). *Social Trust and the Management of Risk*. London: Earthscan.
- Evans, A.W. (2000). Fatal train accidents on Britain's mainline railways. *Journal of the Royal Statistical Society, A*, **163**, Part 1, 99-119.
- Freudenberg, W.R. (1992). Heuristics, biases and the not so General Public. In S. Krimsky & D. Golding. *Social Theories of Risk*. New York: Praeger.
- Jones-Lee, M. and Loomes, G. (1995). Scale and context effects in the valuation of transport safety. *Journal of Risk and Uncertainty*, **11**, 183-203.
- Kasperson, R.E., Renn, O., Slovic, P., Brown, H.S., Emel, J., Goble, R., Kasperson, J.X., & Ratick, S. (1998). The social amplification of risk: A conceptual framework. *Risk Analysis*, **8**, 177-187.
- Kasperson, R.E. (1992). The social amplification of risk: progress in developing an integrative framework. In: S. Krimsky, and D. Golding (eds.) *Social Theories of Risk*, pp. 153-178, Praeger, Westport CT.
- Pidgeon, N.F. (1999). Risk communication and the social amplification of risk: theory, evidence and policy implications. *Risk, Decision and Policy*, **4** (2), 145-159.
- Reason, J.T. (1997). *Managing the Risks of Organizational Accidents*. Aldershot: Ashgate.
- Slovic, P. (1993). Perceived risk, trust and democracy. *Risk Analysis*, **13**, 675-682.
- Slovic, P. (1992). Perception of risk: reflections on the psychometric paradigm. In: S. Krimsky, and D. Golding (eds.) *Social Theories of Risk*, pp. 117-152, Praeger, Westport CT.
- Slovic, P., Fischhoff, B. and Lichtenstein, S. (1980). Facts and fears: Understanding perceived risk. In R. C. Schwing and W. A. Albers (Eds.), *Societal Risk Assessment*. New York, Plenum Press.
- Slovic, P., Lichtenstein, S. & Fischhoff, B. (1984). Modeling the societal impact of fatal accidents. *Management Science*, **30**, 464-474.
- Turner, B.A. and Pidgeon, N.F. (1997). *Man-made Disasters*, 2nd Edn. Oxford, Butterworth-Heinemann.
- Weinstein, N.D. (1989). Optimistic biases about personal risks. *Science*, **246**, 1232-1233.
- Weber, R.P. (1990). *Content Analysis*, 2nd Edn. London: Sage.

APPENDIX A SAMPLE CHARACTERISTICS

The sample age, sex, occupational class, and household income distributions are shown in Tables A.1 - A.4. For comparison purposes, the proposed quotas and composition of the “relativities” main study sample are also shown.

The age distribution is shown in Table A.1. This shows that the present study recruited a slightly higher percentage of those in the 30-44 and 45-59 age-groups than the proposed quota (based on the 1991 Census) and the “relativities” main study. However, overall there were no statistically significant differences between the distribution of ages in the present study and either the proposed quota ($\chi^2(3)=5.49$, $p=0.14$) or the main study ($\chi^2(3)=5.11$, $p=0.16$).

**Table A.1
Age Distribution of Respondents**

Age-Group	Present study N (%)	Proposed Quota (Census, 1991) (%)	“Relativities” main study: N (%)
18-29	27 (18.0%)	24.5%	34 (26.1%)
30-44	44 (29.3%)	26.0%	37 (28.5%)
45-59	45 (30.0%)	21.0%	26 (20.0%)
60+	34 (22.7%)	28.5%	33 (25.4%)

The sex distribution is shown in Table A.2. It is clear from this that there was no statistically significant difference between the sex of respondents interviewed in the present study and the main study ($\chi^2(1)=0.015$, $p=0.92$).

**Table A.2
Sex of Respondents**

Sex	Present study N (%)	Proposed Quota (Census, 1991) (%)	“Relativities” main study: N (%)
Female	75 (50%)	50%	66 (50.8%)
Male	75 (50%)	50%	64 (49.2%)

The occupational classification of respondents is shown in Table A.3. This shows that the present study recruited a slightly lower percentage of occupational classes IV/V and slightly higher percentage of classes I/II and III than both the proposed quota and the main study. However, overall there were no statistically significant differences between the distribution of occupational classes between the present study and either the quota ($\chi^2(2)=2.00$, $p=0.37$) or the main study ($\chi^2(2)=3.01$, $p=0.22$).

Table A.3
Occupational Classification

Classification	Present study N (%)	Proposed Quota (Census, 1991) (%)	<i>“Relativities” main study: N (%)</i>
I/II	55 (37.1%)	28.5%	38 (29.2%)
III	63 (42.6%)	45.0%	61 (46.9%)
IV/V	30 (20.3%)	26.5%	31 (23.9%)
Missing	2	-	0

The household income of respondents is shown in Table A.4. It is notable that a higher percentage of respondents in the present study reported household incomes greater than £20,000 per annum in the present study compared to the main study (67.0% compared to 40.8% respectively). Moreover, there was a statistically significant difference between the distribution of income across the two studies ($\chi^2(8)=25.2$, $p<0.01$).

Table A.4
Household Income

Income	Present study N(%)	<i>“Relativities” main study: N (%)</i>
<£3,999	4 (2.8%)	6 (4.8%)
£4,000-7,999	5 (3.5%)	19 (15.2%)
£8,000-11,999	12 (8.4%)	18 (14.4%)
£12,000-15,999	14 (9.8%)	20 (16.0%)
£16,000-19,999	12 (8.4%)	11 (8.8%)
£20,000-29,999	38 (26.6%)	26 (20.8%)
£30,000-39,999	31 (21.7%)	14 (11.2%)
>£40,000	27 (18.9%)	11 (8.8%)
missing	7	5

Data were also collected on respondents' estimated mileage by car and rail over the last 12 months. From Table A.5 it can be seen that the reported car mileage was comparable between the two studies, confirmed by the finding that there was no significant difference between the distributions ($\chi^2(7)=2.50$, $p=0.93$).

Table A.5
Car Mileage

Mileage	Present study N(%)	<i>“Relativities” main study: N (%)</i>
<1,000	19 (12.9%)	22 (16.9%)
1000-3000	20 (13.6%)	19 (14.6%)
3000-7000*	31 (21.1%)	30 (23.1%)
7000-12,000	35 (23.8%)	26 (20.0%)
12,000-18,000	20 (13.6%)	18 (13.9%)
18,000-25,000	14 (9.5%)	8 (6.1%)
25,000-35,000	5 (3.4%)	5 (3.9%)
>35,000	3 (2.0%)	2 (1.5%)
Missing	3	0

*Note: National average 5,000 miles per year
(Transport Statistics Great Britain 1997)*

Table A.6 shows a rather different picture with regards to rail travel. Whereas in the main study the median respondent's estimated annual rail mileage was between 1-200 miles per year in the present study the median was in the 500-1000 range (20-100 miles per week). Also, around 20% of the present sample might be considered 'heavy' or regular rail users (>100 miles per week). This compares to only around 5% 'heavy' rail users in the main study sample. These observations are confirmed by the finding that there was a significant difference between the distributions ($\chi^2(7)=25.6, p<0.01$).

Table A.6
Rail Mileage

Mileage	Present study N(%)	<i>“Relativities” main study: N (%)</i>
zero	29 (19.7%)	44 (33.9%)
1-200	13 (8.8%)	25 (19.2%)
200-500*	25 (19.0%)	15 (11.5%)
500-1000	37 (25.2%)	27 (20.8%)
1000-5000	14 (9.5%)	12 (9.2%)
5000-10,000	15 (10.2%)	1 (0.8%)
10,000-25,000	10 (6.8%)	4 (3.1%)
>25,000	4 (2.7%)	2 (1.5%)
Missing	3	0

*Note: National average 350 miles per year
(Transport Statistics Great Britain 1997)*

APPENDIX B

SAFETY PRIORITIES QUESTIONNAIRES: SUMMARY DATA

Data from the four variants of the Safety Priorities Questionnaires (SPQs) are shown in Tables B.1 to B.4.

Table B.1 (SPQ A) shows comparisons between the road (RD) and domestic fire (DF) programmes. Reasons for giving priority to the road programme include (less) *personal-control*, (more) *involuntary*, (more) *uneasy*, and (more) *household-benefit*. The number of deaths per year was seen as an argument for prioritising RD by 60.8% and not an argument by 35.1%. The ages of those affected was seen to be an argument for prioritising by about half the respondents (typically in favour of the RD programme). When asked to vote, a majority preferred the RD programme, with a substantial vote for equal priority (only one respondent gave priority to DF).

Table B.2 (SPQ B) compares the road (RD) and railway (RL) programmes. (more) *household-benefit* was the most often endorsed argument for giving priority to the RD programme, with (more) *uneasy* the next most often. Also, the 1800 deaths on the roads pushed just over half of respondents in favour of the RD programme (around 40% were influenced by the age distribution as well). (more) *media-attention* was given most often as the reason for giving priority to the RL programme; (less) *personal-control*, (larger) *scale*, and (more) *involuntary* were endorsed as arguments for RL by about one in four respondents. Overall, the vote was split between RD and equal priority with only around one in six respondents giving priority to RL.

Table B.3 (SPQ E) compares the domestic fire (DF) and public fire (PF) programmes. Few arguments were endorsed for the DF programme. On the other hand, (less) *personal-control* and (more) *involuntary* were considered arguments for the PF programme by around two-thirds of respondents; (larger) *scale* was endorsed by around half, and (more gaps) *expert-knowledge* by 40%. The vote was more evenly split than versions A and B, with around a third going for PF, and a quarter for DF.

Table B.4 (SPQ F) compares the public fire (PF) and railway (RL) programmes. Fewer dominant arguments were endorsed for this version of the questionnaire, although arguments were more typically in favour of the RL programme. Around one in three respondents endorsed (more) *uneasy* and (more gaps) *expert-knowledge* as arguments for the RL programme; around one in four endorsed (larger) *scale*, (less) *personal-control*, and (more) *involuntary*. Neither *number-per-year* nor *age-affected* emerged as strong arguments for either programme. The vote was split with around a third going for the RL programme, and one in five for the PF programme.

Table B.1
SPQ A - ROAD (RD) vs. DOMESTIC FIRE (DF)

N=75		DIFFERENCE - RD			NO DIFFERENCE/ DON'T KNOW	DIFFERENCE - DF		
	N	priority RD	not an argument	priority DF		priority RD	not an argument	priority DF
(larger) scale	73	24 (32.9%)	16 (21.9%)	1 (1.4%)	19 (26.0%)	0	9 (12.3%)	4 (5.5%)
(less) personal-control	74	43 (58.1%)	17 (23.0%)	1 (1.4%)	7 (9.5%)	1 (1.4%)	4 (5.4%)	1 (1.4%)
(more) involuntary	74	41 (55.4%)	17 (23.0%)	3 (4.1%)	10 (13.5%)	0	2 (2.7%)	1 (1.4%)
(more) media-attention	74	7 (9.5%)	11 (14.9%)	1 (1.4%)	27 (36.5%)	5 (6.8%)	18 (24.3%)	5 (6.8%)
(more gaps) expert- knowledge	74	13 (17.6%)	6 (8.1%)	0	50 (67.6%)	0	3 (4.1%)	2 (2.7%)
(more) uneasy	74	39 (52.7%)	15 (20.3%)	0	13 (17.6%)	0	2 (2.7%)	5 (6.7%)
(more) household benefit	73	33 (45.2%)	13 (17.8%)	0	21 (28.8%)	0	2 (2.7%)	4 (5.5%)
	N	priority RD (1800 deaths/yr)	not an argument	priority DF (600 deaths/yr)				
(different) number-per- year	74	60.8%	26 (35.1%)	3 (4.1%)				
		priority RD (higher % 17-59yrs)	not an argument	priority DF (higher % 0-16/ 60+ yrs)				
(different) age-groups affected	74	25 (33.8%)	36 (48.7%)	13 (17.6%)				
	N	priority RD	equal priority	priority DF				
VOTE	74	43 (58.1%)	30 (40.5%)	1 (1.4%)				

Table B.2
SPQ B - ROAD (RD) vs. RAIL (RL)

N=75		DIFFERENCE - RD			NO DIFFERENCE/ DON'T KNOW	DIFFERENCE - RL		
	N	priority RD	not an argument	priority RL		priority RD	not an argument	priority RL
(larger) scale	74	6 (8.1%)	3 (4.1%)	0	11 (14.9%)	6 (8.1%)	31 (41.9%)	17 (23.0%)
(less) personal-control	73	8 (11.0%)	1 (1.4%)	0	18 (24.3%)	1 (1.4%)	21 (28.8%)	24 (23.9%)
(more) involuntary	75	12 (16.0%)	3 (4.0%)	0	24 (32.0%)	1 (1.3%)	14 (18.7%)	21 (28.0%)
(more) media-attention	74	0	0	0	7 (9.5%)	6 (8.1%)	30 (40.5%)	31 (41.9%)
(more gaps) expert- knowledge	73	8 (11.0%)	1 (1.4%)	0	37 (50.0%)	2 (2.7%)	8 (11.0%)	17 (23.3%)
(more) uneasy	74	25 (33.8%)	18 (24.3%)	0	15 (20.3%)	1 (1.4%)	6 (8.1%)	9 (12.2%)
(more) household benefit	75	38 (51.4%)	13 (17.6%)	0	19 (25.7%)	0	2 (2.7%)	2 (2.7%)
	N	priority RD (1800 deaths/yr)	not an argument	priority RL (15 deaths/yr)				
(different) number-per- year	75	42 (56.0%)	27 (36.0%)	6 (8.0%)				
		priority RD (higher % 0-16/ 60+ yrs)	not an argument	priority RL (higher % 17-59yrs)				
(different) age-groups affected	75	30 (40.0%)	40 (53.3%)	5 (6.7%)				
	N	priority RD	equal priority	priority RL				
VOTE	75	32 (42.7%)	31 (41.3%)	12 (16.0%)				

Table B.3
SPQ E - DOMESTIC FIRE (DF) vs. PUBLIC FIRE (PF)

N=75		DIFFERENCE - DF			NO DIFFERENCE/ DON'T KNOW	DIFFERENCE - PF		
	N	priority DF	not an argument	priority PF		priority DF	not an argument	priority PF
(larger) scale	75	4 (5.3%)	0	0	9 (12.0%)	6 (6.7%)	19 (25.3%)	38 (50.7%)
(less) personal-control	75	1 (1.3%)	0	0	2 (2.7%)	3 (4.0%)	18 (24.0%)	51 (68.0%)
(more) involuntary	74	1 (1.4%)	1 (1.4%)	0	4 (5.4%)	4 (5.4%)	16 (21.6%)	48 (64.9%)
(more) media-attention	75	1 (1.3%)	1 (1.3%)	1 (1.3%)	13 (17.3%)	3 (4.0%)	26 (34.7%)	30 (40.0%)
(more gaps) expert-knowledge	75	4 (5.3%)	3 (4.0%)	1 (1.3%)	48 (64.9%)	1 (1.3%)	5 (6.7%)	13 (17.3%)
(more) uneasy	75	7 *9.3%)	10 (10.3%)	0	18 (24.0%)	3 (4.0%)	12 (16.0%)	25 (33.3%)
(more) household benefit	73	9 (12.3%)	4 (5.5%)	0	42 (98.6%)	0	5 (6.9%)	13 (17.8%)
	N	priority DF (600 deaths/yr)	not an argument	priority PF (35 deaths/yr)				
(different) number-per-year	75	41 (54.7%)	27 (36.0%)	6 (8.0%)				
		priority DF (higher % 0-16/ 60+ yrs)	not an argument	priority PF (higher % 17-59yrs)				
(different) age-groups affected	74	27 (36.5%)	35 (47.3%)	12 (16.2%)				
	N	priority DF	equal priority	priority PF				
VOTE	71	17 (23.9%)	30 (42.3%)	24 (33.8%)				

Table B.4
SPQ F - PUBLIC FIRE (PF) vs. RAIL (RL)

N=75		DIFFERENCE - PF			NO DIFFERENCE/ DON'T KNOW	DIFFERENCE - RL		
	N	priority PF	not an argument	priority RL		priority PF	not an argument	priority RL
(larger) scale	74	8 (10.8%)	10 (13.5%)	1 (1.4%)	30 (40.5%)	1 (1.4%)	6 (8.1%)	18 (24.3%)
(less) personal-control	74	4 (5.4%)	2 (2.7%)	1 (1.4%)	39 (52.7%)	2 (2.7%)	7 (9.5%)	19 (25.7%)
(more) involuntary	73	7 (9.6%)	7 (9.6%)	1 (1.4%)	35 (47.9%)	0	5 (6.9%)	18 (24.7%)
(more) media-attention	74	1 (1.4%)	2 (2.7%)	0	39 (52.7%)	0	8 (24.3%)	14 (18.9%)
(more gaps) expert-knowledge	74	2 (2.7%)	5 (6.7%)	0	36 (48.6%)	0	6 (8.1%)	25 (33.8%)
(more) uneasy	74	9 (12.2%)	6 (8.1%)	0	22 (29.7%)	1 (1.4%)	8 (10.8%)	28 (37.8%)
(more) household benefit	73	12 (16.4%)	4 (5.5%)	0	35 (47.9%)	0	4 (5.5%)	18 (24.7%)
	N	Priority PF (35 deaths/yr)	not an argument	priority RL (15 deaths/yr)				
(different) number-per-year	74	17 (23.0%)	46 (62.2%)	11 (14.9%)				
		priority PF (higher % 60+ yrs)	not an argument	priority RL (higher % 17-59yrs)				
(different) age-groups affected	74	15 (20.3%)	47 (63.5%)	12 (16.2%)				
	N	priority PF	equal priority	priority RL				
VOTE	73	14 (19.2%)	35 (47.9%)	24 (32.9%)				

APPENDIX C RELATIVITY VALUES

The main test for internal consistency consisted of examining the differences between the *direct* and *chained* procedures for computing the R_{Ci} ratios. Table C.1 presents the summary data for each respondent's 1ST - 4TH ranked programmes (R_{1i} - R_{4i}). This provides the strictest test of the differences between the methods. For comparison purposes the same data from the "relativities" main study are also presented.

Table C.1
Mean (and Standard Error) R_{Ci} Ratios Elicited for the 1ST - 4TH ranked contexts

	Present Study (N=135)			"Relativities" Main Study (N=119)		
	Direct	Chained	p value ^a	Direct	Chained	p value ^a
1 ST ranked (R_1)	1.000 (0.00)	1.000 (0.00)	n/a	1.000 (0.00)	1.000 (0.00)	n/a
2 ND ranked (R_2)	0.866 (0.018)	0.866 (0.018)	n/a	0.835 (0.021)	0.835 (0.021)	n/a
3 RD ranked (R_3)	0.792 (0.023)	0.736 (0.027)	0.002	0.776 (0.024)	0.715 (0.027)	0.0003
4 TH ranked (R_4)	0.726 (0.025)	0.655 (0.029)	<0.0001	0.706 (0.028)	0.617 (0.030)	<0.0001

^aThe p-values reported are based on two-tailed t-tests of the hypothesis that the mean R_{Ci} ratios calculated using the chained and direct methods are different from one another

Since the ratios were computed from the ranking of contexts inferred from the tables themselves R_{1i} will be exactly 1.0 for all respondents and the R_{2i} ratios elicited using the *direct* and *chained* methods will be identical. However, if respondents have not been wholly consistent in their matching responses across the tables, the R_{3i} and R_{4i} ratios may not necessarily be identical. As shown in Table C.1, with α set at 0.05, the R_{3i} and R_{4i} ratios elicited from the *chained* method were significantly lower than those elicited from the *direct* method. This is the same pattern of findings as the "relativities" main study, suggesting that the internal consistency of the tables method was about the same in the present study.

The other internal consistency check resulted from the fact that respondents completed one of two versions of the tables questionnaire: referred to as the 'Top-R' and 'Top-L' versions. In both versions the numbers in the table were symmetrical around the middle line where both programmes prevented the same numbers of deaths; but in the 'Top-R' version, the lines in the top half favoured the programme on the RIGHT (e.g., LEFT - Prevent 10 car driver/passenger deaths vs. RIGHT - Prevent 11, 12, 15, 18, 20, 25, 30, 40, 50, 70 and 100 deaths in domestic fires) whereas the lines in the bottom half favoured the programme on the LEFT (e.g., LEFT - Prevent 11, 12, 15, 18, 20, 25, 30, 40, 50, 70 and 100 car driver/passenger deaths vs. RIGHT - Prevent 10 deaths in domestic fires); whereas in the 'Top-L' version, the lines in the top half favoured the programme on the LEFT and the lines in the bottom half favoured the programme on the RIGHT. Since the standardised instructions used by moderators asked respondents to start from the top lines of their tables, this manipulation allowed us to test for a 'starting point' effect: i.e., whether the fact that the top line in the 'Top-L' version favoured the programme on

the left (e.g., LEFT - Prevent 100 car driver/passenger deaths vs. RIGHT - Prevent 10 deaths in domestic fires) caused responses to differ systematically from those elicited by the 'Top-R' version which favoured the programme on the right (e.g., LEFT - Prevent 10 car driver/passenger deaths vs. RIGHT - Prevent 100 deaths in domestic fires).

The R_{4i} ratios elicited were also compared between the 'Top-R' and 'Top-L' sub-samples, where, as with the comparisons between the tables methods, we would predict the greatest difference is liable to be observed. However, summary data (see Table C.2) and *t*-tests suggest that the ratios elicited for the 4TH ranked programme were *not* significantly different between the 'Top-R' and 'Top-L' sub-samples.

Table C.2
Mean (and Standard Error) R_{4i} Ratios Elicited in the 'Top-R' and 'Top-L' versions

	Present Study (N=135)			"Relativities" Main Study (N=119)		
	'Top-R'	'Top-L'	p value ^a	'Top-R'	'Top-L'	p value ^a
Direct	0.743 (0.037)	0.710 (0.039)	0.54	0.714 (0.040)	0.695 (0.037)	0.73
Chained	0.646 (0.043)	0.663 (0.043)	0.76	0.669 (0.042)	0.660 (0.037)	0.89

^aThe *p*-values reported are based on two-tailed *t*-tests of the hypothesis that the mean R_{4i} ratios were significantly different between the 'Top-R' and 'Top-L' sub-samples



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